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Mortuary variability in prehistoric Central California : a statistical study of the Yukisma Site, CA-SCL-38

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Mortuary Variability in Prehistoric Central California: A Statistical Study of the Yukisma Site, CA-SCL-38

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Abstract

Mortuary Variability in Prehistoric Central California: A Statistical Study of the Yukisma Site, CA-SCL-38

by Viviana Bellifemine

The Yukisma site, CA-SCL-38, consists of a large Costanoan/Ohlone burial mound in north Santa Clara County, Central California. It has been dated from 200 B.P. to at least 2200 B.P. From the burial assemblage, 244 individuals associated with 32000 beads and artifacts, were analyzed. Theoretical models of socio-cultural organization manifested in mortuary behavior are addressed as a working framework. A multivariate approach to the mortuary data using cluster and factor analysis is presented. The theoretical framework, mortuary assemblage, and analytical approach are used to formulate and test three specific hypotheses related to the socio-cultural organization of the prehistoric inhabitants.

Statistical analysis indicates the cemetery was highly organized. Age and sex distribution of the site population was strongly patterned. Clustering and factor analysis point to several relationships between mortuary variables. The pre-contact cultural organization was likely to be hierarchical with complex levels of social status.

Acknowledgments

This section is dedicated to those who provided shelter and ports of call in this long and varied journey, full of trials and tribulations. It is only in the moment of writing this small section that I have realized how people-intensive this branch of science really is, how many people contribute to the process of recovery from the digging to the act of reconstructing a sometimes hazy picture of what past societies and cultures were like.

Through the process of the research and writing of this thesis, many people have contributed to a greater or lesser degree to its completion. Anthropology is a holistic science and since one cannot become an expert on all the disciplines that are necessary in today's research, one must perforce lean on others for the part that they can contribute.

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Table of Contents

List of Tables

List of Figures

1. Introduction

The study of mortuary variability, as more than a mere cataloging of burial data, rests on the premise that the treatment of the dead as a social phenomenon is more than just random action. Huntington and Metcalf wrote, "in all societies ... the issue of death throws into relief the most important cultural values by which people live their lives and evaluate their experiences" (1979:2). Thus, it is natural that "Mortuary evidence ... represents the direct and purposeful culmination of conscious behavior, rather than its incidental residue" (O'Shea 1981:39). Through this connection the archaeologist and the cultural anthropologist unite to glean an understanding of some of the social relationships of past cultures from present archaeological investigations.

1.1 Objectives

The objectives of the present analytical study of the archaeological assemblages derived from the Yukisma site are twofold. First, to determine the social structure at CA-SCL-38 by the analysis of mortuary variability through the systematic application of statistical methodologies. Second, to establish a baseline for further explorations and interpretations of the wide-scale pre-contact social organizations of Central and Northern California.

It is hoped that the use of some of the more recently developed multivariate statistical tools will shed light on patterns of hierarchical and group differentiations in the societies that used CA-SCL-38 as a burial ground. In accordance with the archaeological evidence from previous studies in California (T. King 1970, 1976, 1978, L. King 1969, 1982, Leventhal 1993, Luby 1991), the following hypotheses will be tested:

Hypothesis 1: The cemetery was highly structured.

Hypothesis 2: The social structure was hierarchical rather than egalitarian.

Hypothesis 3: There is evidence for rank, power, and authority in the society.

The goals of the present study are to confirm or refute the stated hypotheses. This will be accomplished through the extraction of the relevant patterns of mortuary variability by applying multivariate statistical methods to the mortuary assemblage from the Yukisma site. These analyses include univariate, bivariate, and multivariate phases. The univariate analysis seeks to determine gross distribution characteristics for the mortuary variables (body treatment, artifact associations, location within the cemetery, etc.). The bivariate analysis searches for correlations of the mortuary variables with age and sex. The multivariate analysis (cluster and factor analysis) is used for determining more complex interrelated patterns. The results of the statistical analyses will be interpreted in accordance with a theoretical formalism of mortuary behavior as defined within the anthropological literature.

1.2 Theoretical Background: Approaches to Mortuary Behavior

Mortuary analysis is based on the premise that disposal of the dead in a society is not a random act, but obeys a set of rules that varies according to the complexity of the social system's structure and the ritual and belief system of the population, and that there is a predictable relationship between the individual's treatment in death and his/her social position in life. Saxe (1970) and Binford (1971), among others, have formalized the theory of mortuary analysis based on this premise. It is in the framework of this theory that the testing of the previously stated hypotheses will ensue.

Social reconstruction of past societies based on mortuary analysis through this formalism has been widely used to answer questions at the single site level (Peebles 1974, Braun 1979), or at the regional level (Chapman 1987, Earle 1978, Levy 1982). This framework was initially employed in conjunction with, and was developed from, ethnographic data (Binford 1971, Saxe 1971), but was later applied to the archaeological record (Rothschild 1979, O'Shea 1984, T. King 1970, L. King 1982).

Saxe (1970) formulated a theoretical framework arguing that mortuary practices could be analyzed within the context of social systems (1970:1). He developed his idea as follows:

> *"When archeologists excavate a set of burials they are not merely excavating individuals, but a coherent social personality who not only engaged in relationships with other social personalities but did so accordingly to rules and structural slots dictated by the larger social system" (1970:4).*

Saxe introduced three important terms that form the definitive underpinnings of his work: *social identity,* "a category of persons or what has been called a social position or status" (1970:4); *identity relationship,* "when two or more social identities are engaged in a social relationship" (1970:4); and *social persona,* "a composite of several social identities selected as appropriate to a given interaction" (1970:7). These concepts, borrowed from Goodenough's 1965 work on role theory, enabled Saxe to link social relationships involving the deceased to the disposal treatment. Moreover, Saxe proposed that different types of social organization with different sets of social relationships will evidence different sets of disposal treatments (1970:12).

Saxe's study (following Brown's [1966,1967] work at the Spiro site) is based on the application of formal analysis to three ethnographic groups: the Kapauku Papuans of New Guinea, the Ashanti of West Africa, and the Bontoc Igorot of the Philippines. As he explained, formal analysis renders regularity in the data and "... helps to unravel the structure latent in the variables of disposition of the dead as a step towards formulating a number of empirical generalizations concerning the relationship between social factors and the taxonomies they produced" (1970:27).

Saxe's theoretical framework, defined by his eight hypotheses, despite later modification (Goldstein 1981, O'Shea 1984), constitutes a pivotal point towards the validation of the relationship between social organization and mortuary practices. A brief exposition of Saxe's framework will be discussed here:

> *Hypothesis #1: The components of a given disposal domain cooperate in a partitioning of the universe, the resultant combinations representing different social personae (1970:65).*

"Components" are defined as "any unidimensionally scaled value of a variable ... that reflect[s] social personae differentially," and are "the minimal units of meaningful behavior." In effect, social personae are symbolized by distinctions in mortuary practices. If this is true, then there is not only a qualitative, but also a quantitative relationship between societal classes and types of mortuary treatment, and these are potentially reflected in the preserved burial record. Also implied is that the components group in complex patterns to define the social personae.

> *Hypothesis #2: In a given domain, the principles organizing the set of social personae are congruent with those organizing social relations in the society at large (1970:66).*

A correlation is noted between the dimensions recognized in mortuary treatment and the social structure of any given society. For more egalitarian societies differences are based on age, sex and/or personal achievements. In such societies "all" infants will possess fewer components than adults. Conversely, when certain infants exhibit components similar to those present in a selected group of all ages, then the social system indicates non-egalitarian characteristics with principles of ascription (by birth/lineage).

> *Hypothesis #3: Within a given domain personae of lesser social significance tend to manifest fewer positive components in their significata relative to others, and conversely (1970:69).*

Simply stated, the higher the social status of the individual, the greater the number of significant components in the burial context. These predictors are more reliable in egalitarian societies, and may be restricted to within each social stratum in more complex stratified societies (King 1976:67, O'Shea 1984:11).

Saxe also applied the concept of "involvement," in which the status of the individual is linked to the number of identity relationships to/from that individual. In turn, the number and importance of these relationships is related to the breadth of participation in the burial ceremony.

> *Hypothesis #4: The greater the social significance of the deceased the greater will be the tendency for the social persona represented at death to contain social identities congruent with that higher position at the expense of other[s] the deceased may have had in life, and conversely (1970:71).*

The manifestations of lesser social significance will tend to be relegated in deference to those of higher social significance in burials of higher rank individuals. The representations of the social personae are relative. Whether a certain facet of the social persona is represented depends on the rank of the individual. When an individual has higher status, the representation of less important aspects defers to the more important.

Hypothesis #5: The more paradigmatic the attributes evidenced in the key structure of the domain, the less complex and more egalitarian the social organization. Conversely, the more tree-like the attributes, the more complex and less egalitarian the social organization (1970:75).

Following the development of the "tree" and "paradigm" formalism, this has the practical effect that the greater the mutual independence of the burial attributes, the more egalitarian the society. The greater the number of significant correlations found among the mortuary variables, the more hierarchical the social organization.

Hypothesis #6: The simpler a sociocultural system the greater will be the tendency for there to be a linear relationship between number of components in significata, number of contrast sets necessary to define them, and the social significance of the significata; and conversely (1970:112).

In an egalitarian society, where there are opportunities for many to attain high status, it is expected that the redundancy inherent in such attainment by a variety of individuals will make their identification within the society depend upon many factors. In a highly stratified society, however, this should break down, to the point that the individual with the highest rank may be unique.

This proposition has been found to be sometimes problematic in application. Energy expenditure has often served to differentiate between social strata, and in some of these applications the proposition has only been found valid within each social stratum (Goldstein 1981).

> *Hypothesis #7: The simpler the sociocultural system the less divergence will be evident in the treatment of different kinds of deviant social persona, and conversely (1970:118).*

Stated here is the relationship between the complexity of a society and the degree of differentiation in the treatment of different kinds of "unusual" individuals (cripples, criminals, etc.).

> *Hypothesis #8: To the degree that corporate group rights to use and-or control crucial but restricted resources are attained and-or legitimized by means of lineal descent from the dead, such groups will maintain formal disposal areas for the exclusive disposal of their dead, and conversely (1970:119).*

This hypothesis moves into the realm of causality about economic/ecological reasons for the establishment and maintenance of exclusive burial areas. There is some argument, however, about the negative aspects of the proposition (Goldstein 1981). Goldstein tested the hypothesis with a world-wide sample of ethnographic accounts of societies and demonstrated that Saxe's hypothesis was not completely correct as stated: "not all corporate groups that control crucial restricted resources through lineal descent will maintain formal, bounded disposal areas exclusively for their dead" (1981:60). Moreover she restated the hypothesis in three separate sub-hypotheses:

A. To the degree that corporate groups right to use and/or control crucial but restricted resources are attained and/or legitimized by lineal descent from the dead (i.e. lineal ties to ancestors), such groups will, by the popular religion and its ritualization, regularly reaffirm the lineal corporate group and its rights. One *means of ritualization is the maintenance of a permanent, specialized, bounded area for the exclusive disposal of their dead.*

B. If a permanent, specialized bounded area for the exclusive disposal of the group's dead exists, then it is likely that this represents a corporate group that has rights over the use and/or control of crucial but restricted resources. This corporate control is most likely to be attained and/or legitimized by means of lineal descent from the dead, either in terms of an actual lineage or in the form of a strong, established tradition of the critical resource passing from parent to offspring.

C. The more structured and formal the disposal area, the fewer alternative explanations of social organization apply, and conversely (1981:61).

As Goldstein points out in the first sub-hypothesis, corporal rights and/or power are more generally reaffirmed by **popular ritual**, while exclusive disposal areas for the dead are just one manifestation of resource control.

Similarly important is Binford's essay, "Mortuary Practices: Their Study and Potential," published in 1971. In this study he reaffirms his previously developed ideas on mortuary practices. Instigated by a "processual" view of archaeology, he reacts against the formal cultural-historical approach (e.g., Kroeber 1927). This school regarded mortuary practices as unstable, varying independently of biological or social behaviors, and that the level of similar or multiple practices among independent sociocultural units was the result of cultural mixing, hybridization, or of generic or affiliational cultural relationships.

Binford refutes these arguments based on a comparative ethnographic study of 40 non-state organized societies from the Human Relations Area files. He proposed that two components should be evaluated:

First is the social persona (terminology common with Saxe) of the deceased (Goodenough 1965), "... a composite of the social identities maintained in life and recognized as appropriate for consideration at death. Second is the composition and size of the social unit recognizing status responsibilities to the deceased. We would expect direct correlations between the relative rank of the social position held by the deceased and the number of persons having duty-status relationships *vis-à-vis* the deceased (Gluckman 1937)" (Binford 1971:17).

According to Binford, the social persona recognized in mortuary ritual will vary according to the level of corporate participation in the ritual and to the relative rank of the social position of the deceased (1971:17).

This statement forms the basic linkage between differential mortuary treatment and the social position of the individual within the living community. Furthermore, the social persona recognized in differential treatment evidences relations with respect to age, sex, social position, social affiliation, circumstances of death, and cause of death (1971:17). The characteristics recognized in the funerary treatment of the individual are set forth by Binford as:

- Body treatment, which involves preparation of the body, form of disposal (mummification, cremation, etc.), and disposition of the body.

- Grave preparation, which includes the form (subsurface, architecture, materials, etc.), orientation, and location (in community life-space, in differential location, etc.).

- Grave furniture, as consisting of the form of the furniture (as in the inclusion of different types of grave goods), quantity of same, or a combination of both.

Based on the preceding considerations applied to the data, Binford developed the following propositions:

> *Proposition #1: "... there should be a high degree of isomorphism between (a) the complexity of the status structure in a socio-cultural system and (b) the complexity of mortuary ceremonialism as regards differential treatment of persons occupying different status positions" (1971:18).*

Thus, there should be a high correlation between complex mortuary treatment and a complex society. He roughly confirmed this hypothesis by correlating the classification of the society (into one of four groups) and the number of factors that they used to differentiate mortuary practice.

> *Proposition #2: "... there should be a strong correspondence between the nature of the dimensional characteristics serving as the basis for differential mortuary treatment and the expected criteria employed for status differentiation among societies arranged on a scale from simple to complex" (1971:19).*

This proposition alludes to a similar argument as the previous, but refers to the type of the mortuary variables rather than their number. The dimensions represented in the mortuary treatment of simpler societies are age, sex, and personal achievement, and in more complex societies more abstract characteristics (social position, sub-group affiliation) are represented, cross-cutting age and sex.

> *Proposition #3: "... the locus of mortuary ritual and the degree that the actual performance of the ritual will interfere with the normal activities of the community should vary directly with the number of duty-status relationships obtaining between the deceased and other members of the community" (1971:21).*

The first of the two referents (locus of mortuary ritual) sets forth a linkage between the place of interment and the aforementioned relationships. An example is given by Binford (1971:22) of burial placement in egalitarian tribes. In such tribes, infants are buried under the house floor, or in the periphery of the settlement, related to the very limited number of relationships involved. Contrariwise, adults are interred in the formal burial ground, a sign of the more numerous "duty-status" relationships entered into throughout the individual's life.

In non-egalitarian societies, however, age is not necessarily correlated with rank, and therefore is not expected to correlate with burial placement.

The second of the two referents (performance of the ritual) in this proposition shows a similarity to Saxe's Proposition #3 in its linkage to "duty-status" relationships. In his exposition, Binford set forth the "disruption" of the society at large in the performance of the burial rite as another indicator of status and community relationships. This emphasis also ties in with the discussion by Saxe about "involvement."

Binford concluded his analysis (in opposition to the cultural-historical approach) "... that the form and structure which characterize the mortuary practices of any society are conditioned by the form and complexity of the organizational properties of the society itself." Furthermore, "In no way can ideational innovations or communicated knowledge or ideas be cited as sufficient cause for change, variability, or stability" (1971:23).

Independently, Tainter (1973:6) in his study, links the last of Binford's propositions with an energy expenditure analysis:

> *"Expanding on this proposal, we may suggest that both the amount of corporate involvement, and the degree of activity disruption, will positively correspond to the amount of energy expended in the mortuary act. Energy expenditure in turn should be reflected in the size and elaborateness of the burial facility."*

Tainter related energy expenditure with labor in primitive societies and cited studies to support his analytical position (1977:332). In principle, his energy expenditure concept transforms the structural complexity and degree of organization of the social system into quantifiable units reflecting a number of social strata. Although the concept is especially applicable to the archaeological record, there are methodological problems in how to measure and quantify energy expenditure (Braun 1981, Goldstein 1981). O'Shea argues that if levels of energy expenditure are observed in mortuary remains as a reflection of rank differentiation, present evidence indicates that rank differentiation is not always visible archaeologically (1984:17). Furthermore, some of the weaknesses in Tainter's approach might misinterpret horizontal social differentiation (non-rank-related, e.g., clans, sodalities) for vertical social differentiation (hierarchical), and/or distinguish the "noise" or confusion generated by parallel status relationships (O'Shea 1984:20, Goldstein 1981:56). Despite these limitations, Tainter's method provides a multidimensional approach to the analysis of mortuary remains, where degrees of energy expenditure can provide a gross indication of rank differentiation in the society (O'Shea 1981, 1984, Goldstein 1981).

The Binford-Saxe research approach has received various levels of criticism (e.g., Hodder 1982, Pearson 1982). Despite these criticisms, their unified theory has become not only the framework in mortuary analysis, but basic to the construction of larger chains of arguments (O'Shea 1984, Brown 1995).

Brown contributed (1971, 1981) by comparing archaeological data from the Spiro site, a Mississippian ceremonial center in eastern Oklahoma, to ethnographic accounts from two southeastern chiefdoms, the Natchez-Taensa and the Choctaw. This contribution focused on the archaeological remains, and considered postdepositional effects, temporal change, and cultural behavior as factors affecting his data (O'Shea 1984:8).

In his analysis, Brown (1981:29) enumerated a set of general expectations regarding cultural and mortuary behavior, based on the hierarchical qualities of a society:

- *As long as hierarchical aspects of society are minimal, distinctions chosen for symbolic treatment will be based on age, sex, personal ability, personality, circumstances of death and social deviance;*
- *Societies exhibiting minimal hierarchy will record symbolic distinctions with a minimum of wealth, the average depending on availability;*
- *As the hierarchical aspects of society increase, burials will record gradations in treatments among otherwise equivalent statuses;*
- *As the hierarchical aspects increase, children will be accorded relatively more elaborate attention in proportion to the decline in the opportunity for replacement of the following generation;*
- *As authority increases the amount of wealth and effort expended on the burial will increase;*
- *As power increases the attachment of the powerful exclusively to locations indicative of the power base will emerge.*

Brown follows with three discriminants of rank in the archaeological record. These are: the effort-expenditure principle, symbols of authority, and the demographic structure. The effort-expenditure principle, introduced by Zipf (1949) and refined by Tainter (1975a, 1975b, 1977a, 1977b, 1978), argues that the mortuary treatment of individuals of higher rank will involve greater expenditure of energy. This principle should be of great general applicability. Symbols of authority, the singularly useless principle that states that the group in which authority is normally vested exhibits its symbols of authority, these being those that are associated with the group in which authority is usually vested, is further strengthened by the self-evident statement that symbols of authority must be present to assert the presence of authority (Peebles and Kus 1977). It is difficult to envision how this principle can be of any great use archaeologically without ethnographic referents. Demographic structure, on the other hand, is a powerful tool for the recognition of differential membership of age and sex categories in certain status groups.

As his contribution, O'Shea advanced a set of principles and some corollaries to form the necessary base of constraints on mortuary variability based upon the previous cited works (1974:33). He also added conditions under which these principles are valid.

> *Principle 1: All societies employ some regular procedure or set of procedures for the disposal of the dead.*
> *Principle 2: A mortuary population will exhibit demographic and physiological characteristics reflecting those of the living population.*
> *Principle 3: Within a mortuary occurrence, each interment represents the systematic application of a series of prescriptive an proscriptive directives relevant to that individual.*
> *Corollary 3a: The nature of the society will pattern and circumscribe the practices for the disposal of the dead.*
> *Corollary 3b: The specific treatment accorded an individual in death will be consistent with that individual's social position in life.*
> *Principle 4: Elements combined within a burial context will have been contemporary in the living society at the time of interment (Worsaae's Law).*

O'Shea treated the processes involved in the transformation from mortuary ritual to observable archaeological phenomena, after Schiffer and Clarke's study (O'Shea 1984:24). This transformation is termed the *formation process*. It is further subdivided into *primary depositional* *pathways,* and *postdepositional processes.* The depositional pathways can be further subdivided into three classes: *intentional, coincidental,* and *accidental.* Postdepositional processes include natural environmental change, and changes brought about at a later time, by the same or unrelated cultures, with or without ritualistic significance. These postdepositional processes can be either *pattern masking* or *pattern enhancing,* and thus alter the state of maximal behavioral patterning extant immediately after the depositional phase.

To these various processes O'Shea added the limitations in the detection and recognition of the patterns in the archaeological record, including the limitations of data analysis. The net result is randomization of the information. This is precisely the principle at work in systems that suffer loss of information (increase in entropy), that precludes the adoption of some statements about the causal culture.

This view of the factors that affect the burial record is complemented by Bartel's (1982) exposition of the mortuary ritual as a process that feeds on itself through the burial ceremony and its effect on the societal concept of death.

1.3 Limitations of Mortuary Analysis

Despite the promises offered by the study of mortuary variability of a past society, researchers must be aware of the limitations inherent in such analysis. As seen previously, effects of site formation processes individually and in combination act as "filters" through which mortuary ritual variability must be interpreted (O'Shea 1984). This includes the sampling problem, i.e. since mortuary treatment is not random, the mortuary population cannot be treated as a statistically valid sample of the living population. A further sampling complication is the possibility that a site was not completely excavated (Clarke 1973:16). Even in the presence of complete excavation, all the grave goods may not reach the grave, the ones that do may not survive interment, and they must be recognized by the investigator (Chapman and Randsborg 1981, Ucko 1969). This in part leads to the possible error in negative inferences (i.e., stating a number of classes rather a minimum number based on absences of grave goods at some burials) (O'Shea 1984, Goldstein 1981). In addition, although there are some archaeological patterns with definite socio-cultural implications, others can only be reliably interpreted with the help of ethnographic accounts.

Furthermore, although the current theories of mortuary variability tend to work well for simpler cultures, more complex cultures may exhibit mortuary behavior that does not directly and unambiguously reflect the complexity of the culture (Chapman and Randsborg 1981). There are, however, exceptions even for the relatively simple prehistoric societies, in which increasing complexity was not reflected in the mortuary behavior.

Even if all the previous hold, if the site has a long period of utilization, then patterns that change through time may be confused, unless the dating for each burial is known (not always possible) and taken into account (O'Shea 1984, T. King 1976).

Despite these contingencies, mortuary analysis remains an important tool in the search for the socio-cultural organization and beliefs of past cultures, but must take part in a framework of complementary avenues of investigation that take into account all aspects cultural manifestations.

1.4 Development of Hierarchical Socio-Cultural Systems

The foregoing discussion of the differences between egalitarian and non-egalitarian socio-cultural systems begs the question of how these systems arise. Researchers, well into the 60s, held the view that the development of non-egalitarian systems was driven by the rise of agriculture and/or the production of a surplus (Bonar 1922, Childe 1951, Steward 1955). This surplus then permitted the support of a privileged class (economic Marxist theory anthropology). This model was demolished by Sahlins (Brown 1981) who demonstrated that social rank existed independently of a definable surplus of goods. Sahlins also presented the need to distinguish social ranking from authority, since they exist and manifest independently in the archaeological record.

Furthermore, Sahlins suggested that the necessity for social ranking in light of competition can then be seen in the pattern of small, self-sufficient groups, of various subsistence practices (e.g., hunter-gatherers, collectors, horticulturalists) with stable resource bases. There is then no need (or evidence) for centralized authority, but there is social ranking nonetheless. Social ranking is therefore driven by the biological requirement to compete for marriage mates and control of wealth in groups that are otherwise self-sufficient (Rosman and Rubel 1971, Friedman 1975).

Two theories explaining the rise of social rank are currently in sway. However they are not mutually exclusive. These two theories are the circumscription theory developed by Carneiro (1970), and the managerial theory developed by Service (1975) and Wright (1977). The former is based on the acquisition of power through control of restricted access to critical resources (Carneiro 1970). The latter is based on the emergence of leadership to solve a critical-resource allocation problem. The range of applicable models has been expanded by Earle (1978), and Peebles and Kus (1977) to include threats to the security of the group and/or its food supply.

Interestingly, these arguments do not take into account population growth. Population growth both precedes and follows the rise of social ranking (Brown 1981), and has been cited as a sufficient, but not a necessary condition (Cowgill 1975, Flannery 1972).

1.5 Economy of Funerary Rites

Brown (1995) noted that the social personality theory (representationist) view of mortuary variability and its relationship with societal structure break down in many cases in modern Western burial customs (Pearson 1982). He cited studies (e.g., Aries 1981) that present marked departures from the representationist model. Pearson proposes that economy and politics are more appropriate concepts upon which to base the study of mortuary theory. Earlier, Goldstein (1976) was a harbinger of this perspective by noting that the physical treatment of the burial is not the primary locus of mortuary expression, but a part of the funeral rite as a whole.

In the economic view, the burial ritual is an allocation of resources upon the dead by the living, and is then subject to budgeting considerations in the broader context of the current state and availability of energy (e.g., time, effort, resources) in the society (Brown 1995). Precourt (1984) also espouses this view and uses the Saxe-Binford model as a base for his theoretical scheme. He formalizes the relationship between *predominant modes of economic transaction* and the treatment of the dead at burial.

Although these particular considerations will not be dealt with in the present study, they will, nonetheless, become more valuable in a regional approach to mortuary behavior in light of inter-group interactions. It is important to keep some of these concepts in mind when analyzing the material wealth derived from the mortuary assemblage (destruction vs. allocation through inheritance) and its variation through time, and the economic causes for said variation. These considerations are valuable to put into focus the relative wealth or energy involvement of the society in a regional and temporal perspective.

1.6 Distinctions Between Status, Authority, and Power

The theoretical framework employed in this study is based on the duty-status relationships between members in the society. To better analyze the consequences of these relationships, the concepts of social rank (status), economic control (power, wealth), and political function (authority) must be taken into account.

T. King (1976:4), following Bohannan's 1963 work, defined status, authority, and power thus:

- Status is any "set of rights and obligations that are inherent in (a) social position."
- Authority is a "societally defined right to direct or rule upon the behavior of others."
- Power is "the objective ability to influence the behavior, whether institutionalized or not."

The distinction between these concepts is important because, though there are many instances where two or more of these functions are represented in the same individual, there are similarly instances where they are not (Brown 1981). This independence, according to Brown, has been documented among small, self-sufficient independent groups. It is the transition from egalitarian systems to the more complex regional-hierarchical systems that is dependent on the establishment of authoritarian lineages that derive privilege not available to the masses. It becomes part of the function of the mortuary ritual to reassert this control through differential treatment of the dead.

In his study, Brown offered a methodology for distinguishing rank, authority, and power. According to Brown "the disposition of symbols of authority among the dead will be indicative of the composition of the group within which authority is normally vested" (1981:29).

Peebles and Kus (1977) hypothesize that for there to be evidence of ranking there must be two segments of the population: one with high energy investment in the mortuary ritual that shows strong evidence of ranking and lineage based status, and another, with lower energy investment, that has egalitarian traits, that is, with treatments based on age and sex. It is obviously this higher status segment that is the beneficiary of regional hierarchical structures.

1.7 Central California Models of Social Organization

Burial studies conducted in California have mostly dealt with lifeways analysis, chronological issues, and development of regional artifact typologies (Schenck 1926, Uhle 1907, Nelson 1909, 1910, Bickel 1981, Gerow and Force

1968, Heizer and Cook 1950, Loud 1918, and others). A few archaeologists have recently begun to approach the problems of social organization and its development (Bean 1974, Blackburn 1976, Bean and Blackburn 1976, T. King 1970, 1978, C. King 1978, Wiberg 1988, Milliken and Bennyhoff 1993, Luby 1991, L. King 1982, Leventhal 1993, 1996).

The development of agriculture was for a long time considered the essential and necessary step that transformed simple societies into complex social and political systems (Steward 1955, White 1959, Childe 1951, Fried 1967, Service 1962). The lack of agricultural development among prehistoric societies in California was the reason for considering its indigenous peoples as "simple" in social organization.

Until the late 60s, it was widely accepted that as a consequence of agriculture there would be surplus food production, sedentism, increased leisure-time, greater general health, craft specialization, and social differentiation. These ideas were challenged by Lee's 1968 studies of the !Kung and Woodburn's 1968 studies of the Hadza. As a result of these alternative perspectives T. King (1976:23) argued that is an oversimplification to view California hunter-gatherers typically as "bands" with absence of political differentiation. This is not to say that agriculture had played no role in the development of complex social systems, rather that it is not the *sine qua non* for such. King also studied the cultural processes proposed by Service (1962), Fried (1967), and Steward (1955), by which social complexity may come about without the development of agriculture.

Archaeological studies (T. King 1970, 1974, 1976, 1978, Fredrickson 1973, 1996, Luby 1991, Moratto 1984, L. King 1969, 1982, Wiberg 1988, Jackson 1986, Leventhal 1993, Cambra et al. 1996), as well as ethnographic and ethnohistoric evidence (Bean 1974, Blackburn 1976, Goldschmidt 1976, Gayton 1976), indicate that prehistoric and protohistoric California societies were non-egalitarian, functioning as participants of complex inter- and intra-group interactions. These interactions included, but perhaps were not limited to, trade, ritual congregations and obligations, marriage and military alliances, and sometimes conflict.

T. King (1976) discussed a possible model for the development of more complex social differentiation in the Bay Area, and other areas of California, as a result of the varied ecological systems. These ecological systems permit the establishment of sedentary groups which then progress to more varied social forms under the pressures of competition for limited resources, through war or through competitive trade. In his exposition, T. King used Carneiro's (1970) and Chagnon's (1970) ideas of the function of war ("social circumscription") in the development of hierarchical systems. This proposition had been given validation through Gearing's (1962) possible substitution of the forces of intense competition in community exchange and redistribution for those of war. Basgall (1987) in his study provided a detailed account of the economic influence of the acorn, in its many varieties, as a staple of the Northwest Coast Indians. Basgall speculated that intensification of acorn use, as a staple, would lead to an increase in sedentism. This, in turn, would lead to the disruption of the acquisition of other resources that required greater mobility, and engender the need for large scale storage. The process would become more rapid once initiated, and result in greater territorial consolidation, leading to the emergence of the "tribelet" system, with its need for formalized exchange systems, all leading to incipient authority and the rise of hierarchical structures in the society. The partial substitution of war (which might be difficult to prove) by the forces of population pressure and resource scarcity (which have been solidly proven in many studies) makes of the whole developmental argument a more likely proposition.

Archaeological Evidence of Status in California

As revealed through the study of mortuary treatment, there is ample archaeological evidence of hierarchical systems in California. For example, T. King has produced studies (1970, 1978) that specifically address evidence of social ranking in California mortuary populations. In a study based on the mortuary complex at Tiburon, CA-MRN-27, T. King found some evidence for possible lineal descent organization, although he stopped short of claiming that the Coast Miwok had a true "ramage" organization (one in which rank is ascribed by primogeniture). King's study on lineal descent was questioned by Moratto (1984) and Kautz (1972), though they acknowledged the presence of ranking at the site. In pursuit of rank differentiation and social structure, King employed Binford's three part division of artifact types: ideotechnic, sociotechnic, and technomic. His reasoning was that since he found few technomic artifacts at CA-MRN-27, this was an unusual site, reserved for use by special classes and/or lineages. Nearby, down in the canyon was CA-MRN-26 and, although dated to the same time period, it presented striking organizational differences. King interpreted this pattern as indicative of different types of co-temporal disposal sites.

T. King's other study (1976) is based on the archaeological investigation of several sites located in the Buchanan Reservoir area, a collection of "Middle Horizon" burial sites, consisting of a total of 222 burials. King found that the tests based on the Saxe-Binford model gave ample support to the existence of political differentiation. These tests included:

- A, lack of correlation between mortuary differentiation and age and sex.
- B, children should not be segregated, mortuary assemblages should be similar for the sexes, lobes should be correlated with rank markers but not age or sex, and that there should be much distinctions in spatial clusters according to offerings.
- C, burials with markers of high status should he less differentiated than those without such markers.
- D, the key structure of the customs reflected should be maximally redundant.
- E, burials with indicators of high status should be spatially clustered (ibid.).

He applied a statistical methodology based on cluster analysis to arrive at his interpretative conclusions. This was based mostly on a monothetic divisive analysis of the mortuary variables (grouped all together) using the information statistic, based upon Peebles (1972) (using the CLUSTAN program).

In addition, Fredrickson (1974) carried out an intersite study in Contra Costa County that presented a radical change in social organization several hundred years before the beginning of the "Late Horizon" Period (ca. A.D. 500). His analysis was also based on the incidence of the three Binford classes of artifacts and also influenced by the results of T. King's 1970 study.

1.8 Political Differentiation in California

There is archaeological evidence both for and against political differentiation in studies of California prehistoric mortuary practices. The former was found at Medea Creek, CA-LAN-243, a pre-contact Chumash site (L. King 1982), and the latter at the Rincon site in Southern California (Stickel 1968). Since the dates of "occupation" at these two sites are widely spaced (Rincon 3655 ± 80 B.P., Medea Creek A.D. 1500-1785) and in order of increasing political differentiation, one can tentatively conjecture that social complexity and ranking was increasing through time (T. King 1976:32). This is also consistent with Decker's (1968) work on Santa Catalina Island.

Fredrickson (1996) provides arguments for the rise and entrenchment of social and political differentiation due to competition for limited resources. He based part of his analysis on Kroeber's definition of tribelets and their organization. The limited resources may come about through population growth, but may also be due to differential territorial resource availability of local temporary climatic events (perhaps causing local resource fluctuation). He argued that the social and political differentiation arises through the establishment of a class of high status individuals that handle the inter-tribelet competition, through trade or otherwise, for these limited resources. Fredrickson makes clear that there is not one single mechanism that brought about the socio-political differentiation, but rather, that they varied from region to region, and probably did not act independently.

In his study of the Ryan Mound (CA-ALA-329) Leventhal (1993) found evidence of exclusive, ceremonial use of the mound, although others argue it could also have an occupational component (Wilson 1993). Leventhal based this finding on the high number of individuals with complex and intensive burial treatment, and on the lack of residential features. This treatment included cremations and labor intensive burial associations. He employed the use of ethnography and ethnohistory, as well as archaeological evidence to justify the models used to form his interpretive conclusions. He models the occupants of the East Bay as having developed a wealth complex organization, and speculated that it may have been derived from a position of "middlemen" in trading practices involving the resources of the coast and the Central Valley.

In his study of Component III of the Patterson Mound, CA-ALA-328, dated to approximately 350 B.C., Luby (1991) found significant evidence of social status levels. He found widely varying classes of individuals, from those with no associations and including all ages and sexes, comprising 45% of the population, to more highly differentiated groups. Some of these groups possessed diverse artifact associations. He also found some possible measure of status ascription by birth.

1.9 Statistical Methods Applied to Mortuary Analysis

The rise of quantitative statistical methods applied to archaeology in general and mortuary analysis in particular took place through the development of the "New Archaeology" (now known as the "processual" school, influenced by Binford, Saxe, O'Shea, Brown, and others). This approach involved a new paradigm that the adaptive context of the society was paramount, and therefore, similarities were amenable to scientific inference by hypothesis and analytical confirmation (Shennan 1988).

Chapman and Randsborg (1981) provide a brief compilation of statistical analysis methods applied to mortuary variability by several researchers in the last 25 years. They progress from the tests of significance by Milisauskas (1978) and Saxe (1971), through nearest neighbor analysis for spatial patterning by Peebles (1971) and Tainter (1976), automated cluster analysis by Shennan (1975) and Hodson (1977), the use of monothetic divisive techniques by Tainter

(1975) and King (1978), principal component analysis by van de Velde (1979), and formal analysis by Brown (1971) and Saxe (1970). There have also been applications from information theory (Tainter 1978) and general evaluations of the fitness of these methods (Tainter 1975, Mainfort 1977).

There are many areas where the theoretical foundation presented above point to the diagnostic nature of groupings of mortuary variables/values. References to "partitioning," "structure," and "component sets" show the holistic nature of the framework. It is therefore natural to address the mortuary analysis with techniques based on groups and correlations. Despite this natural connection, the more involved multivariate approaches have been scarcely applied in California studies. This lack is understandable, given the "salvage" nature of so much of the archaeology in the San Francisco Bay Area and other regions in California. In contrast, the Yukisma site is a truly unusual site. It consists of a large number of individuals, meticulously excavated and recorded. Accordingly, it presents an excellent opportunity to apply the powerful multivariate statistical techniques to the extraction of the full measure of meaning from the data. As will be set forth in the methodology, these are the principal tools employed in the present study.

1.10 Hypotheses and Test Expectations

Based upon the preceding theoretical framework, the following tests for the stated hypotheses can be derived.

- **Hypothesis 1**: If the cemetery was highly structured then:

    a) The cemetery should present structure in one or more of the following components, and some correlation between them: sex and age, location, body preparation, grave associations (Saxe #1, #8, Goldstein).

- **Hypothesis 2**: If there is evidence for rank, power, and authority in the society then:

    a) The number of types of artifacts should be non-randomly distributed (Saxe #1).

    b) The distribution of number of types of artifacts should be a decreasing function (Saxe #1, #3, Brown).

    c) There should be distinctive artifact and/or body treatment clustering (Saxe #1).

    d) There should be authority symbols differentiated from status symbols (Brown, Peebles and Kus).

- **Hypothesis 3**: If the social structure was hierarchical rather than egalitarian then:

a) The components should exhibit few correlations with age and sex (Saxe #2, Binford #2).

b) Children should not be distinguished from some adults in location (Saxe #2, Binford #3).

c) Sex distinctions in associations should be low (Binford #3).

d) Location should be independent of age and sex, but correlated with markers of rank and/or wealth (Binford #3, Saxe #8, Goldstein).

e) Mortuary association clusters should be distinct (Saxe #2).

f) Burials with high status should be spatially clustered (Binford #3).

g) There should be some infants and/or children with markers of status (Saxe #2).

2. Site Description

2.1 Geography

The project area is located within the Elmwood Correctional Facility at 701 S. Abel Street in the City of Milpitas, near the northern boundary of Santa Clara County, approximately 6 miles from the present southern end of San Francisco Bay. Prehistoric site CA-SCL-38 is located in the USGS Milpitas California 7.5 minute quadrangle, at T. 6S., R. 1E in Zone 10, coordinates 596550 meters Easting/4141700 meters Northing using the Universal Transverse Mercator Grid (UTMG) system (Leventhal 1993). The site is situated in the northern part of Santa Clara Valley, on a flood plain between Coyote Creek, which runs southeast/northwesterly, draining into San Francisco Bay, and the channeled Lower Penitencia Creek which drains into Coyote Creek. Lower Penitencia Creek, *Yukisma* in aboriginal dialect, runs adjacent to, and approximately 200 feet from, the eastern boundary of the site (Leventhal 1993).

Santa Clara Valley is a geostructural trough, nearly 100 km in length. It is bounded to the east by the Diablo Range, approximately 1500 meters above sea level at its highest, the 1100 meter high Santa Cruz Mountains to the west, and the Gabilan Range to the south. This last feature is separated from the Santa Cruz Mountains by the "Pajaro Gap" canyon, coursed through by the Pajaro River that empties into Monterey Bay (Broek 1932).

The Diablo Range and the Santa Cruz Mountains are mainly composed of Franciscan Formation rocks. The Franciscan Formation are the oldest and most extensively exposed rocks in the South Coast Range. They date to the Late Mesozoic Era. They are composed mainly of sandstone, slate and volcanic rocks, metamorphic rocks, limestone, and chert. The Gabilan Range, on the other hand, is composed of a granitic-metamorphic core complex. The valley is a heterogeneous composite of sedimentary rocks, among which are: fluvial, aeolian, and estuarine deposits (Elsasser 1986).

The Valley floor is mainly composed of sedimentary rocks, including fluvial, aeolian, weathered and estuarine deposits laid down mainly by the two major drainages, Guadalupe River and Coyote Creek, and their tributaries that flow into the San Francisco Bay.

The valley climate is described as Mediterranean, with characteristically wet winters and dry summers. There are several prevailing wind courses shaped by the usual high and low pressure centers that lie off the coast, and by the intervening ranges. These courses create a number of distinct micro-climates throughout the valley affecting precipitation and annual mean temperatures. Near San Francisco Bay, at the northern end of the valley, precipitation increases inland (Broek 1932).

Moreover, these conditions create a vast number of ecologically distinct settings (estuary, marsh, mountains, hills, temperate rain forest, arid chaparral, etc.) that support many different floral and faunal complexes.

2.2 Ethnographic and Linguistic Overview

The Costanoan or Ohlone linguistic groups occupied the area ranging from the San Francisco Peninsula on the west to both sides of the Carquinez straits in Contra Costa County and south to Monterey Bay.

The term *Costanoan*, from the Spanish for coastal people, was first applied by Latham to the group of dialects from Soledad to the San Francisco Bay (Milliken 1993:22). The term *Ohlone* is derived from Latham and was used by most of the surviving descendants (Galvan 1968). The terms Costanoan and Ohlone have been used interchangeably by many authors.

The group of Costanoan/Ohlone languages form part of the Utian family (Miwok-Costanoan), within the Penutian stock (Levy 1978). The members of the group order approximately from north to south as: Karkin, Ramaytush, Chochenyo, Tamyen, Awaswas, Chalon, Mutsun, and Rumsen. According to this division, CA-SCL-38 falls within the Tamyen-speaking territory. Based upon Milliken's map of distribution of tribal groups, the site is located near the boundary of three tribal groups: the Alson, Santa Ysabel, and Tamien, all located within approximately 10 miles of the site.

Cultural information about the contact period of the Ohlone Tribe derived from several ethnohistoric and ethnographic sources. These include accounts from the diaries of early Spanish and European expeditions into the Bay Area region, mission records, and later ethnographic work conducted during the first half of the 1900s.

Descriptions from first hand encounters with the indigenous inhabitants of the San Francisco Bay Area were recorded in diaries of early expeditions, such as Fages in 1770 and 1772, Juan Bautista de Anza in 1776, Father Font in 1776, Capitan Ayala in 1775, and Fray Santa Maria in 1775. These ethnographic accounts were later translated by Bolton (1911, 1927, 1930, 1931), Priestly (1937), Galvin (1971), and others.

After these initial expeditions, the missionization period began with the establishment of the Mission San Carlos

Borromeo in 1770, Mission of San Francisco de Asis in 1776, Mission Santa Clara in 1777, Mission Santa Cruz in 1791, Missions San Jose and San Juan Bautista in 1797, disrupting and transforming the Costanoan people's way of life forever (Milliken 1995:32). During the first half of the 1900s there was an outburst of ethnographic activity in an effort to "salvage" the last of the available data from the fast-disappearing tribal members. This work was carried out principally by Kroeber (1904, 1929, 1932), Gifford (1916, 1926), Barrett (1903, 1904, 1908, 1919), Harrington (1921-1939), and many others.

From these accounts, various authors have pieced together various perspectives of the aboriginal political and ritual organization of the Ohlone Tribe. Milliken described the general structure of the political organization of the Ohlone tribal groups centered around San Francisco Bay (1984, 1993, 1995). Based upon anthropological research the Ohlone were organized into tribal associations that held control of clearly marked areas. The area controlled varied between 60 and 150 sq. mi. These associations were bound by marriage and varied in size between 200 and 1000 people. According to Gifford (1926) the lineage was the principal political and corporate unit, however more complex models have been proposed by later authors (Bean 1974, 1976, Blackburn 1976).

The manner in which the Ohlone lived on the land was ecologically dependent. These ecological conditions also affected the population density, varying between 0.5 and 10 inhabitants/sq. mi. (Bean 1974, Cook 1978). Some groups were organized into one large community, while others were divided among several smaller sites. According to Milliken (1995:21) there were no higher permanent political organizations, and the "tribelets" were related in a fluid web of alliances and conflicts. Bean (1974) states that these relationships were also heavily influenced by ecological conditions.

There is conflicting evidence relating to the degree of power held by the headman, called *capitán* by the Spanish, of each association (Milliken 1995). Milliken also stated that there were no women chiefs, but they did wield considerable influence in the community through control and organization of dances, the primary expression of communal life. Regional dances, trade feasts, and ritual obligation were also mechanisms for the sharing and efficient utilization of resources on a regional level.

On the other hand, Levy (1978:487) claimed that the office of chief was held by both men and women, and was inherited patrilineally, although with the consent of the community. The chief had numerous responsibilities, and acted as the leader of a council of elders. There is also evidence for polygyny and the existence of patrilineally extended households (Harrington 1933:3).

Another expression of the ritualistic significance of dances was the quantity and complexity of the funeral rituals and their organization (Merriam 1907, Leventhal 1993). This complexity gave rise to all manner of different offices that were responsible for the various tasks (e.g., presenting invitations, organizing mourners and dancers, providing food for guests, etc.) (Bean 1974).

In addition to the political association of groups were ritual congregations of several "tribelets," such as the jimsonweed cult in Southern California (Bean 1972), and the Kuksu cult in Central and Northern California (Kroeber and Gifford 1949). The Ohlone were also reported to have established a Bear and Deer moiety system (Harrington 1942:12, Levy 1978:488, Cambra et al. 1996). These moieties served to define potential marriage alliances, and therefore affected the political landscape (Bean 1974:18).

From the foregoing can be perceived some of the ways in which the socio-political and ritual organization of the Ohlone are closely inter-related. In addition, it is evident through these patterns, together with the tribal and linguistic boundaries, how closely tied these groups were to the local ecology and environment. Given the patchwork nature of the ecological landscape of the San Francisco Bay Area (and of Central California), this dependence gives rise to a complex set if inter-tribal economic and socio-cultural interactions.

2.3 Site Background

This project was initially conducted by Ohlone Families Consulting Services (OFCS), cultural resource management arm of the Muwekma Ohlone Tribe, in order to comply with the California Environmental Quality Act (CEQA) (Jones et al. 1993) regulating the impact of demolition of existing structures. Demolition at the Elmwood Correctional Facility was required for the construction of a large barracks, designated as M8 in the area 6 Design Development plans. After an initial subsurface testing program, which included eight 1 m by 1 m excavated units and 16 auger bore holes, conducted during April 1993, 243 discrete burial features were exposed, documented, and removed from the project area between August 1993 and October 1994. Based on the material recovered and the results of the testing program, Leventhal et al. disputed earlier conclusions by Cartier about the site functioning as a village with a cemetery component. Leventhal et al. believe CA-SCL-38 constituted a large prehistoric earth mound cemetery, of which undisturbed areas still remain beneath existing buildings (Leventhal et al. 1993).

2.4 Previous Investigations

CA-SCL-38 was first formally recorded in 1952 by C. W. Meighan of the University of California at Berkeley. Yukisma, historically known as Alms House Mound, was described as an "extensive habitational site marked by a low, almost not discernible mound" about 300 feet in diameter and 4 feet high (Meighan 1952). Meighan also indicated that the burial context had been previously disturbed by plowing activities associated with the County Alms House Farm. As a result of UC Berkeley excavations, six burials (all inhumations) and associated artifacts, isolated charmstones, whistles and a shell feature were recovered (Table 2-1).

Previously, San Jose State University conducted subsurface excavations (one trench) in 1950. No written reports are known to have been produced as a result of these two archaeological investigations.

Table 2-1 Distribution of Burials (Meighan 1952)

Burial	**Sex**	**Age**	**Pos.**	**Side**	**Face**	**Ort**	**Depth**	**Associations**
1	M	Adlt.(21)	TF	L	S	?	27″	none
2	?	Child (7)	F	L?	N	?	28″	none
3	F	Adlt.(?)	F	R	Dn?	W	42″	mortar over skull
4	F	Adlt.(20)	TF	D/F	Up?	W	46″	fish hook
5	F	Adlt.(25)	?	?	?	S	60″	none
6	?	Child (?)	F	D	NE	SW	66″	shell covering face

Age: Adlt (Adult),
Pos: (position): TF (tightly flexed), F (flexed)
Side: L (left), R (right), D (dorsal), D/F (dorsal/frog)
Face: Dn (down)
Ort: (orientation)

Archaeological Resource Management (ARM) conducted five small surface reconnaissance studies since 1981 for particular building sites during the planning and development of the Elmwood Detention Center Master Plan (Cartier 1981a, 198[illegible], 1985a, 1985b, 1987). Following these studies Cartier assessed the area as archaeologically sensitive, and as including prehistoric and historic components.

In 1988 Cartier conducted a subsurface testing program of twenty-eight bore augers and two 1 m by 1 m hand-excavated test units. The object of the study was "to determine the extent of the prehistoric village and cemetery, its contents, its age, and its significance as a cultural resource" (Cartier 1988). Cartier found that the "boundaries of the Yukisma site extend westerly from Abel Street, across the perimeter road, and under the current structures..." (Cartier 1988:14). Based on the cultural materials recovered (dietary, faunal and shell remains, chipped stone debris, groundstone fragments, vitrified/baked earth, and human skeletal remains), and a radiometric date (A.D. 1450), Cartier concluded "it is now understood that the deposit is a Late Period village site with cemetery" (Cartier 1988:14).

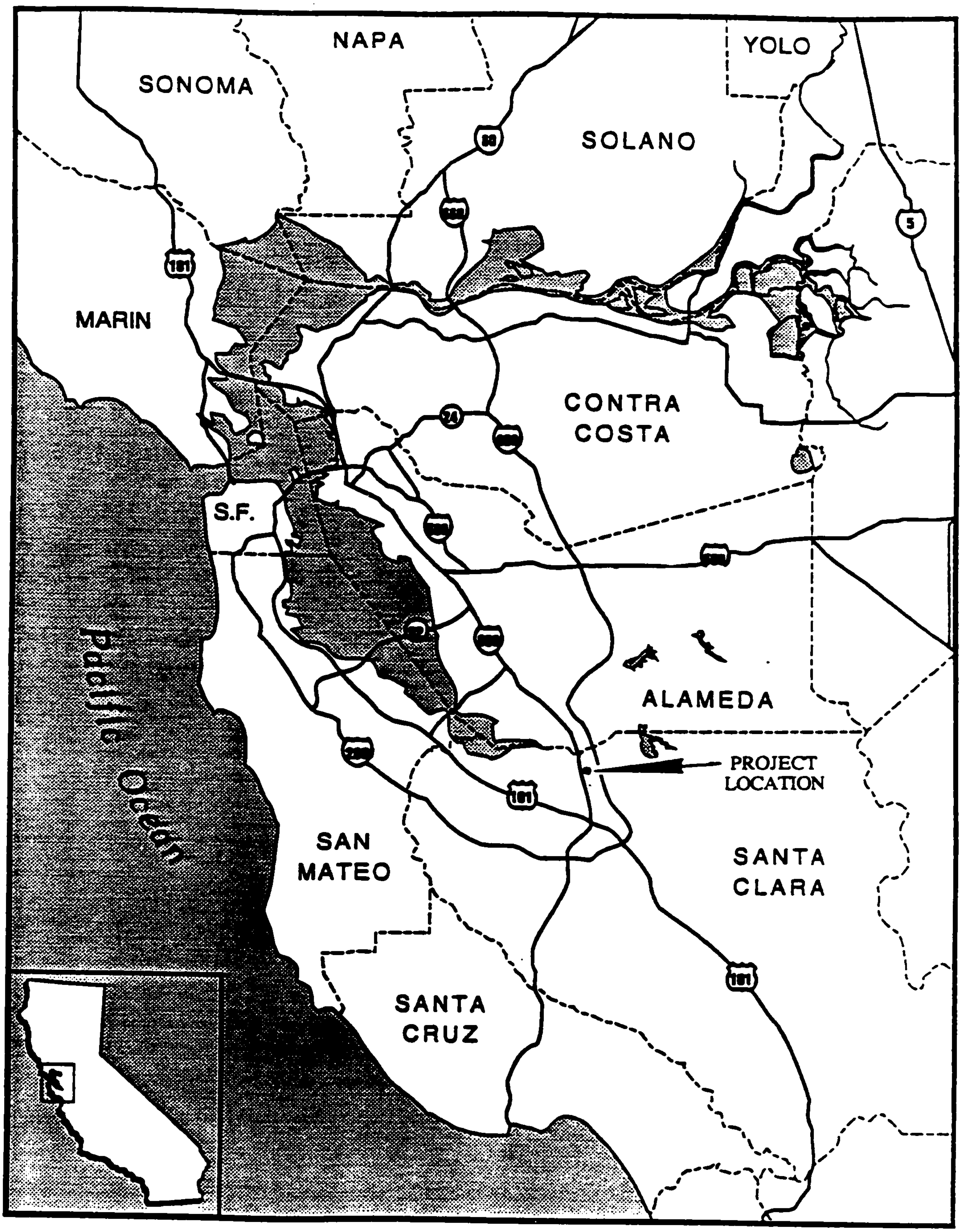


Figure 2-1 Site Location

3. Methodology

This thesis will describe and analyze only the skeletal remains and grave associations recovered during the subsurface excavation at the M8 housing unit of the Elmwood project. Artifacts outside of grave context (isolated) will be included in the general descriptions and counts, but will not be included in the analytical phase. Cultural material recovered and results from the initial test phase were reported separately (Leventhal et al. 1993). A final report, including a comprehensive bio-archaeological study of all material unearthed during the various phases of the project, is currently in preparation.

3.1 Field Methods

The burial recovery phase occurred during the on-going construction project, which required the use of heavy equipment (e.g., bladed motor grader) to locate archaeological features in a timely manner. These circumstances required expeditious and reliable recording of the unearthed cultural material, since the nature of the project resulted in the near complete destruction of the affected portion of the mound site. After the identification of archaeologically sensitive areas standard archaeological field techniques were utilized. Burials were excavated by hand, and the soil removed was passed through 1/8″ and 1/4″ mesh screens. Other non-burial features and/or units were excavated in arbitrary 10 and 20 cm levels using 1/8″ and 1/4″ mesh screen. All cultural material recovered was labeled and bagged for later recording and analysis.

Field notes and standard forms were used to record the mode of interment (disposal, position, facing, disposition), estimated age and sex, condition of the skeleton, osteological inventory, soil and grave pit information, and burial assemblage for each grave. This information included a diagram of the burial, illustrating to scale the position of each skeletal element (complete or fragmentary) and the mapping of the artifacts (when possible) *in situ* with respect to the body. Made possible by this detailed and accurate data, studies were conducted on the placement of the artifacts within the grave and regularity of occurrence as indicative of mortuary behavior.

In addition, all remains were photographed, soil samples were taken from selected units and features, and charcoal was recovered for radiocarbon analysis.

Spatial Distribution

Due to the nature of the field methods employed for burial recovery, and the ongoing excavation and construction at the site, several different datum points were used to establish the locations of the burials. The main site datum was established on the southwest corner of the cement culvert located along the east perimeter fence line in the northeastern portion of the construction zone, at approximately 22 feet (6.7 m) above sea level (Cambra et al. 1996). For each burial the distance in meters and bearing (degrees magnetic) from the datum were recorded. In the data analysis phase, these were converted to one common Cartesian coordinate system and origin.

A transit and stadia rod was employed in order to determine the depth of each burial with respect to the main site datum or the additional various datum points. These measurements were later reduced to a common system into metric depths below surface. Two different depth measures were taken for each grave, to the top of the grave and to the bottom of the pit.

3.2 Laboratory Methods

Human osteological remains, faunal remains and artifacts recovered during the field season were transferred to the Anthropology Laboratory at San Jose State University where they were washed and cataloged. All human remains were inventoried on standard record forms, including sex and age criteria, presence/absence of skeletal elements, condition of skeleton (e.g., fragmentary, burnt), dental and other pathological conditions, and metric and non-metric data. Remains were later boxed according to the grave number assigned in the field. Selected bone elements with traumatic or pathological involvement were photographed, and some were analyzed by X-ray. One element of each individual was retained from repatriation for further DNA analysis.

3.2.1 Osteological Analysis

3.2.1.1 Age and Sex Determination

Age and sex were assessed by Dr. Robert Jurmain, skeletal biologist, and the San Jose State University osteology team. The criteria used relied upon morphological characteristics of the os coxa, including sub-pubic concavity, ventral arch, medial aspect of the ischiopubic ramus, pubic length, epiphysial fusion, osteometrics and dental development, auricular surface, and medial rib end, among others (Todd 1920, Bass 1991, Phenice 1969, Ubelaker 1978, Lovejoy et al. 1985, Suchey et al. 1984, and others). In addition, a different method based on the angle of the posterior ramus of the mandible developed by Loth (1996) was also applied to adult individuals of indeterminate sex (Morley 1997).

3.2.1.2 Number of Individuals

The minimum number of individuals (MNI) forms the basis of this analysis. For those burials that included 5 or more extra elements (which differ in size, or are duplicate elements), the same burial number followed by the letter "A" was assigned to indicate the potential presence of a separate partial individual. Fragmentary individuals issued different numbers in the field and found later to constitute the same individual judging from proximity, similar age/sex categories, and/or complementary skeletal elements, were assigned the number of the most complete individual. Historic plowing and the later construction of the Elmwood Correctional Facility buildings affected some burials.

3.2.2 Archaeological Analysis

All materials recovered were initially washed and separated according to material (shell, bone, stone) and to culturally modified (artifacts) or un-modified elements (e.g., faunal remains). All items were counted and cataloged, using the accession prefix of the burial number followed by consecutive numbers (e.g., 34-3) for those associated with burials or using the prefix 250 or greater for those found as isolates. These items were later bagged with this provenience label. The classification methodology used for each artifact and faunal remains are explained in the following sections.

3.3 Definitions, Classification, and Coding

During the course of this study all field records, field notes, osteological inventory records, and photographs were reviewed by the author in order to minimize any possible mistakes in determining burial attributes (e.g., position, orientation, etc.). After standardizing the classification system employed for each attribute, these were coded and entered into a statistical analysis program (Statistical Package for the Social Sciences, SPSS, Version 6.1) for data reduction. For each individual burial, the following information was recorded:

3.3.1 Age and Sex

For statistical purposes sex was coded as male, female, and indeterminate.

Age categories were initially expressed as a range whenever possible. The mean age value was then employed to group individuals into categories spanning 5 years for individuals between 0 and 15 years of age, and 10 year intervals for individuals 16 and older. An additional generalized "adult" category was created to include those individuals with assigned ages of 15+, 16+, 17+, 18+, 21+, 25+, 35+, 41+, 45+, 50+, and "adult." For analytical purposes a further reduction into four categories was used. These four age categories are: "infant" (0-2), "youth" (2.1-15), "adult" (15.1-40), and "elder" (40.1 and older). When the age range was determined as a lower bound only (e.g., 35+), and the value was 40 or greater, the individual was coded as "elder." The purpose of these criteria is to reflect possible age-based differential mortuary treatment practiced by the inhabitants. If necessary, youths and infants can be collectively referenced as "sub-adults."

3.3.2 Grave Types

Graves were coded as "single" (one individual), "double" (distinction was made between a burial containing either two adults, two subadults, or an adult with a subadult, with all cases considered contemporaneous), "multiple" (more than two individuals interred contemporaneously), and "group." For purposes of this analysis, group is used for those graves that were uncovered in close proximity to each other (with up to one meter separation); however, such a provenience may not necessarily indicate contemporaneity. This category also includes interments that seem to have disturbed previous graves, and graves with similar characteristics (depth, artifact associations, forms of disposal, etc.) that may suggest they are coeval.

3.3.3 Mode of Interment

3.3.3.1 Disposal

This recorded category includes "primary inhumation," "redeposited inhumation," "primary cremation," "partial cremation," and "redeposited cremation."

Primary inhumations are interments of individuals found mostly articulated (except when disturbed), indicating that this is probably the original placement in the grave.

Redeposited inhumations are those of individuals found mostly disarticulated, indicating a possible additional manipulation of the body. This disarticulation may have been caused by disturbance that occurred when a new burial was being excavated by the inhabitants, other activities (historic, e.g., farming, or modern), or transfer of the remains from an original disposal location to the present grave during prehistoric times.

Primary cremations are those graves with high concentrations of charcoal, vitrified clay, and/or oxidized soil in association with nearly completely burnt skeletal remains, indicating *in situ* burning of the body. This type of cremation was classified as Type 2 cremation by Lillard, Heizer, and Fenenga (1939:4).

Partial cremations are interments with partially burnt areas affecting skeletal elements, and with presence of charcoal and/or vitrified clay in the soil matrix. They corresponds to Type 3 cremations in Lillard, Heizer, Fenenga (1939:4), but differ from their typology; in this study when bones are not affected, the feature is not considered a cremation.

Redeposited cremations include individuals partially or mostly cremated, although with no indication of *in situ* activity (lack of oxidized soils, large amounts of charcoal and/or vitrified or baked clay). These individuals were most likely cremated at another location and subsequently transferred to the final grave.

There were some standardization problems with the field determination of the type of cremation. To enhance the statistical reliability, the burials were categorized as inhumations and cremations for the purposes of the statistical analysis. There may be more redeposited cremations than the numbers actually stated, also due to these standardization problems. The field notes were not always clear whether charcoal and/or vitrified clay, if present, existed in a bed, either surrounding or beneath the individual, indicating an *in situ* cremation, or mixed into the matrix, denoting a probable redeposited cremation.

3.3.3.2 Position

Body position was described as: "tightly flexed" (angle between the torso and thighs less than 45°), "loosely-flexed" (angle greater than 45°), "extended" (up to full body extension), or "doubled over" (legs extended over back of torso and head).

3.3.3.3 Orientation

The methodology applied to determine orientation is based upon that defined by Bickel (1981), which traces a line through the spine from the lumbar vertebrae to the cervical vertebrae, when the burial is *in situ*.

Furthermore, cardinal directions were assigned according to the azimuth groupings employed by Wiberg (1988) and utilized by Leventhal (1993) as follows:

north (337.5-22.4)	northwest (292.5-337.4)
east (67.5-112.4)	northeast (22.5-67.4)
south (157-202.4)	southeast (112.5-157.4)
west (247-292.4)	southwest (202.5-247.4)

When the number of categories needed to be reduced to maintain statistical significance, the four cardinal points were used in the following polar coordinate scheme:

north (315.1-45.0)	south (135.1-225.0)
east (45.1-135.0)	west (225.1-315.0)

3.3.3.4 Disposition

This variable is classified into 14 categories: "ventral," "ventral-right" (legs to the right), "right side," "dorsal-right" (on the back with legs to the right), "dorsal," "dorsal-left" (on the back with legs to the left), "left-side," "ventral-left," "right- dorsal" (on the side slightly leaning back), "left-dorsal" (on the side slightly leaning back), "frog-back" (legs flexed and to each side), "frog-ventral," "head-first" (flexed, face down, with pelvic area higher than cranium), and "sitting up" positions. For statistical processing the categories were further combined into the following five categories: "right," "left," "ventral" (including ventral-right and left, and frog-ventral), "dorsal" (including dorsal-right and left, and frog-dorsal), and "other" (head first and sitting). This re-coding resulted in five categories, rather than the fourteen previous categories.

3.3.3.5 Facing

Position of the face, when possible, was determined in the field as one of the following ten categories: "N," "NE," "E," "SE," "S," "SW," "W," "NW," "up," or "down." Later these semi-quad positions were reduced to the four main cardinal points, with "N" containing "N" and "NE," "E" formed by "E" and "SE," "S" and "SW" included in "S," and "W" and "NW" reduced to "W."

3.3.3.6 Special Treatment

In addition the following characteristics were noted.

Pre-Interment Fire Pit

Presence of a layer of charcoal on the bottom of the grave was noted, probably indicating the body was placed over hot coals. It is believed that "the action of the fire was halted by throwing dirt over the body" (Gerow and Force 1968:38). Since this activity is not distinguished archaelogically from an *in situ* partial cremation, it will be differentiated from the latter when no evidence of burning is noted on the skeletal remains.

Post-Interment Fire Pit

A post-interment fire pit consists of a fire above the body, and separated from it by soil. This causes a mass of oxidized soil on top of the body. There may be fire involvement in the skeletal remains.

Localized Burning

A number of individuals were observed (in the field or at the lab) to have very small, localized areas of charred bone. This category of interment consists of those individuals with such areas, but not associated with large deposits of charcoal, vitrified clay, etc., or other indications of intense fire. They may be associated with small, concentrated quantities of charcoal.

Rock Cairn

These are all burials associated with a quantity of rocks. The rocks may be cobbles or chunks of vitrified clay, and may be placed underneath, over, or around the body.

3.3.4 Grave Associations

Grave associations include all artifacts and unmodified stone and faunal remains (shell and bone) recovered with each burial.

3.3.4.1 Faunal Remains Analysis

All faunal remains recovered from the Yukisma site were initially grouped into the following categories:

- Mammal, Bird, and Fish with Burials
- Mammal, Bird, and Fish isolates
- Mammal and Bird tools with Burials
- Mammal and Bird tool isolates

Bone

Both bird and mammal bone were identified by Glen Wilson, assisted by Dr. Leon Pappanastos, Muriel Maverick, and the author, using the faunal collections in the Biology Department's Bird and Mammal Museum at San Jose State University. Fish remains were processed at the Stanford University Laboratory and are not included here. Each identifiable skeletal element was described and tabulated according to family, genus or species (when possible), skeletal element, lateral location of the element, maturity of the individual (when possible), weight, and cultural modifications (burnt, butchered, artifact, etc.), if any. Unidentified elements were counted and weighed separately.

The only bones that were used in the statistical analysis were those in the form of work implements or tools. The remaining were listed in the assemblage descriptions.

Shell

The shell from CA-SCL-38 was forwarded to Stanford University for analysis, and was not processed as of this date; and therefore, is not included in the present analysis.

3.3.4.2 Artifact Analysis

Artifacts were divided according to material (e.g., stone, shell, bone). Further subdivisions grouping artifacts with specific attributes (e.g., morphological, functional) are described for each category. Typological classification follows widely accepted or conventional classifications utilized by archaeologists in Central California. Isolated artifacts were also described and included in the general count, but omitted from the final computational analysis.

Stone Artifacts

Flaked Stone Artifacts

All flaked stone materials were reviewed and analyzed by Leventhal and the author and initially identified by their morphological characteristics (probable mode of production, stage in the reduction process, etc.), functional characteristics (use/wear patterns, edge damage, etc.), and by their geological source material (Franciscan chert, Monterey chert, obsidian, etc.). Four groups were established: debitage, informal tools, obsidian tools, and manuports (Cambra et al. 1996).

Informal Tools

Informal tools include the following categories: cores (large pieces of workable stone with one or more scars resulting from the removal of a flake or blade), assayed cobbles (non-heat treated cobbles exhibiting one or two flake scars), utilized flakes (which lack intentional post-detachment modification), and modified flakes (which display few flake detachments and partial edge nicking or nibbling).

Cores are further subdivided into cobble cores, multi-face cores, cobble cores/hammerstones, pebble cores, exhausted cores, core fragments, and grouped with assayed cobbles (after Cambra et al. 1996).

Obsidian Tools

Obsidian tools include all the projectile points and bifaces recovered at the site. All obsidian tools were submitted for X-ray Fluorescence Analysis at the Northwest Research Obsidian Study Laboratory in Oregon to determine their geologic source. Obsidian hydration analyses were performed by Glen Wilson, Director of the San Jose State University Obsidian Hydration Laboratory. Six readings were taken, and the means were then calculated and applied to the Calendric Date Conversion Formula for each obsidian source, as established by Origer (1982, 1989). Calculations include the EHT (Effective Hydration Temperature Adjustment) for the San Jose/Gilroy area.

Obsidian Projectile Points: Projectile points are bifacially fashioned implements with hafting elements present. These tools were most likely attached to the ends of spears, darts, and arrows. Typological variation may indicate chronological significance. Morphological attributes necessary for their classification include length, width, thickness, weight, stem length and width, neck width, proximal shoulder angle (PSA), distal shoulder angle (DSA), edge treatment (e.g., serrations), and condition (tip, base, mid-section, etc.). These morphological attributes were used to divide the points into the following types: Obsidian Stockton Serrated, Obsidian Lanceolate Serrated, Obsidian Large Contracting Stem, and unclassified fragments.

Bifaces: Bifaces are tools bearing scar flakes removed by percussion and/or pressure flaking on both faces. Parameters included in the description of their morphological attributes are length, width, thickness, weight, and condition.

Debitage

Debitage ranges from flakes with no observable post-detachment modification to discards from the reduction sequence in tool manufacture. This category includes cortical flakes (exhibiting 50% or more of the dorsal surface consisting of cortex), bipolar cortical flakes (bulb of force at one end with presence of shattered or severed cone of force at same end, remnant of cortex present), primary flakes (exhibiting less than 50% remnant of the cortex), secondary flakes (thinning flakes with smaller striking platforms and less pronounced bulb of percussion), flakes (unclassified), shatter (irregular angular chunks technologically nondiagnostic), and thermal spalls (elements that suggest thermal alteration prior to knapping or after manufacture).

Manuports

Manuports (unmodified lithic material imported to site) include pebbles, cobbles, and fragments with non-diagnostic attributes.

Ground Stone Artifacts

This category is represented by manos, mortars, pestles, and abraders, and was analyzed by Leventhal and the author. Measurement of morphological quantities (length, width, weight, etc.), morphological characteristics, and wear surfaces analysis were performed for each tool following a functional classification developed by Mikkelsen (1985). Specimen material was visually determined. Macrobotanical analysis was performed on mortars and stone pipes.

Mortars

Mortars were used with pestles to pound and grind food resources. They are divided into two main categories, shaped and unshaped. Unshaped mortars are represented by hopper mortars (flat surfaced boulders used with baskets), boulder mortars (partially- or non-modified boulders), and cobble mortars (miniature mortars). Shaped mortars exhibit complete exterior and interior shaping. They are subdivided into "show" mortars and bowl mortars (Bennyhoff 1977, Leventhal

1993). Wear patterns, such as striations, pecking, and grinding, were examined. Description and metrics of the morphological attributes, such as rim shape, concavity, base shape, etc., were recorded. The condition (intact or "killed") as well as the placement of these tools in the grave is also described as an indicator of mortuary practice.

Pestles

Pestles were tools utilized in conjunction with mortars to process food. They are grouped according to length into long (>350 mm), medium (110-350 mm), and short (<110 mm), after Mikkelsen (1985). Description of the ends is based on the shape in plan view. They are categorized into flat, slightly convex, convex, and irregular, using Mikkelsen's parameters (1985). Visual analysis of end wear in the form of grinding, pecking, striations, spalling, and residue presence was also performed in order to estimate mode of utilization and resource processed. The absence of wear is also noted as a characteristic indicative of grave offerings instead of utilitarian items.

Manos

These implements were used in conjunction with grinding slabs to grind seeds or other substances. They are grouped into unifacial or multifacial according to the number of faces utilized. The cross-sectional shape of the wear facets (flat, slightly convex, or convex) was determined, since it can yield information on the direction of use and/or type of resource processed. End and side wear were also recorded. Additional attributes which are indicators of differential use, such as central depressions, presence of residue, striations, spalling, etc., were also recorded.

Abraders

These implements are unmodified cobbles displaying wear in the form of ground or polished areas. Material, wear patterns (e.g., polish, striations), and presence of residue, were noted.

Charmstones

Charmstones are grouped into Squat, Piled Plummet, and Plummet, following the "Variants of Principal Types of Charmstones" developed by Elsasser and Rhode in 1992 (Rhode 1996: Chart 1:237). Special attributes, such as knobbing, grooving, and the presence of asphaltum, were noted. A number of these tools appear to have been broken or "killed" at the time of burial. This characteristic was noted, when possible, since it is indicative of mortuary practice.

Stone Pipes

These objects are described by material utilized, length, and neck shape. Botanical analysis determined the type and origin of plant residue, if any. A report on these results is presented in a separate report.

Stone Beads

Beads are described and classified according to their material. Measurements of diameter, thickness, and perforation diameter were obtained with dial calipers.

Bone Artifacts

Bone tools were initially identified, when possible, by taxon using comparative osteological collections from the Department of Biology, San Jose State University. These were later typed following the classification developed by Gifford (1940). The following groups were recognized: awls, pins, strigils, serrated bone, wedges, gouges or smoothers, needles, pendants, bipointed objects, beads, tubes, whistles and bull-roarers.

Shell Artifacts

Beads

Olivella beads were classified according to the typological criteria developed by Bennyhoff and Hughes (1987). Four main classes were recognized: Spire Lopped (A), Callus (K), Thick Rectangle (L), and Thin Rectangle (M). Spire Lopped was further subdivided by size based on maximum diameter into small (3.0-6.5 mm), medium (6.51-9.5 mm) and large (9.51-14.00 mm). Punched (A4) and ground (A5) varieties were identified and counted separately. Some specimens had sections removed from the body whorl, probably for the manufacture of type M beads. These sections are bounded with straight cuts. This group has not been specified as a subtype by Bennyhoff and Hughes (1987). Barrett and Gifford (1933) describe the Miwok practice of baking the Olivella beads in fire ashes to remove the natural coloration and leave them white.

Bushing (K2) beads were individually counted. Thin Rectangles were grouped into Normal Sequins (M1a), Narrow sequins (M1c), Normal Pendants (M2a), and Narrow Pendants (M2c). Measurements (diameter, thickness, perforation diameter, length and width) were performed on 10% of each burial bead population, except in cases where the number of beads was greater than 1500, when a 5% sample was used, or where the total number was small, when the whole population was measured.

Problems were found with automatic classification using the classificatory parameters presented in Bennyhoff and Hughes. Sometimes a parameter is expressed as a single value, instead of a range. At other times, some of the cases on the tails of the distributions fall out of the strict range of the closest type, but do not fit into any of the other defined types. More work is necessary to ensure that the classification is discrete (i.e., no case falls into more than one type) and has full coverage (every case falls into at least one clearly defined type).

An additional problem with the Bennyhoff and Hughes classification methodology is that it depends heavily on the size of the perforation, one of the more difficult attributes to measure. Presently, there is a lack of available tools to perform accurate measurements, leading to an increase of measurement errors. Further complicating this problem is the relatively large range in the measured values, deriving from the natural variations in the manufacture of the beads. Added to this is the effect of string wear which could cause significant distortion in the originally drilled perforation.

Another problem also lies with the lack of a quantified measure of the curvature attribute. Bennyhoff and Hughes illustrate the curvature for various types, but do not provide a measurement methodology, nor do they include ranges of values for the curvature attribute typology (Bennyhoff and Hughes, p. 137). For example, it is not clear whether the thickness that they refer to is actually the thickness or the curvature. This problem became acutely apparent in differentiating the type L beads from the type M beads. The class of rectangular beads show a fair amount of overlap in the quantified attributes, but differ strongly in the curvature presented in their figures. Other non-metric attributes that could distinguish the types (larger perforation, shelving, ventral face grinding) have equal if not greater quantification problems. In an attempt to quantify this problematic attribute a new curvature parameter was derived based upon the curvature employed by Bennyhoff and Hughes, and the thickness such that:

$$PCurvature = \frac{curvature - thickness}{thickness}$$

This curvature attribute formula yields an adimensional parameter that can be compared between beads of varying thickness and width. This parameter gives a relative value of the curvature that indicates how much a bead is curved with respect to its thickness (i.e., a very thick bead could have a large curvature value but not appear to be very curved in relative terms). Other standardizations are possible, such as using the ratio between the curvature and the width, or the curvature and the length, or some other combination that might yield a better discriminatory effect.

For the future of typological classification, amenable to automatic processing, a system based on derived measurements that more directly describe the size (such as the area) and the shape (ratio of length to width in rectangular beads) could be more advantageous. This could ease the classification of subtypes, such as narrow, wide, etc. Determination of which parameters are most suitable and significant and their quantification still requires much additional work and refinement.

For the purposes of classification the range of certain parameters have been expanded for some of the classes. Of particular note is the perforation diameter for M1 and M2 types and their variants, which is stated in Bennyhoff and Hughes simply as "normally 1.0." This was modified to a range (0.6-1.4 mm) to include the large number of previously unclassifiable specimens that resulted from the strictly interpreted preliminary analysis.

Once the classification was completed, there still remained the problem of the deficiency of differentiation between the type L and type M beads. Due to the lack of a quantitative measure for the curvature, these two types differ only in the perforation diameter, as previously stated. In the case of the apparently anomalous appearance of a type, visual determination of the bulk curvature of the sample was used to complete the classification. Further measurements to ascertain the final typological classifications in light of these results still remain to be accomplished.

Pendants

These are cut, shaped, perforated and often decorated abalone (*Haliotis sp.*) and clam shell artifacts, usually described as ornaments. Two main divisions have been made according to material, *Haliotis* and clamshell pendants. At CA-SCL-38 *Haliotis* pendants were manufactured from *Haliotis rufescens* and *Haliotis cracherodii*. Identification of species was recorded when a remnant of the epidermis was present. These ornaments are grouped based on their shape into rectangular, circular, semi-circular, trapezoidal, banjo, crescent, and triangular. Each pendant is described by its attributes (edge work, perforation, condition, species) and typed according to Gifford's typology (1947). Clam shell pendants such as those found at the Yukisma site had not been described by Gifford.

3.4 Statistical Analysis Methods

For all the statistical analyses the entire burial sample was used. Except when an individual case was missing the relevant information for a test, all the individuals were used. In tables, these missing cases are listed as "Unknown." No random sampling was performed.

3.4.1 Frequencies and Distributions

All the major artifacts, burial attributes, and spatial distribution were correlated with age and sex. These distributions were analyzed by the use of contingency tables produced by cross-tabulations (contingency tables are presented in Appendix A). In this method, the frequency distribution of a variable is subdivided with respect to the values of another variable into a number of cells. Deviations from the expected values, showing over- or under-representation, point to some level of dependency, based on the chi-square (χ^2) of the residuals. These "abnormalities" were explored and described in each section. Although in some cases the statistical significance of the residuals is insufficient to assert a correlation, they were nonetheless described since they may point to differential burial tendencies.

To preserve statistical validity only those artifacts present in 5 or more burials were given the full treatment, thus hoping to avoid small-sample-size problems. The remaining artifacts were noted for the purpose of determining markers of status/authority.

3.4.1.1 Measures of Association

Chi-square analysis was used as a first-order test for deviations from non-correlated distributions. Where possible a 95% confidence level was adopted for rejection of the null hypothesis of variable independence, but those results at the 90% confidence level (P) were also noted. The critical χ^2 for statistical significance is a function of the degrees of freedom (*df*) of the sample and the desired confidence level ($\chi^2(P, df)$). Inverting this function, the probability as a function of the χ^2 and *df* ($P(\chi^2, df)$) that the value of χ^2 can be arrived at by chance can be obtained. This value can be directly compared with similar results for other attributes. The lower this value, the more statistically significant the relationship.

In addition, Kolmogorov-Smirnov and Mann-Whitney tests were used when an ordinal variable was being tested (e.g., orientation). These tests are for determining whether two samples represent the same distribution. In this case the two samples are most commonly chosen according to sex and/or age in order to test for any gender preferences.

Several other measures of association were also employed. These are Goodman and Kruskal's τ, and Kendall's τ_c and τ_c (Norusis 1992). Goodman and Kruskal's τ is a measure of the improvement in predicting one variable when the state of the other is known. As such it is asymmetric, in that one variable may help more in predicting the other than viceversa (Shennan 1988:81). Kendall's τ statistics are based on the comparison of cases by pairs, and the comparison of variable values. They use different normalizations, but basically describe the number of pairs that have variables low, high, or in opposite directions (Norusis 1992:198-200). These auxiliary statistics are only reported when significant.

When a column or a row in the cross-tabulation analysis is dropped due to zero valued cells, the analysis may become degenerate. In this case log-linear analysis is used. The log-linear technique is a multi-variate method based on the multiplication of probabilities for independent variables. It is used to explore not only the existence of variable correlations, but also if these correlations are more complex than one to one, indicating the manner in which they are related (Shennan 1988:89-99).

3.4.1.2 Variable Reduction

Since the numbers of artifacts found were often fairly low, sometimes variable values were collapsed to ameliorate the statistical influence of numerous low expected cell counts. Every effort was made to keep the number of cells with expected cell counts of less than 5 at 20% or below.

The variables used in the analysis were the burial descriptives (orientation, disposition, etc.) and the associated artifacts. The associated artifacts were characterized by presence/absence, and by a nominal, ordered variable ("amount") that was derived from the actual quantity of the artifact associated with each burial in the following manner. The distribution of quantities was plotted (quantity on the x-axis vs. number of cases with this quantity on the y-axis). Then the break points for four categories ("none," "few," "some," and "many") were determined visually (a more deterministic method based on the assumption that the distribution is a Poisson distribution could be used). This is to allow some comparison of the quantity of an artifact (i.e., pestles and beads) associated with a burial (frequency histograms are presented in Appendix B). These two variables (presence and amount) were then cross-tabulated with age and sex (Appendix A). In addition, the cross-tabulations were repeated selecting out the cases with indeterminate sex and those cases with artifact absence. This permits some cross-checks on any correlations found, as well as allowing discrimination of more specific cases. This is an attempt to find a middle ground between presence/absence and using the full range of values in the distribution, which in general leads to a total loss of statistical meaning due to the large number of cells generated. The ultimate intent is to distinguish differential burial practice related to rank, and the quantity of a burial's associations is almost certainly relevant to the individual's social status.

3.4.1.3 Artifact Diversity

The artifact diversity, the number of different types of artifacts associated with a burial, was found tc be a very useful measure of mortuary differentiation. It was carried out in preparation for the multivariate analysis stage, but was used when reviewing results.

3.4.2 Cluster Analysis

3.4.2.1 Introduction

Cluster analysis seeks to simplify a data set with many variables by grouping cases into similar "clusters," sets of cases with some sort of similarity among them. There are two main techniques for cluster analysis, monothetic agglomerative hierarchical and polythetic divisive (Everitt 1974, Gordon 1981, Doran and Hudson 1975, Shennan 1988, Sneath and Sokal 1973). Agglomerative techniques begin with each case in its own cluster and proceed to merge them in accordance with one of various methods and distance measures. Divisive techniques (e.g., K-Means clustering) begin with a specified number of cluster centers and proceed to assign cases to them. Sometimes the clustering results vary widely depending on the method and distance measure selected (Shennan 1988). Agglomerative techniques have been found to be appropriate for the study of mortuary variables (O'Shea 1984, Huggett 1992, Luby 1991), and are used in this work.

The clustering was carried out on several different classes of burial attributes (e.g., location, mode of interment, artifact associations), in order to preserve the independence of the results, and for computational compatibility of the attributes. For example, if all the burial attributes are dealt with at once, a cluster containing a single age group might be suspect, since the clustering method already has a bias toward clustering similar ages. Also it is possible to use methods more suitable for particular types of variables (ordinal, nominal, binary, etc.).

3.4.2.2 Distance Measures

Central to cluster analysis is the distance measure applied. The distance measure is a means of comparing how similar or dissimilar are two cases based on their variable values. These measures vary according to whether the variables are binary (e.g., true/false, presence/absence), nominal (coded variables with no particular order implied), or ordinal (values imply an ordering). In each case a variety of distance measures are applicable (Norusis). In this analysis the Lance-Williams shape coefficient was used for binary data (due to its similarity to the Jaccard coefficient [Shennan 1988], which weighs more heavily a presence similarity than an absence similarity), and the Squared Euclidean for all others (due to its wide applicability).

3.4.2.3 Clustering Methods

For the general agglomerative clustering technique there are several widely used methods to determine which two clusters to merge, based on the distance measure. For example: Simple Linkage (Nearest Neighbor), the distance between two clusters is taken to be smallest distance between two cases, one from each cluster; Complete Linkage (Farthest Neighbor), the distance between two clusters is taken to be the farthest distance between two cases, one from each cluster; Ward's Method, merge the two clusters that result in the smallest increase in the overall sum of squared distances within each cluster (Norusis, Sneath and Sokal 1973).

In the present analysis several methods were explored. Ward's method was chosen for all the analyses because examination of the resulting dendrograms showed that it yields solutions with the most homogeneous clusters, with a minimum number of one-case clusters. Cluster homogeneity was deemed important because it more clearly points to the significant attributes that differentiate one cluster from another.

3.4.2.4 Number of Clusters in Solution

Finding the optimal number of clusters in a data set is sometimes problematical. At one extreme there are too many clusters to simplify the problem significantly, and at the other there are too few clusters to adequately account for the variation in the data.

One technique used with agglomerative methods is to examine the agglomeration schedule. The agglomeration schedule specifies which clusters are being combined and the value of the resultant metric. Ideally there would be small values at the beginning, indicating highly similar clusters, and large values toward the end of the process, indicating that the clusters are well differentiated. Locating a large relative jump in these values at a certain point in the schedule points to a "natural" solution. In practice this is not always the case, with the values increasing rather evenly.

Several other methods were explored (Aldenderfer 1982) but they were not available in the software used. When no obvious "ideal" number of clusters was found by noting sudden jumps in the agglomeration schedule metrics, it was decided on by purely subjective criteria so as to balance cluster homogeneity and resultant solution simplicity.

3.4.2.5 Limitations

There are several limitations to general clustering techniques. One often cited is the continuing debate over whether the clustering algorithms themselves impose a particular bias on the data. Are the clustering solutions developed for a data set "real" or are they a figment of the procedure with no basis in the significant parameters of the problem (Shennan 1988, Sneath and Sokal 1973, Doran and Hodson 1975)? In this particular case there is no large body of previous results that can serve to confirm or invalidate the clustering results. With this caveat, the results are presented with some notable properties.

Secondly, there is the question of what is a cluster. Except in the most trivial of cases, there are in general many different clustering solutions that may point to different processes at work. Different clustering methods tend to select for different types of clusters; that is, Ward's method selects for generally hyper-spherical clusters, while the nearest neighbor technique allows more straggling cluster solutions.

Variable Coding Effects

Another problem encountered is the choice of variable codification. The methods are sensitive to the order of the values chosen since the methods presuppose an ordinal relationship. This was a problem for the burial attribute clustering, which uses coded variables. The problem in this study was in part controlled by an appropriate choice of variable coding, the values were ordered such that similar attribute categories (i.e., "left" and "back-left") had less different values than dissimilar ones (i.e., "dorsal" and "ventral"). This is not without its dangers, since preconceived notions of the mortuary patterning may be introduced.

The spatial clustering did not suffer from this handicap, since the two variables are real interval variables, and the burial artifact clustering based on presence/absence uses a true/false scheme for which there are specific treatments.

Not only is the order of the coded values significant, but so is the interval between them. For example, if the disposition variable is coded 1=inhumation, 2=cremation, and the orientation variable is coded 0=N, 1=E..., does it mean that the difference between a cremation and an inhumation is the same as that between a burial oriented N and one oriented E? The algorithms will answer that question in the affirmative, even though this solution may not be what was intended.

A related problem is the burial orientation, since this is a linearization of a periodic variable that wraps on itself. No satisfactory method was found to convey to the software that a difference between a burial oriented N and another to the E was the same as that to yet another oriented W.

When the variables represented artifact counts, the variables were normalized to range from 0 to 1 (Norusis). This provides some equality between the different artifacts, since *a priori* there is no reason to weigh one more heavily than another.

3.4.2.6 Validation

It is desirable to have some measure of validation of the cluster solution arrived at by these methods. This validation provides some confidence that the solution found is reproducible (i.e., not sensitive to small variations in the sample), and that it does in fact represent some "real" structure in the data. In the course of selecting the clustering method and the distance measure, similarities in the solutions were noted. On the whole, the different methods and distance measures tend to yield roughly the same basic pattern of clusters; the main difference lying in some smaller clusters of outliers, off the main solutions.

Another possible method to validate the clustering solution is to assess the mapping of the structure in the data set before and after clustering. This assessment is done through the *cophenetic correlation coefficient*. This is calculated by comparing S_{ij}, the similarity matrix, and S_{ij}*, the matrix constructed from the metric at which each pair of cases is clustered. The correlation between these two matrices, on an element by element basis, is the desired coefficient (Shennan 1988). This method was not used in the present study.

In order to validate the clustering results in some fashion, the original data set was randomly divided into two samples, and the same clustering operation carried out on both (Huggett personal communication). The resultant clusterings were then compared with the original clustering. The maximal fraction of cases (with a limiting value of 1 for perfect agreement) that can be mapped in a one-to-one fashion provides some quantitative measure of agreement.

3.4.2.7 Spatial Clustering

Hierarchical agglomerative cluster analysis was performed on the burial locations to determine grave groupings.

Ward's method was selected for its ability to generate relatively dense, well differentiated, homogeneous clusters. The Squared Euclidean metric was naturally chosen as the distance measure.

3.4.2.8 Mode of Interment Clustering

All five mode of interment variables (disposal, position, orientation, disposition, and facing) were clustered, but the solutions indicated that the facing interfered with the formation of a solution with a reasonable number of clusters. Accordingly, and taking into account the discovered correlation between the facing and the orientation, the facing was dropped from the clustering. In addition, all cases with unknown orientation or with two or more unknowns for any variables were excluded. Excluding the unknowns for orientation was done to avoid further confusing the issue for this troublesome variable. Furthermore, the codings of the other variables were modified to emphasize the difference between inhumations and cremations and to avoid spurious clusterings.

3.4.2.9 Burial Artifact Clustering

Burial artifacts were clustered in two separate ways. Artifacts that were associated with 5 or more burials were used. This criterion resulted in 16 variables, some of which were composite (e.g., manos and abraders were combined into one variable). The presence/absence of the artifacts was first clustered, using Ward's method with a Lance-Williams Shape Parameter distance measure. Only those burials that had at least one association were used. Secondly, the frequency counts for each association were clustered. In this case all the burials were taken into account. Ward's method was again used, with a Squared Euclidean distance measure. The counts were normalized to the 0-1 range. Both cluster solutions were validated as previously described.

Both clusterings were correlated with age and sex, and with the spatial and burial attribute clustering solutions.

3.4.3 Factor Analysis

Factor analysis was used to explore variable correlations. Factor analysis attempts to simplify a problem by extracting common factors from a set of variable values. The artifact values are assumed to be linear combinations of a set of abstract factors. By numerical techniques these factors can be calculated from the variable correlation matrix. If the number of factors extracted is equal to the number of variables the correlation is exact, but the problem is not simplified. There are several methods to limit the number of factors extracted. One of the most common, and the one used here, is that the eigenvalue of the factor must be greater than 1.

The problem can be further simplified by "rotating" the factor solution. The aim is to have the factor loadings either maximized or minimized. The ones that are "significant" are chosen for diagnostic purposes. There are several ways to determine which are significant (Burt-Banks formula, loading > .3, etc.). The simplest is to choose the greatest absolute value for a given artifact.

These factor loadings fall into three kinds of patterns: "grouped," where all significant factor loadings are of the same sign; "bipolar," with both positive and negative loadings; and "specific," with only one significant factor loading.

Factor scores, the value of each abstract factor for each burial, are then calculated. Cluster analysis is performed on these factor scores, serving to group burials with similar values for these abstract factors.

The procedure can be carried out for both artifact presence and for the actual artifact frequency of each burial. The same set of artifacts used for the artifact clustering was used for the factor analysis.

4. Mortuary Complex and Archaeological Assemblages

4.1 The Burial Sample

4.1.1 Sex and Age Distribution

The burial sample consists of an approximate total of 244 individuals composed of 64 (26%) females, 100 (41%) males, and 80 (33%) of indeterminate sex (Table 4-1, Figure 4-1).

Table 4-1 Sex and Age Distribution by Burial

Age	Male	%	Female	%	Indet.	%	Totals	%
0-1					5	6%	5	2%
1-5					14	18%	14	6%
6-10					11	14%	11	5%
11-15					7	9%	8	3%
16-25	25	25%	12	19%	9	11%	46	19%
26-35	31	31%	9	14%	1	1%	41	17%
36-45	38	38%	22	34%	3	4%	63	26%
46+	2	2%	11	17%	0	0%	13	5%
adult	4	4%	10	16%	30	38%	44	18%
Totals	100	41%	64	26%	80	33%	244	100%

Most of the sub-adult population died between the ages of 1-5 and 6-10. Very few individuals aged 0-1 and 11-15 were recovered. The under-representation of neonates or infants is a frequent pattern found among indigenous burial populations from California (L. King 1982, Warren 1971, Greenwood 1972, Jones and Waugh 1995). Several reasons may contribute to this anomaly. The absence of infant burials can be attributed to differential preservation or recovery techniques, although such explanations do not justify the low numbers in the 11-15 category. Another possibility for this under-representation may be the partial recovery of the actual cemetery; more individuals in those age categories could remain *in situ* in the unexcavated area. Lastly, culturally determined factors could contribute to differential burial treatment (off site, no formal burial, etc.). This last factor has already been addressed by Binford's views on ties between the social persona and duty-status relationships. In addition, fewer individuals may have died at that age (11-15) than those surviving to adulthood.

Morley (1997) studied the paleodemography of the site, and verified that there are not enough infant burials to support the population of the site. In addition she compared this site to CA-ALA-329, with which there are striking similarities. There was low mortality in females of child-bearing age, which could point to differential burial practices, or to greater care for this segment of the population. The excess of males aged 30-40 is also high, and similar to males aged 35-45 at CA-ALA-329. Females were outliving males at both sites. Part of these effects could be caused by inter-personal aggression at both sites (Jurmain 1983, 1991, Jurmain and Bellifemine 1997).

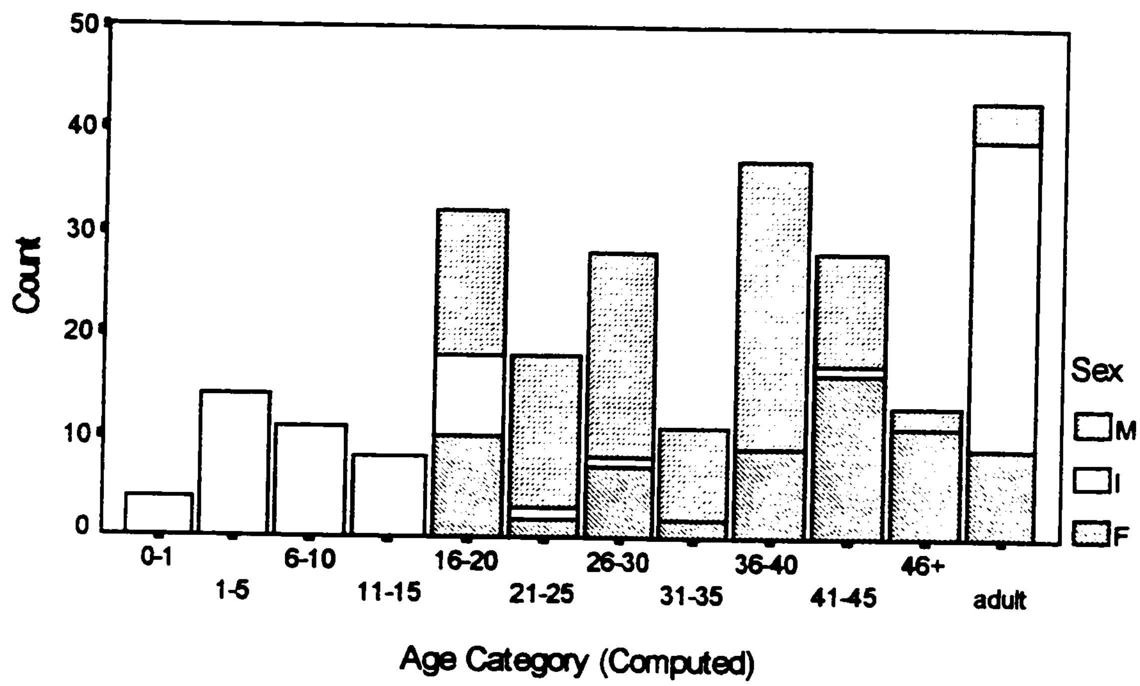
The mortality rate in adults reaches its peak at ages 36-45, while there is a sharp decrease in the rate for older adults (46+). With such a high death rate among young adults, there are fewer individuals of mature age left to die (at-risk population). The remaining age groups, including the "adult" category, are nearly equally represented.

Statistical tests indicate a very high correlation between age and sex (P = 0.00013). There is a marked gender difference in mortality between the ages 16-35. Out of 47% of the sample within this age range, 72% are males and only 27% are females. For the "46+" and "adult" categories this effect is reversed, 77% of those individuals are females while only 22% are males. Mortality reaches an equilibrium among males and females between the ages of 36-45 (Morley 1997).

Several factors may contribute to the disproportionate death rate in young males. Some researchers believe sexing methodologies utilized by physical anthropologists produce a systematic bias in favor of males (Weiss 1972, Rothschild 1990). Male characteristics may be more easily detected, and this can skew the results, especially in the case of incomplete skeletal remains where many of the females may be categorized as indeterminate.

Differential burial treatment may also be a contributing factor. Possibilities include burying females elsewhere, and that this is a specialized site where young male adults were brought from neighboring villages to be interred. A third possible factor is that the population may have been affected by an increase in inter-group conflict or warfare.

Figure 4-1 Age and Sex Distribution



4.1.2 Mode of Interment

4.1.2.1 Disposal

Of the total sample of 244 individuals, 5 (2%) individuals had indeterminate or unknown form of disposal. Of the remaining burials, primary inhumation was the predominant mode of disposal preferred through time by the inhabitants of CA-SCL-38.

A total of 201 (84%) of the burials were recorded as primary inhumations. This burial practice appears to be evenly distributed among males and females, possibly indicating a non-preferential practice according to gender (Table 4-2). The age distribution of the primary inhumations shows no significant departure from the age distribution of the entire mortuary assemblage. All infants are included in this category.

Table 4-2 Disposal Distribution by Sex

Disposal	**Whole Sample**	**Males**	**Females**	**Row Total**
Primary Inhumation	201 (84%)	90 (91%)	56 (88%)	146 (90%)
Redeposited Inhumation	5 (2%)	1 (1%)	4 (6%)	5 (3%)
Primary Cremation	3 (1%)	0 (0%)	1 (2%)	1 (1%)
Partial Cremation	23 (7%)	6 (6%)	3 (5%)	9 (6%)
Redeposited Cremation	7 (3%)	2 (2%)	0 (0%)	2 (1%)
Column Total	239 (98%)	99 (99%)	64 (100%)	163 (67%)
Unknown	5 (2%)	1 (1%)	0 (0%)	1 (1%)
Total	244 (100%)	100 (41%)	64 (26%)	164 (67%)

Redeposited inhumations were found in 5 (2% of the total) individuals (Figure C-49), 2 were adults and 3 elders. Of these, 4 cases were females and 1 was male (the latter was an elder).

Cremations of all types constituted a total of 33 (14%) individuals (Table 4-3). Some of the cremations are associated with burnt seeds and/or bulbs. The artifact assemblages associated with cremations were not necessarily burnt.

Table 4-3 Cremations by Burial

Burial	Sex	Age	Type of Cremation
1	M	25-35	partial
24	M	35-45	partial
40	I	Adult	primary
77	I	21+	partial
78	F	40-50	partial
83	I	25+	partial
89	M	41-50	partial
96	I	17+	partial
100	I	25+	partial
123	F	45-55	partial
135	I	8-11	partial
139	I	21-30	partial
147	M	31-40	redeposited
149	I	25+	partial
150	I	15+	partial
151	I	25+	partial
153	I	25+	redeposited
163	M	21+	partial
173	I	13-20	partial
174	I	25+	redeposited
181	I	25+	redeposited
192	I	25+	redeposited
204	M	16+	partial
216	I	16+	primary
222	I	6-10	partial
223	F	35+	primary
224	M	21-26	partial
225	I	17+	partial
230	F	31-40	partial
239	I	10-15	redeposited
240	M	21-35	redeposited
242	I	25+	partial
243	I	6-10	partial
Total	33		

Only 3 burials are primary cremations, two of indeterminate sex (Burials 40 and 216) and one female (Burial 223), all adult individuals. Burial 216 presents a form of disposal unique in the site. The body was encased in a mass of vitrified clay. The manner in which this was done is still unknown at this time.

Partial cremations were recorded for 23 (10%) individuals (Figure C-48). This practice appears mainly, but not exclusively, restricted to adults, although the youth and elder categories are also represented. None of the infants recovered exhibits evidence of fire treatment. This absence may be due to small sample size or differential preservation. Gender did not appear to have played a role in this form of disposal, where males and females are similarly represented.

Seven individuals were redeposited cremations (Table 4-3), of which six were adults, and one was a youth (Burial 239). Of these, only two individuals were sexed, being in both cases males. The rest were of indeterminate sex.

Form of disposal was not significantly correlated with age or sex. The contingency tables had many cells (70%) with value zero or with expected frequency less than five, making the statistics suspect.

When the form of disposal is re-coded to cremations and inhumations, individuals of indeterminate sex account for 21 (64% of cremations) of the cases, which may be indicative of the difficulty of sexing a cremated skeleton. By contrast, 55 (27% of inhumations) cases are of indeterminate sex. The over-representation of cremated individuals of indeterminate sex occurs only in the adult category, which are normally more easily sexed. Incomplete and/or badly preserved skeletal elements in connection with cremations are the primary cause of this anomaly.

When the individuals that could not be sexed are excluded from the analysis, males and females do not deviate from the expected values (P = 0.66205). When tested against age, however, a $P(\chi^2, df)$ of 0.06037 (i.e., at 90% level of confidence) indicates a correlation with form of disposal, where inhumations are more common for infants and elders, and cremation is mainly practiced for adults (Table 4-4).

Table 4-4 Disposal Distribution (Condensed) by Age

Disposal	**Infant**	**Youth**	**Adult**	**Elder**	**Row Total**
Inhumations	8 (100%)	24 (86%)	110 (81%)	64 (94%)	206 (86%)
Cremations	0 (0%)	4 (14%)	25 (19%)	4 (6%)	33 (14%)
Col. Total	8 (3%)	28 (11%)	135 (55%)	68 (28%)	239 (98%)
Unknown	1 (0.4%)	2 (0.8%)	2 (0.8%)	0 (0%)	5 (2%)
Total	9 (4%)	30 (12%)	137 (56%)	68 (28%)	244

Although inhumations are the normative means of mortuary treatment, and cremations were restricted to fewer individuals, males and females were, in this population, equally likely to receive either treatment. With respect to age, inhumations are over-represented for elder individuals. On the other hand cremations appear to have a higher incidence in youth and adult individuals. Infants appear not to be cremated, but this is not a statistically significant deviation from the expected values, given the small number of infants.

4.1.2.2 Position

Of the 244 individuals recovered, body position was reliably assessed for 188 (77%) individuals. Of these, 159 (84%) are tightly flexed (Figure C-50), 25 (13%) are in a semi-flexed position (Figure C-52), 3 (1.5%) individuals are extended, and 1 was doubled over.

Infants and youths were almost exclusively interred in a tightly flexed manner (except one youth). Adults and elders were equally likely to be in this position. However males (86%) are more commonly found in this position than females (75%). The semi-flexed position is found for one child (Burial 178), the rest of the individuals are adults and elders, where elders are over-represented. In this case females (24%) are favored over males (11%). Only 3 individuals, all adult males, were found in extended position (Burials 142-144), and one, an adult female, was interred with legs extended over the head (Burial 206).

A chi-square test on position vs. sex indicates a correlation between the two variables (P = 0.05349). Although the null hypothesis cannot be strictly rejected at a 95% level of confidence, there is some discernible patterning. Testing position and age group, on the other hand, indicates lack of constraint.

Due to the low number of cases in some of the categories a further regrouping into "tightly flexed" and "other" was performed to secure more reliable results. In assessing sex distribution, a P(χ^2, *df*) of 0.08723 was obtained, indicating a dependency at a 90% level of confidence. Males appear more commonly in a tightly flexed position; females, on the other hand, were buried slightly more often in other than tightly flexed positions. Table 4-5 shows the distribution for the complete sample (including individuals of indeterminate sex), and for males and females.

Table 4-5 Position Distribution

Position	Whole Sample	Males	Females	Row Total
T. Flexed	159 (85%)	78 (86%)	44 (75%)	122 (81%)
Other	29 (15%)	13 (14%)	15 (25%)	28 (19%)
Col. Total	188 (77%)	91 (91%)	59 (92%)	150 (61%)
Unknown	56 (23%)	9 (9%)	5 (8%)	14 (6%)
Total	244 (100%)	100 (41%)	64 (26%)	164 (67%)

Although tests of position against age revealed no significant statistical difference (P = 0.36561), infants and youths are almost exclusively tightly flexed, and adults and elders are equally represented in the "tightly flexed" and "other" categories (Table 4-6).

Table 4-6 Position Distribution by Age Group

Position	Infant	Youth	Adult	Elder	Row Total
T. Flexed	5 (100%)	20 (95%)	82 (83%)	52 (83%)	159 (85%)
Other	0 (0%)	1 (5%)	17 (17%)	11 (18%)	29 (15%)
Col. Total	5 (55%)	21 (70%)	99 (72%)	63 (93%)	188 (77%)
Unknown	4 (45%)	9 (30%)	38 (28%)	5 (7%)	56 (23%)
Total	9 (4%)	30 (12%)	137 (56%)	68 (28%)	244 (100%)

A variant of the "tightly flexed" position was found in five of the burials (58, 88, 172, 210, and 213) (Table 4-7). In these, the body is in a ventral position, legs underneath, chin extended, and the arms in back, placed tightly together (or nearly so), bringing the scapulae close together (Figure C-51). The group is composed of three males, one female, and one of indeterminate sex, all adults. Three are in the central concentration, and the other two are quite close together in the periphery. This type of interment may have been accorded to specific members of society, although the associated artifacts do not indicate a specific status.

Table 4-7 Tightly Flexed Variant Characteristics

Burial	Sex	Location	Associations
58	I	Central	30 pendants
88	M	Central	6 A beads, 788 M beads, 14 pendants
172	M	Central	None
210	F	Periphery	1 A bead
213	M	Periphery	None

Distinctive treatment of body position was found in 5 cases. Burials 141 to 144 comprise a burial group of four males, of which three are in an extended position (Burials 142-144) and one (Burial 141) that is flexed. Two of these individuals (142, 143) are ventrally extended, superimposing each other, and Burial 144 appeared to have been "dropped," with extended and spread legs and arms, overlapping the other three individuals (Figure C-57).

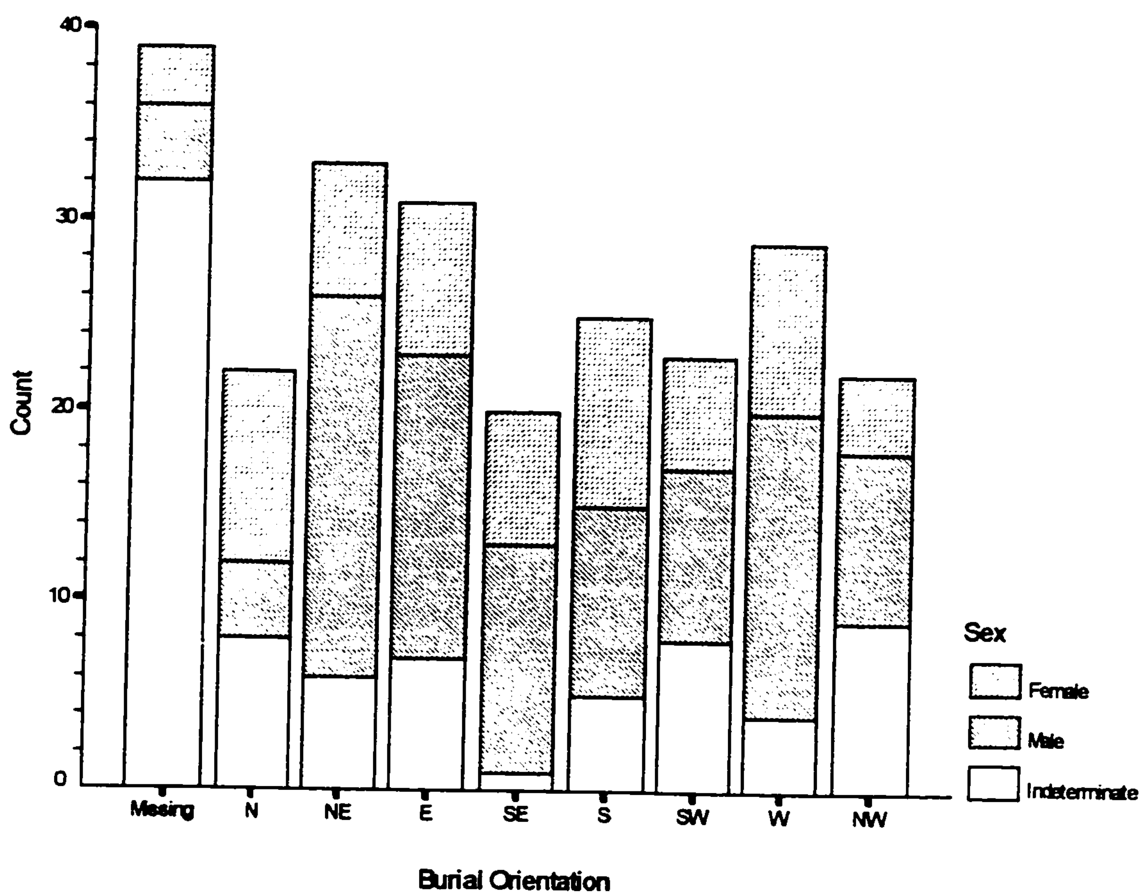
Burial 206 was also interred in a unique position. This individual, aged 25-45, was a female buried on her back, with the legs extended upward toward the head and positioned off to the right side.

4.1.2.3 Orientation

Burial orientation was determined for 205 (84%) individuals. Figure 4-2 illustrates body orientation and its distribution by sex.

Visual inspection of Figure 4-2 suggests that the orientation of the burials is not random. The Kolmogorov-Smirnov Goodness of Fit Test was used to test for a uniform distribution. This yielded a 2-tail probability of 0.0013. This result falls well below our criterion of 0.05 level of probability significance testing. We thus reject the null hypothesis, concluding that the individuals at CA-SCL-38 were not oriented randomly.

Figure 4-2 Orientation Distribution by Semi-Quadrant



Although all directions are represented, there is indication of a slight preference for the E-W axis (NE, E and W orientation). All other directions appear equally represented (Table 4-8).

When all individuals of indeterminate sex are excluded from the analysis, the following pattern emerged: males were more frequently oriented to the NE, followed by an equal number of cases oriented either to the E or W, and N being the least common. Females show a slight preference for the N and S, followed by an equal distribution toward the E and W. In this case, a P(χ^2,*df*) of 0.18913 results. This indicates that at the chosen confidence level, orientation is not significantly correlated with the sex of the individual. The null hypothesis in this case can be rejected if a lower level of confidence is accepted (80%).

Table 4-8 Orientation Distribution by Semi-Quadrant

Orientation	Whole Sample	Males	Females	Row Total
N	22 (11%)	4 (4%)	10 (16%)	14 (9%)
NE	33 (16%)	20 (21%)	7 (12%)	27 (17%)
E	31 (15%)	16 (17%)	8 (13%)	24 (15%)
SE	20 (10%)	12 (13%)	7 (12%)	19 (12%)
S	25 (12%)	10 (10%)	10 (16%)	20 (13%)
SW	23 (11%)	9 (9%)	6 (10%)	15 (10%)
W	29 (14%)	16 (17%)	9 (15%)	25 (16%)
NW	22 (11%)	9 (9%)	4 (7%)	13 (8%)
Col. Total	205 (84%)	96 (39%)	61 (25%)	157 (64%)
Unknown	39 (16%)	4 (2%)	3 (1%)	7 (3%)
Total	244 (100%)	100 (41%)	64 (26%)	164 (67%)

Since the variable tested is ordinal and ranked, the Mann-Whitney Rank Test and the Kolmogorov-Smirnov Test were applied. In both cases a 2-tail probability of 0.4989 and 0.6330 respectively indicates no preferential orientation according to sex.

When cross-tabulated with respect to age, the semi-quad orientation does not show statistical correlation (P =

0.30218). Notwithstanding, frequency tables indicate some preferences that deviate from the expected values. Infants appear slightly over-represented in a northerly direction, the youth group also appears to be oriented either N or NW, adults are more commonly oriented E and SW, and with less frequency, toward NW, N, and NE. NE is the most frequent alignment for the elders, while SW is under-represented.

When the orientation values are reduced to the four main cardinal points (N, E, S, and W)(Table 4-9)(Figure 4-3), a more significant preference toward E is apparent in both males and females. In spite of the lack of statistical correlation (P = 0.23690), males are more frequently oriented E, and females slightly more often oriented S.

Table 4-9 Orientation Distribution by Quad and Sex

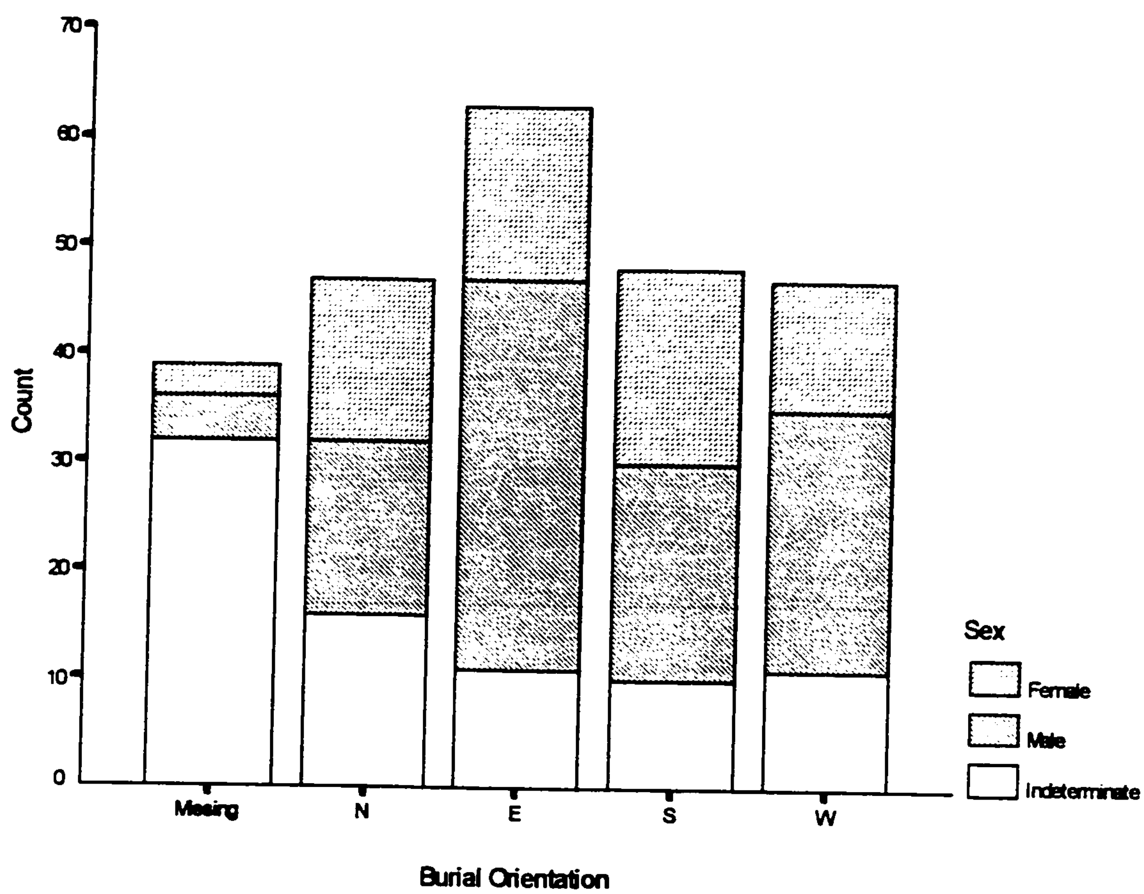
Orientation	Whole Sample	Male	Female	Row Total
N	47 (23%)	16 (17%)	15 (25%)	31 (20%)
E	63 (31%)	36 (38%)	16 (26%)	52 (33%)
S	48 (24%)	20 (21%)	18 (30%)	38 (24%)
W	47 (23%)	24 (25%)	12 (20%)	36 (23%)
Col. Total	205 (84%)	96 (39%)	61 (25%)	157 (64%)
Unknown	39 (16%)	4 (2%)	3 (1%)	7 (3%)
Total	244 (100%)	100 (41%)	64 (26%)	164 (67%)

Table 4-10 Orientation Distribution by Quad and Age

Orientation	Infant	Youth	Adult	Elder	Row Total
N	4 (67%)	8 (35%)	17 (15%)	18 (28%)	47 (23%)
E	0 (0%)	3 (13%)	39 (35%)	21 (32%)	63 (31%)
S	1 (17%)	4 (17%)	28 (25%)	15 (23%)	48 (23%)
W	1 (17%)	8 (35%)	27 (24%)	11 (15%)	47 (23%)
Col. Total	6 (67%)	23 (77%)	111 (81%)	65 (96%)	205 (84%)
Unknown	3 (33%)	7 (23%)	26 (19%)	3 (4%)	39 (16%)
Total	9 (4%)	30 (12%)	137 (56%)	68 (28%)	244 (100%)

Similarly, when the cardinal point distribution is correlated with age a P(χ^2,*df*) of 0.03443 indicates a statisti-

Figure 4-3 Orientation Distribution by Quadrant



cally significant relationship (Table 4-10). This relationship takes the form of an excess of elders oriented N, while the number of adults oriented E is overly represented, and those oriented N is less than expected. For the youth category, 70% are evenly distributed between N and W. For the infants, 4 out of the 6 cases are oriented N.

4.1.2.4 Disposition

As a further indicator of burial treatment, the disposition, or the side on which the person was buried, was recorded. A total of 193 (67%) of the 244 individuals yielded positive side identification. Of the known sample, the most common form of disposition is on the side (right or left), and dorsal with legs toward either side. The following dispositions were evenly distributed among the remaining individuals. They are: ventral, ventral leaning to the right or to the left, ventral with flexed legs spread to each side (frog/ventral), dorsal with flexed legs spread to each side (frog/dorsal), to the side (right or left) leaning slightly to the back. Three individuals were placed in a unique manner; two were in a sitting position and one was apparently buried head first. These will be explained in more detail below.

Statistical tests with respect to sex and age yielded high χ^2 significance values (possibly due to the large number of low expected value cells), although cross-tabulations do indicate deviations from the expected values. Males show a preference for the "dorsal (leaning left)" and "ventral," while the "right side" and "frog/ventral" are under-represented. Females, on the other hand, were more commonly found on the "right side" and "frog/ventral," while "dorsal (leaning left)" and "ventral" are under-represented. With respect to age, two out of three infants of known disposition were interred on the left side; similarly, youths were found more frequently on the side (right or left). "Ventral" position was found exclusively in adults; however, "dorsal (leaning to right)" was also preferred. Elders are over-represented on the left side (leaning back).

Further value reduction resulted in five categories: "frontal," "dorsal," "right side," "left side," and "other" (Table 4-11). In this case there is a slight preference for the dorsal disposition (33%) followed almost equally by the right and left sides (26% and 22% respectively). Again, correlation tests indicate independence with sex (P = 0.27045). Despite this result, there is a slight preference for males to be interred in a dorsal position, and for females to be positioned to the right side.

Table 4-11 Disposition Distribution by Sex

Disposition	**Whole Sample**	**Male**	**Female**	**Row Total**
Frontal	34 (18%)	17 (18%)	11 (18%)	28 (18%)
Dorsal	63 (33%)	35 (37%)	16 (27%)	51 (33%)
Right	50 (26%)	19 (20%)	19 (32%)	38 (25%)
Left	43 (22%)	20 (21%)	14 (23%)	34 (22%)
Other	3 (2%)	3 (3%)	0 (0%)	3 (2%)
Col. Total	193 (79%)	94 (94%)	60 (94%)	154 (63%)
Unknown	51 (21%)	6 (6%)	4 (6%)	90 (37%)
Total	244 (100%)	100 (41%)	64 (26%)	164 (67%)

There are no major anomalies in the distribution of ages in the complex as a whole when discriminated according to the burial disposition (P = 0.31750) (Table 4-12). Cross-tabulation indicates that individuals in the youth category were disproportionately on the right side. Adults were more often placed dorsally and ventrally, while elders were over-represented on the left side.

Table 4-12 Disposition Distribution by Age

Disposition	Infant	Youth	Adult	Elder	Row Total
Frontal	0 (0%)	2 (9.5%)	24 (23%)	8 (13%)	34 (18%)
Dorsal	0 (0%)	5 (24%)	37 (35%)	21 (33%)	63 (33%)
Right	1 (33%)	9 (43%)	24 (23%)	16 (25%)	50 (26%)
Left	2 (67%)	5 (24%)	18 (17%)	18 (28%)	43 (22%)
Other	0 (0%)	0 (0%)	2 (2%)	1 (2%)	3 (2%)
Col. Total	3 (33%)	21 (70%)	105 (77%)	64 (94%)	193 (79%)
Unknown	6 (67%)	9 (30%)	32 (23%)	4 (6%)	51 (21%)
Total	9 (4%)	30 (12%)	137 (56%)	68 (28%)	244 (100%)

Finally, Burial 8, a male 21-45 years of age, was the only individual interred head first with hips and lower limbs positioned above the rest of the body.

Two individuals (Burials 38 and 237), identified as male adults, were discovered in an upright sitting position.

4.1.2.5 Facing

An additional attribute, recorded when possible, was positioning of the face. Facing was determined for 160 (66%) cases out of the 244 individuals in the sample. Of the ten categories represented (up, down, and 8 semi-quad cardinal points), down has the highest incidence with 49 (31%) cases.

Face oriented to the NW, SW, and upwards are the categories least represented in the sample.

Several deviations from the expected values are observed according to the age distribution. Measure of association tests indicate a very low $P(\chi^2, df)$ of 0.00004 denoting a high dependency. Facing was assessed for one infant directed toward the NW. SE was the preferred direction for the youth group. Adults were extremely over-represented facing down, while elders were more commonly found facing E and W. Although no significant correlation was found by gender, males tend to face NE and S, and females toward the E.

Correlation tests with the two variables, sex and age, resulted in 60% or higher number of cells with expected frequencies less than five. This result is caused by the relatively large number of categories, resulting in unreliable statistics.

For this reason, the values were reduced by recombining the eight semi-quad cardinal points into four (N-NE, E-SE, S-SW, and W-NW), in addition to the up and down directions. As before, the preferred face orientation is downward with the same number of cases as mentioned previously (31%). N-NE follows with 37 (23%) cases. Facing upwards was the least favored facing found for the inhabitants of the Yukisma site.

Correlation tests yielded no significant association with respect to sex ($P = 0.25732$). However, cross-tabulation denotes a higher incidence than expected for males facing S-SW, while females were over-represented facing E-SE. Conversely, males are under-represented in the E-SE orientation, while females are under-represented in the S-SW facing.

When cross-tabulated with the four age groups, a $P(\chi^2, df)$ of 0.08421 results. The correlation is thus statistically marginal. Most of the variance derives from an overabundance of adults facing down, elders facing N-NE, and youths facing E-SE. The adult case is particularly notable, since 70% (34 of 49) of the down facings are adults.

An additional test was performed to confirm a suspected correlation between body orientation and facing of the individual. A $P(\chi^2, df)$ of zero verifies a high correlation between the two variables. Results show the two variables differ close to 180°, indicating that independently of the position of the body (dorsal, sideways, etc.), the cranium is most often tucked in with the chin against the chest cavity.

4.1.2.6 Special Treatment

In addition to the modes of disposal already discussed, a number of special treatments are observed in a few individual graves. These include pre- and post-interment fire pit, localized burning, and rock cairns, both singly and in combination.

Pre-Interment Fire Pit

Two burials (21 and 25) were observed in the field to have a layer of charcoal and vitrified clay under the body (Figure C-53). There was no observed burning of the bone, clearly indicating that the deposition of the body was later than the fire.

Radiocarbon dating from Burial 21 yielded a date of 860 ± 150 B.P. In addition hydration readings from obsidian recovered yielded 2.0 microns. Burial 21 is located in the central portion of the mound and Burial 25 is located in the periphery.

Post-Interment Fire Pit

Only one individual (Burial 1), an adult male, presented this treatment. It was located outside the central concentration. There is a localized burn area of oxidized soil toward the north portion of the grave. The right humerus projected above the other skeletal elements and was affected.

Localized Burning

Twenty-one individuals presented characteristics of localized burning. Two of these were also associated with a rock cairn (Burials 128, an infant, and 201, an elder male). Of the remaining nineteen individuals (Burials 67, 71, 78, 51, 81, 82, 105, 124, 134, 140, 161, 162, 166, 179, 194, 201, 227, 228, 232, and 241), fourteen are adults and five are elders (Burials 78, 81, 105, 179, and 232). Of these, twelve individuals are males, and five are females (Burials 67, 78, 81, 227, and 232). While males were mainly concentrated in the central area, females were located in the periphery.

All the individuals with localized burning only were associated with high artifact assemblage diversities (2.6 ± 1.8). Three radiocarbon dates were obtained: Burial 51, 440 ± 160 B.P.; Burial 166, 4230 ± 200 B.P.; and Burial 179, 1710 ± 200 B.P. In addition, obsidian hydration results showed: Burial 82, 1.8 and 1.9 microns; Burial 140, 2.2 microns. Not taking into account the oldest date (probably an aberration) places these burials in the Middle and Late Period.

Rock Cairn

Nine graves exhibited this characteristic. One was an infant (Burial 128) which also displayed some charring of the lower vertebral bodies, three individuals were youths between the ages of 5 and 10 (Burials 3, 203, and 217), two were adults (Burials 202 and 204), and three were elders (Burials 25, 188 and 201). This practice appears to be exclusive to males in the adult population. None of these graves were recovered from the central area. It is also of interest that almost no associations were found with any of these burials (diversity = 0.7 ± 0.8).

4.1.2.7 Summary

Table 4-13 summarizes and compares the results of the analysis of significant relationships between the five attributes of burial treatment and the primal indicators of mortuary differentiation, age and sex. The two outcomes derive from two separate statistical runs, initially including each variable with its complete set of values (all categories). When the number of cases became small in many cells, and the cells with expected frequencies less than 5 surpassed 25% of all cells, then the significance values were considered not reliable. In this case, the categories were condensed into fewer number of groups (compacted categories) in order to increase the number of cases in each group.

Table 4-13 χ^2 Significance for Mode of Interment with Respect to Age and Sex

		Chi-Square Significance			
		All Categories		Compacted Categories	
Burial Variable	Frequency	Age	Sex	Age	Sex
Disposal	239	0.47491	0.16465	*0.06037*	0.66205
Position	188	0.66583	*0.05349*	0.36561	*0.08723*
Orientation	205	0.30218	0.18913	**0.03443**	0.23690
Disposition	193	0.82106	0.34029	0.31750	0.27045
Facing	160	**0.00004**	0.37448	*0.08421*	0.25732

The frequency column indicates the number of individuals in each sample. This number decreases when testing significance with respect to sex, since all individuals with indeterminate sex are excluded.

All $P(\chi^2, df)$ values that show a significance at the 95% level are shown in **bold**. Those significant at the 90% confidence level are in *italics*. Facing with respect to age is correlated when all categories are reported; however, this correlation weakens when the number of categories is reduced.

When using a 90% confidence level, there are two cases where a statistical correlation for the compacted variable is absent in the un-compacted form. These are orientation and disposal. There are no cases of the converse; that is, whenever there is a correlation in the un-compacted variable, it is still significant (although it may be less so) when compacted. This instills more confidence in those cases (position/sex, facing/age) that show a correlation. Even though not clear statistical proof of a relationship, other variables do exhibit tendencies that may be evidence of differential mortuary treatment (orientation/sex, disposition/sex, facing/sex). However, in both cases (reduced or not) age appears to be a better discriminant with respect to body position.

Form of disposal and position are the modes of interment with the highest degree of labor expenditure differentiation (cremation vs. inhumation, tightly flexed vs. other). Tightly flexed, primary inhumation was the norm (and also the form with the least energy and resource involvement). Tightly flexed bodies occupy the minimum amount of space, and therefore require a smaller grave. Cremations involve the expenditure of relatively large quantities of firewood, and its procurement and transport were labor intensive activities.

CA-SCL-38 presents a wide range of variation in forms of cremation. The methods themselves used for complete burning also varied widely (cf. Burial 216). The complete burning of the body (primary cremation) was seldom practiced. The normative form of cremation at CA-SCL-38 was *in situ*, partial cremation, of single individuals (as compared to CA-MRN-27 where many cremations were multiple, "stirred," and disarticulated). There were few instances where the body was further manipulated after the act of cremation (redeposited cremations). The cremation practices evidenced at CA-SCL-38 have also been found along the San Francisco Bay, Marin coast, and the Sacramento-Delta region (Gerow and Force 1968:38).

In addition, there are other treatments (pre- and post-interment fire pit, localized burning) that may have been performed that involve the use of fire. Although these are not classified as cremation in the present study (cf. Lillard, Heizer, and Fenenga 1939), it is evident that fire treatment has special significance in the mortuary practices. The localized burning has been interpreted (Leventhal 1993, Jones 1996) as offerings of some kind, maybe contained in a basket or bundle (although no archaeological evidence of such remains).

An interesting concurrence of the data arises in comparing to some different sites. In total, approximately 20% of the burials at the Yukisma site show evidence of fire-related activity. This compares to 19.7% at CA-ALA-329 (Leventhal 1993), and approximately 20% (8/45) at University Village (Gerow 1968). This relationship is despite the wide range in site dates.

At CA-MRN-27, T. King (1970) found evidence of a platform for the performance of the cremations. Similar evidence was found at other sites (Schenck 1926). No such evidence was recovered from the Yukisma site, where *in situ* cremation appears to be more common. The cremations were concentrated at two locations, mostly at the center, and some along the fence excavation (NE section).

The pattern of artifact associations with burials that were fire-associated is also interesting. At both CA-MRN-27 and University Village many associations were found with fire-treated individuals. At CA-ALA-329 however, fire-treated burials were marked with few associations. The differences between these sites have not been satisfactorily explained, and they may be due to tribal idiosyncrasies, or typology differences.

At the Yukisma site, cremations, in total and by cremation types, had an average diversity around 1.7. The 21 individuals with localized burning had a diversity of 2.3 ± 1.8, not very different from cremations. It is interesting to note that one of the individuals with a pre-interment fire pit had a diversity of 8, among the highest in the site.

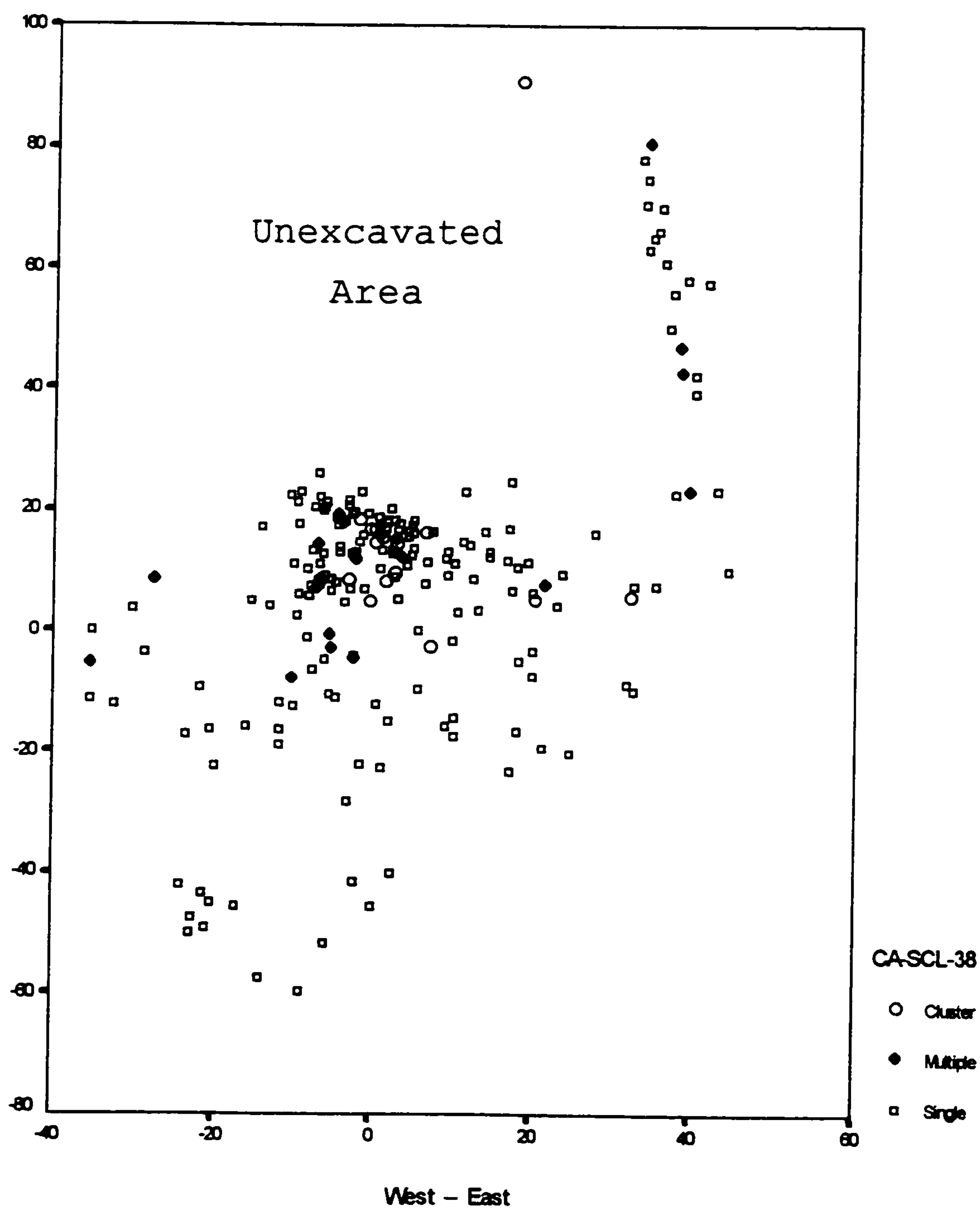
The characteristics of burials with rock cairns are very different from those with fire-treatment. Only two of nine are adults, and they have very few associations. No sexed females were in this group. At CA-SCL-732 (Jones 1996) 11 of 100 burials were associated with rock cairns/concentrations, and dated to the Early Period and Intermediate Phase of the Middle Period.

4.1.3 Spatial Distribution

4.1.3.1 Horizontal

The spatial distribution of the burials is shown in Figure 4-4. An area of approximately 4,000 m^2 was excavated; un-excavated portions are also shown. The spatial distribution of the graves indicates a main area densely clustered, and decreasing in density toward the periphery of the cemetery to the east, south and west. The highest concentration ends abruptly at the northern border of the excavated area, suggesting a large portion of the burial site remains undisturbed underneath the present buildings.

Figure 4-4 Spatial Distribution by Burial Type



A second area to the NE was also excavated following a fence line that runs parallel to and approximately 20 meters from Lower Penitencia Creek. These burials occurred with a spacing of one to two meters. This spacing is greater than that in the center, but less than that in the periphery. Visual inspection of the distributional pattern suggests some discontinuities between groups of burials.

4.1.3.2 Multiple Burials

A total of 20 graves containing 43 individuals (18% of the total population) are believed to constitute double or multiple interments that occurred contemporaneously (Table 4-14) (e.g., Figure C-57). These contexts include three dou-

Table 4-14 Multiple Burials

Type	Burials	Age/Sex
Double	13,50	A/M, A/M
Double	52,53	A/M, A/M
Double	99,101	A/F, E/F
Double	105,105A	E/M, A/M
Double	134,160	A/I, A/M
Double	167,167A	A/M, A/I
Double	226,227	A/M, A/F
Double w/subadult	30,30A	Y/I, A/F
Double w/subadult	76,76A	E/M, I/I
Double w/subadult	95,95A	Y/M, A/I
Double w/subadult	119,120	I/I, A/F
Double w/subadult	194,194A	A/M, Y/I
Double w/subadult	195,195A	Y/I, A/I
Double w/subadult	242,243	A/I, Y/I
Double w/subadult	219,220	A/M, I/I
Double subadult	137,159	Y/I, Y/I
Double subadult	155,156	I/I, I/I
Double subadult	235,235A	I/I, I/I
Multiple	141,142,143,144	A/M,A/M,A/M,A/M
Multiple	149,150,151	A/I, A/I, A/I

Age: Elder (E), Adult (A), Youth (Y), Infant (I)
Sex: Male (M), Female (F), Indeterminate (I)

ble graves containing only subadults (infants and youths) (e.g., Figure C-56), eight double graves with one adult and one subadult (e.g., Figure C-55), seven double graves with only adults and elders (e.g., Figure C-54), and two multiple graves, one with three adult individuals and the other with four adults.

4.1.3.3 Burial Clusters

Since there is no reliable temporal connection within clusters, they will, for the most part, not be treated here, except for the "160s" cluster (Figure C-58). These are a total of eleven individuals (Burials 161-169, 184, and 148) arranged in a rough semicircle. They vary slightly in depth, but are so close as to be almost touching. One burial (167) is associated with two mortars and a pipe. All are males except Burial 169 (an infant), and Burial 184 (an elder female).

4.1.3.4 Vertical

The vertical depth measurements are questionable due to the lack of the original ground contours of the mound because of historic plowing and building development. The data were correlated for the burials of known date, but no significant structure or pattern was found. Therefore, the depth data were not used in the analysis.

4.1.3.5 Summary

There are some points that bear further discussion in the distribution of the types of burials. While most of the burials were single interments, double and multiple burials were a common occurrence. In single burials there is a greater than expected number of elders. In contrast, very few elders were interred in double burials. The two multiple burials were exclusively of adults. In addition, infants were twice as likely to be buried with another individual as alone. Youths were also more likely to be interred with another individual, though in not as dramatic a fashion. Females were slightly more likely to be singly interred than males. The number of types of associations with each type of burial presented a few differences. Double adult burials tended to have a higher diversity (2.8 ± 2.6), but adult/subadult burials tended to have less (.7 ± 1.1). Multiple burials also had low diversities (.7 ± .8), while single burials fell in between (1.3 ± 1.7). Both multiple burials had individuals with obsidian point associations.

4.2 Grave Associations

4.2.1 Artifacts

4.2.1.1 Stone Artifacts

Flaked Stone Artifacts

A total of 279 flaked stone implements was recovered from CA-SCL-38. Of these, 207 (74%) implements were in association with burial contexts; the remaining 72 (26%) were gathered as isolates. Of all flaked stone, 110 (39%) are informal tools, 20 (7%) are obsidian tools, 144 (52%) constitute debitage, and 5 (2%) are unmodified manuports.

A variety of geologic materials are represented among the Yukisma flaked stone assemblage (Table 4-15). The most common materials are Franciscan chert (red, green, gray, and white), Monterey chert, and obsidian (Napa and Annadel). Other materials that occur in smaller quantities are chalcedony, quartz, agate, calcite, serpentinite, sandstone, basalt, rhyolite, scoria, schist, granite, hematite, and cinnabar.

Table 4-15 Flaked Stone Assemblage by Material

Tool Type	RFC	GFC	GrFC	WFC	Monterey C	Metachert	Napa	Annadel	Chalcedony	Quartz	Agate	Calcite	Serpentinite	Sandstone	Basalt	Rhyolite	Scoria	Schist	Granite	Mud Stone	Hematite	Cinnabar	TOTAL
INFORMAL TOOLS																							
Cobble cores	1	1	1	1										1			1			1			7
multiface cores	2	1																					3
Core/hammerstones	1												1		1								3
Pebble cores	6	4							1			1		1		4		1	2		1	31	52
Exhausted cores	1	2																					3
Core fragments	3	6											2					1					12
Assayed cobbles	4	1		1					1														7
Utilized flakes	10	6	1			1																	18
Modified flakes	4	1																					5
OBSIDIAN TOOLS																							
Bifaces							3	1															4
Projectiles							16																16
DEBITAGE																							
Cortical flakes	14	14	3		1				1	1													34
Bipolar cortical flakes	2	1																					3
Primary flakes	37	22	5		2				2		1				2	2							73
Secondary flakes	3				1																		4
Flakes							3						1										4
Shatter	13	6			2				1	2													24
Thermal spalls	2																						[illegible]
MANUPORTS																							
Pebbles																1							1
Cobbles									1								1						2
Fragments																		2					2
TOTALS	103	65	10	2	6	1	22	1	7	3	1	1	4	2	3	7	2	4	2	1	1	31	279
PERCENTAGES	37%	23%	4%	.7%	2%	.3%	8%	.3%	3%	1%	.3%	.3%	1%	.7%	1%	3%	.7%	1%	.7%	.3%	.3%	11%	100

RFC (red Franciscan chert), GFC (green Franciscan chert), GrFC (gray Franciscan chert), WFC (white Franciscan chert)

Franciscan chert constitutes 64% of the total assemblage. This material is locally available and occurs in beds of the Franciscan Formation formed during the Upper Jurassic by a melange of volcanic, metavolcanic, sandstone, shale, schist, basalt, greenstone, limestone, and cherts of many colors. Red Franciscan chert (RFC) is the most prevalent type, comprising 57% of the total chert, while green Franciscan chert (GFC) occurs at a frequency of 36%, gray Franciscan chert (GrFC) 5%, and white Franciscan chert 1%.

Monterey chert occurs minimally (2% of the total flaked stone assemblage), and only as debitage. This material dates to the Miocene, and usually occurs west of the San Andreas fault. The closest known source is located at Año Nuevo.

Obsidian constitutes 8% of the total sample, including formed tools. This material is a volcanic glass imported from the Napa and Annadel sources in the North Coast Ranges.

Cinnabar, in the form of small pebbles, was recovered from two burials (Burials 132 and 135). This mineral is found in the Almaden Valley.

Table 4-16 Distribution of Informal Flaked Stone Tools with Burials

Burial	Sex	Age	Cores	Assayed Cobbles	Utilized Flakes	Modified Flakes
5	F	21-30	1 (scoria)			
7	I	Adult	1 (GFC)			
14	I	31-50	1 (RFC)			
15	M	25-45	1 (RFC)			
21	I	18+	9 (3Rhy,2Gr, 2RFC,1GFC,1SS)		1 (RFC)	1 (RFC)
26	M	30-50			1 (RFC)	
47	M	17-21		1 (GFC)		
61	M	35-45			1 (RFC)	
68	F	40-60	1 (RFC)		1 (GFC)	
73	M	18-20			1 (MC)	
75	I	13-15			1 (GFC)	
77	I	21+		1 (RFC)		
81	F	35-50	1 (Ca)			
84	M	16-20	1 (RFC)			
95	M	15-17				1 (RFC)
112	F	17-23	1 (RFC)			
130	M	18-25	1 (GrFC)			
132	M	16-20	30 (Cnn)			
135	I	8-11	1 (Cnn)			
142	M	15-18	1 (RFC)			
155	I	0.7-1.25			1 (GFC)	
162	M	25-35			1 (GFC)	1 (GFC)
164	M	35-45			1 (RFC)	
171	M	35-45				1 (RFC)
175	M	25-35			1 (RFC)	
177	I	2.5-3.5		1 (RFC)		
185	I	25+	1 (GFC)			
187	F	21-30	1 (SS)			
189	F	35-50		1 (RFC)		
194	M	25-35	1 (GFC)			
202	M	25+			1 (RFC)	
205	F	35-50	1 (RFC)			
224	M	21-26	1 (MS)			
232	F	35-50			1 (RFC)	
240	M	21-35				1 (RFC)
Total	**35**		**55**	**4**	**12**	**5**

RFC (red Franciscan chert), GFC (green Franciscan chert), GrFC (gray Franciscan chert), MC (metachert), Ca (calcite), Cnn (cinnabar), Gr (granitic), SS (sandstone), MS (mudstone), Rhy (rhyolite).

Informal Tools

A total of 110 informal tools was recovered, comprising 40% of the flaked stone assemblage. Of these, 70% (n = 76) were associated with 35 burials (14% of the total population). This category includes cores, assayed cobbles, utilized flakes, and modified flakes.

Cores

Of the informal tools 80 specimens (73%) were identified as core tools. Of these 55 (69% of cores) were recovered from burial contexts. Thirty-one small cinnabar pebble cores are included in this category. Red Franciscan chert and green Franciscan chert appear equally utilized with 14 specimens each, but red chert is more frequently found with burials while green chert is more commonly found isolated. Table 4-15 illustrates material distribution and counts, and Table 4-16 illustrates their distribution with burials.

Assayed Cobbles

A total of 7 specimens was recovered, 4 associated with burials and 3 isolated finds. Red Franciscan chert is the most prevalent material with 4 implements (Table 4-15).

Utilized Flakes

Eighteen utilized flakes were recovered from CA-SCL-38. A total of 12 (67%) of these implements were in association with burials. Red Franciscan chert comprises 55% of the total sample (n = 10), and green Franciscan chert 33% (n = 6).

Modified Flakes

A total of 5 specimens, 4 red Franciscan chert and 1 green Franciscan chert comprises this category. All implements were recovered from burial contexts.

It is not clear if the inclusion of these tools within burials was intentional or occurred by accidental deposition. In some cases these implements could have been the result of temporary site-related activities, and were thus included with the grave fill, however they may be intentionally placed objects as found at other cemeteries.

Statistical tests indicate lack of significant correlation with respect to age and sex. Moreover a $P(\chi^2, df)$ of almost one with respect to the age group categories implies a random distribution. However, there is a slight overrepresentation of informal tools with males (18%). Only 8% of the female population have these implements. All ages, including infants, are represented in this sample.

A similar pattern was obtained when the sample of burials with these implements was subdivided into the frequency categories (i.e., few, some, many) (breakpoints: 1,2,3). Males and females are similarly distributed in all categories except in the "many" where only a male individual (Burial 132) is represented. According to age, the occurrence of "many" implements is only associated with adults. All ages, including one infant (Burial 155), are represented in the "few" category, while only an adult and an elder female had "some." Amount categories were not significantly correlated according to age and sex.

Burial 21 had the largest and most varied flaked stone assemblage of all the individuals recovered. Burials 132 and 135 had respectively 30 and 1 small cinnabar pebbles of approximately 5 mm in diameter.

Obsidian Tools

This category includes all projectile points and bifaces found at CA-SCL-38. A total of 20 implements was recovered from 18 burials (7% of all the burials) (Figure C-1 and Figure C-59).

Obsidian Projectile Points

A total of sixteen obsidian projectile points and fragments was recovered in association with fifteen burials. All were sourced as originating from the Napa Valley. No others were found in other contexts (surface, test units or auger holes).

Stockton Serrated Points: At CA-SCL-38, 6 obsidian specimens were recovered. All exhibit serrated blade margins along half or one third of the blade excluding the tip. Three specimens are side-notched (21-1, 92-6, and 149-1), two are corner-notched (86-8 and 86-9), and all have expanding stems. Their bases range from straight to convex. The remaining point (72-1) is missing the diagnostic basal area.

The number and characteristics of the serrations along the blade margins are thought by some researchers to have temporal significance (Bennyhoff 1977, Fredrickson 1995, Hylkema 1996). Based on obsidian hydration rim values, points smaller and with fewer serrations (1 to 6) dated to Phase 2 of the Late Period, and larger multi-serrated points were dated in middle Phase 1 of the Late Period (Hylkema 1996). At CA-SCL-690 Hylkema recovered 9 Stockton Serrated points that produced hydration readings between 1.8 and 2.4 microns. These results conform to an earlier occurrence, the Middle Late Transition to Phase 1 Late Period (1996). This type of projectile point is also common at CA-ALA-329.

The number of serrations on the points recovered at CA-SCL-38 range from 2 to 7, and the hydration readings range from 1.8 to 2.9 microns (Table 4-17).

Serrated Lanceolate Points: Four obsidian serrated lanceolate points (82-3, 152-3, 171-7, and 218-1) are grouped within this type. They are larger and have greater thickness than the Stockton points (Table 4-17). Serrations are present on opposite sides of the blade except for the tip and base. The basal portion is convex-rounded. This type is believed to slightly pre-date, but to continue to co-occur with Stockton Series points through Phase 1 of the Late Period (Hylkema 1996). Hylkema recorded obsidian hydration readings of 1.8 microns from similar types recovered at CA-SCL-690. At the Yukisma site obsidian hydration values range from 1.6 to 1.9 microns, which makes them chronologically coeval with the Stockton Series.

Large Contracting Stem Points: One example of the Large Contracting Stem type was recovered from CA-SCL-38. It was found in two fragments in Burial 168 with the skeletal remains of a male individual 18 to 23 years of age. One fragment was found between the 6th and 7th cervical vertebrae. The second fragment was proximate to the thoracic vertebrae in the rib cage.

This point exhibits regular serrations on opposite sides of the blade and a contracting stem. The large size suggests it was used as a dart point (Table 4-17, Figure C-

1). Two obsidian hydration values were obtained from each fragment, 1.9 and 2.2 microns.

Projectile Point Fragments: This category groups fragmentary points that lack sufficient diagnostic characteristics to be included with assigned types. Two specimens, one serrated, are tip fragments (144-4 and 225-6). Two other fragments (10-1 and 150-1) are mid-sections of small points. One of these (150-1) exhibits serrations.

Table 4-17 Projectile Point and Biface Attributes

Cat	Typ	Con	Wt	ML	MW	MT	BW	NW	DSA	PSA	HV
1-1	BF	B	0.2	7.4	13	4.0					1.9
4-1	BF	B	0.5	9.0	16	6.0					2.3
10-1	PPF	MS	0.3	11.0	8.0	4.0					2.0
21-1	SS	NC	0.5	17.5	12.0	3.5	10.0	6.0	180	170	2.0
21-21	PPF	MS	0.2	13.2	6.8	2.5					2.0
42-5	BF	NC	6.1	35.0	21.5	8.9					2.2
72-1	SS	MS	0.8	21.0	13.1	2.9					1.5
73-14	BF	MS	3.3	19.3	19.2	8.2					1.7
82-3	SL	C	2.0	40.2	13.0	5.4	6.1				1.8
86-8	SS	NC	0.8	28.3	15.5	2.5	9.0	6.0	150	140	2.9
86-9	SS	NC	3.0	21.5	13.7	3.5	6.0	4.6	160	130	1.9
92-6	SS	NC	1.7	30.2	14.3	5.0		8.0	180	135	2.1
140-6	LCS	C	13.1	87.0	22.7	7.1	11.0	12.0			1.9/2.2
144-4	PPF	T	0.5	11.6	9.5	3.3					2.0
149-1	SS	NC	0.7	22.7	13.8	3.0		7.0			1.8
150-1	PPF	MS	0.2	10.4	9.4	2.7					1.8
152-3	SL	NC	2.1	35.0	13.6	5.0					1.7/1.8
171-7	SL	T	1.1	20.0	14.0	5.0					1.8/1.9
218-1	SL	NC	2.3	38.6	17.4	4.9					1.6
225-6	PPF	T	0.5	20.0	18.2	2.8					1.9/2.3

Dimensions in mm, weight in grams, hydration value in microns
Typ (Type): SS (Stockton Serrated), SL (Serrated Lanceolate), BF (Biface), LCS (Large Contracting Stem), PPF (Projectile Point Fragment)
Mat (Material): N (Napa), A (Annadel)
Con (Condition): C (Complete), NC (Nearly Complete), T (Tip), B (Base), MS (Midsecion)

Bifaces

A total of four fragmentary specimens was recovered from four burials. All were made from obsidian, three from the Napa Valley and one from the Annadel source (Table 4-17).

One almost complete specimen (42-5) exhibits irregular scar flakes, rough and sinuous bifacial edges, and is irregular to slightly lenticular in cross section. Two of the remaining specimens (1-1, 4-1) are small basal fragments, and the third one (73-14) is a mid-section segment. Obsidian hydration yielded values ranging from 1.7 to 2.3 microns (Table 4-17).

Twenty projectile points and bifaces were recovered from eighteen burials (7% of sample). Of these, eleven are of males (11% of total male population) 18 years and older, three of females (5% of total female population) also 18 and older, and five (6% of total indeterminate population) of indeterminate sex, aged 15 and older. Adults and elders are equally likely to possess obsidian tools. Incidence (presence/absence) of these implements is not significantly constrained by age or sex discriminants. This could be due to the low incidence of these points among the population. However, they tend to be more commonly associated with males, and they only occur with adults and elders. The individuals in Burials 21 and 86 are the only ones associated with two projectile points.

Table 4-18 illustrates sex and age distribution of projectile point occurrence and the location within the body of those found *in situ*. In none of these cases was the point actually embedded in the bone.

Table 4-18 Projectile Point Locations

Burial	Sex	Age	Location
1	M	25-35	not *in situ*
4	F	40-50	chest cavity
10	M	35-55	by feet
21	I	18+	not *in situ*
42	M	35-50	not *in situ*
72	F	18-30	near right pelvis
73	M	18-21	pelvic/lumbar
82	M	31-40	abdomen
86	M	45-50	chest cavity
92	M	35-45	chest cavity right side
140	M	31-40	C6/C7, T1/T2
144	M	18-25	inside cranial cavity
149	I	adult	left pelvis
150	I	15+	chest cavity
152	M	18-22	chest cavity left side
171	M	35-45	between T12 and L1
218	F	35-45	pelvic/lumbar
225	I	17+	right 6th and 7th ribs

Of these individuals, Burials 140 and 171 had projectile points inserted between the actual vertebral bodies. Burial 144 exhibits 2 upper incisors and center mandibular teeth broken off, injuries that could be related to the projectile point fragments found in the cranial cavity. Burial 152 exhibits healed lesions in the left scapula, and 6th and 7th ribs, also consistent with causation by the fragmentary point found on the left side of the chest cavity.

Certainty cannot be reached about the violent nature of these events. For the most part, the points recovered were either fragmentary or missing distal or proximal ends, this most likely caused by impact, suggesting inflicted injuries. There are four burials (91, 142, 143, and 161) that do have obsidian projectile point fragments imbedded in bone. They are all adults, three males and one indeterminate. The consequences of these findings are still to be determined because they must be analyzed in the context of a complete paleo-pathological study (Jurmain in progress).

Debitage

A total of 144 pieces of debitage (52% of the flaked stone sample) was recovered from CA-SCL-38. Of these 74% (n = 106) were associated with burials; the remaining 26% (n = 38) was recovered from isolated contexts. This sample included 71 pieces of red Franciscan chert (49%), 43 flakes of green Franciscan chert (30%), 8 of gray Franciscan chert (5%), 6 of Monterey chert (4%), 3 of obsidian from the Napa source (2%), 5 of chalcedony (3%), 3 of quartz (2%), 2 of rhyolite (1%), 2 of basalt (1%), 1 of agate and 1 of serpentinite (0.7% respectively). Distribution by type, material, and quantity are illustrated in Table 4-15.

Manuports

Manuports constitute 2% (n = 5) of the total flaked stone sample. Burial 21 had 2 green schist fragments with no sign of cultural modification. A rhyolite pebble was recovered from Burial 177, a scoria cobble was found with Burial 188, and a chalcedony cobble was included with Burial 232.

Ground Stone Artifacts

Mortars

A total of 26 mortars and mortar fragments were uncovered at the Yukisma site. Twenty-three were grave associations contained in 20 burials (8% of all burials), and three were isolated (Table 4-19).

Table 4-19 Mortar Attributes and Number of Specimens by Association

Attributes	**W/Burials**	**Isolates**
Condition		
Intact	13	3
Complete *	8	0
Fragments	2	0
Killed	6	0
Unshaped		
Hopper Mortar	10	1
Boulder Mortar	4	1
Cobble Mortar	1	1
Shaped		
Bowl Mortar	2	0
Show Mortar	4	0
Material		
Sandstone	8	1
Sandstone Fossiliferous	6	1
Greywacke	7	1
Volcanic	2	0
Total	23	3

These tools were grouped into two main categories: unshaped and shaped. Further subdivision, based on other morphological attributes, resulted in the following types:

Unshaped Mortars

Hopper mortars: (11 specimens) They are large blocky boulders with a naturally flat surface and a concavity caused by food processing. These concavities range in size from 10 cm to 22 cm in diameter, and from 2 cm to 11 cm deep. They were probably used with baskets attached to the flat rim surrounding the concavity. This morphological type is the one most commonly found within the graves. Six females (two elders) and four males (two elders) were interred with this type of mortar.

Two specimens (70-2 and 221-4) exhibit fractures, probably caused before or at the time of burial.

Boulder mortars: (4 specimens) These are large cobbles often only partially shaped. The concavities are larger in diameter and deeper than the ones in the hopper mortars. The rims are rounded and slightly beveled. This type has been described by Beardsley (1954) as type B and Lillard, Heizer and Fenenga (1939) as types B2, B3, and B4. One grave of an adult male individual (Burial 167) contained two mortars, and two adult females graves contained one mortar each. The two mortars from Burial 167 were complete but broken, or "killed," into several fragments. Visual analysis of the breakage pattern suggests that in both cases the exterior base was the striking point. In addition, these two specimens have ground areas on the exterior, suggesting an additional function.

Cobble mortars: (1 specimen) A small mortar made of soft sandstone was found with Burial 21 (Figure C-69). This miniature tool, approximately 7 cm long with a shallow concavity, was probably utilized to process herbs and/or pigments. Beardsley called this type "miniature" or "paint mortar." Although there is no visual evidence of any residue in the basin, there is a black substance on the exterior base. This artifact is subject to further analysis.

Shaped Mortars

Bowl mortars: (2 specimens) Both mortars were associated with adult males. The mortar associated with Burial 45 (45-10) has rounded sides and bottom, with a concavity 15 cm deep, circular as seen from above, and "U" shaped in cross-section. The exterior is highly polished. The rim is rounded and beveled. Specimen 50-17 has similar characteristics although it is oval in shape (Figure C-61). Both mortars are intact.

Show mortars: (4 specimens) This type is distinguished by having straight to slightly curved sides, flat bottom, flat and beveled rim, and a completely dressed exterior (Figure C-60). Three are made of Greywacke sandstone, and one (240-6) is made of red andesite. According to the Geology Department at San Jose State University, this material is commonly found in volcanic areas, such as the Mt. Diablo and Berkeley Hill areas. There is an appliqué of shell on the rim, not commonly found in Central California. Only one mortar (13-13) is intact, while the rest are broken or "killed" (although all the fragments are present). Visual analysis of the breakage patterns indicates that all were impacted from the interior. This pattern seems to be different from the one found among the "boulder mortars" in this collection. Two show mortars were found with two adult males, one with an adult female, one with a child, and two fragments were recovered from a primary cremation with an adult individual of indeterminate sex.

Presence/absence of mortars evidences a lack of significant correlation with age or sex. Cross-tabulation indicates mortars associated with burials were proportionally more often than expected associated with females than males. Ten mortars and one fragment were associated with nine male individuals (9% of all males), and eight mortars were associated with eight female individuals (13% of all females). The remainder (4 mortars) were recovered from four graves with individuals of indeterminate gender. One show mortar was associated with the burial of a child approximately 3-4 years old (Burial 137). One hopper mortar was associated with a double burial containing the remains of an infant (Burial 119), which were placed on the mortar, and an adult female (Burial 120), which was underneath the mortar. The rest are equally associated with adult or elders.

Table 4-20 Distribution of Mortars by Burial

Burial	Sex	Age	Specimens	Type
13	M	30-45	1	Show
21	I	18+	1	Cobble
39	M	20-24	1	Boulder
40	I	adult	2 fragment	Show *
45	M	25-35	1	Bowl
50	M	18-21	1	Hopper
			1	Bowl
55	F	35-50	1	Hopper
67	F	18-21	1	Hopper
70	M	35-45	1	Hopper
			1 fragment	Unknown
72	F	18-30	1	Show
119/120	I/F	1-2.5/ 18-20	1	Hopper
137	I	3-4	1	Show
167	M	18-24	2	Boulder
171	M	35-45	1	Hopper
189	F	35-50	1	Hopper
198	M	30-50	1	Hopper
218	F	35-45	1	Hopper
221	F	25-35	1	Hopper
230	F	31-40	1	Boulder
240	M	21-35	1	Show

There is a tendency to place the mortars up side down over the pelvic or thoracic area of the dead. This pattern seems uniformly independent of sex. In Burial 45 the mortar was covering the cranium, and in the double burial, the infant was placed over the mortar. These two burials appear to be the only exceptions. In cases where the mortar was "killed," the base was placed over the body and the fragments surrounding the individual in a circular manner (this pattern was only visible when the burial had not been disturbed).

Pestles

Sixty-five pestles and pestle fragments were recovered from CA-SCL-38. Forty-one were associated with 29 burials and 24 were isolates and surface finds (Table 4-21). These tools are predominantly shaped, made out of Greywacke sandstone, with high polish along their length (Figure C-2 through C-7, C-62). They are cylindrical, or slightly tapering in shape, only six are conical. Their lengths range from 6.5 cm to 64 cm. The shortest specimen (Specimen 2-3) was associated with the elk feature and has ocher residue at one end suggesting ceremonial use instead of use as a food processing tool. A medium-length pestle of 19 cm, found in association with a child (Specimen 178-10), also exhibits pigment residue (possibly hematite) at one end.

Table 4-21 Distribution of Pestle Attributes by Association

Attributes	**W/Burials**	**Isolates**
Condition		
whole	38	13
end	3	7
medial	0	4
killed	10	2
subtotal	41	24
Shaped	41	19
Unshaped	0	3
Pestle Shape		
cylindrical	37	19
conical	3	3
flanged	12	3
Material		
Greywacke	41	20
sandstone	0	4
Length		
long	24	2
medium	13	13
short	1	0
Working Ends		
one	11	4
two	9	5
none	10	2
s/one	4	1
s/two	4	1
Residue	2	0

Fifteen pestles are slightly grooved or flanged at the proximal end. Thirteen of these are associated with burials and three are isolates.

Ground stone tool morphological attributes, such as shape and wear, are important characteristics that help determine the function and type of resources processed. End-shape morphology, such as flat, slightly convex, convex or irregular, is used after Mikkelsen as a classificatory system. Table 4-22 summarizes the shape of the proximal and distal ends of the 51 (78%) complete pestles. Convex/convex are the most prevalent, but slightly convex/slightly convex and flat/convex are also common.

Visual wear analysis was performed on all specimens. Of the 50 complete pestles (78%), 15 exhibit one working end, 14 show two working ends, and 21 have slight or no wear. This last category is mainly found within graves, possibly indicating prestige and not utilitarian objects.

Ten pestles associated with burials exhibit old breaks, probably due to being broken or "killed" at the time of interment. This pattern has been found characteristically in burials assigned to the Late Period at other Central California sites.

Table 4-22 Distribution of End Classifications

Proximal End	**Distal End**	**Specimens**
flat	convex	6
	s/convex	5
	irregular	1
	Subtotal	**12**
s/convex	flat	0
	s/convex	8
	convex	3
	Irregular	1
	Subtotal	**12**
convex	flat	2
	s/convex	4
	convex	14
	irregular	1
	Subtotal	**21**
irregular	flat	1
	s/convex	2
	convex	1
	irregular	1
	Subtotal	**5**
Total		**50**

The distribution of presence/absence of pestles according to sex and age was statistically un-correlated (Table 4-23). Forty-one (63%) of the pestles were found with 28 (12%) human graves (one was recovered from an animal burial). Proportionally, slightly more females than expected possess pestles. Of the total 17% of the female population (n = 11) have these implements, while only 12% (n = 12) of the males

Table 4-23 Distribution of Pestles by Burial

Burial	**Sex**	**Age**	**Specimens**
2	Elk		1
28	F	40-50	1
35	F	25+	1
37	F	17-19	1
40	I	Adult	1 fragment
52	M	18-23	1
64	M	21-29	1
72	F	18-30	3
75	I	13-15	1 fragment
112	F	17-23	1
120	F	18-20	1 fragment
122	F	41-50	1
130	M	18-25	3
135	I	8-11	2
137	I	3-4	2 (1 frag.)
152	M	18-22	2
157	M	25-35	1
167	M	18-24	1
170	M	25-35	1
171	M	35-45	6
175	M	25-35	1
178	I	2-4	1
180	M	35-39	1
205	F	35-50	1 fragment
218	F	35-45	1
221	F	25-35	1
224	M	21-26	1
231	M	30-40	1
234	F	35+	1
Totals			
29			36+5 fragments

have them. Age distribution shows an over-representation in the adult category, although youth and elder categories are also represented. Pestles were not recovered with infant burials.

A $P(\chi^2, df)$ of 0.07968 suggests a correlation, at a 90% level of confidence, between age and the number of pestles within a grave (category breakpoints: 1, 2, 3). Adults are more likely to have only one pestle. While elders are in general underrepresented, one individual (Burial 171) was interred with the greatest number of pestles (n = 6). The youth category was equally represented with "few" and "some" pestles. These implements were not found with infants. Although no significant correlation was found between number of pestles and sex, there are some tendencies to favor females with "few" and males with "some" and "many."

Manos

A total of six handstones was recovered. Three of these were associated with burials and three were isolate finds (Table 4-24). All are made from indurated Greywacke sandstone beach cobbles, principally shaped (Figures C-8 through C-10). One is unifacial, the rest were bifacially utilized. Two specimens have both slightly convex and convex wear facets. The remaining four have flat opposing facets. The shape of the faces can be associated with mode of use and/or type of resource processed. Flat surfaces are related to light grinding and shelling, while convex faces are related to the processing of harder seeds (Loud and Harrington 1929:136-138, Mikkelsen 1993:329).

Striations are visible on five specimens, running perpendicular and angled to the long axis. Four handstones exhibit wear on the sides. The shape of the ends is mostly rounded, and battering and pecking are the prevalent wear patterns. Only two samples have pecked center depressions (21-15 and 107-1).

One isolate specimen (350-2) shows signs of hematite or ochre residue on one face.

Table 4-24 Distribution of Mano Attributes by Association

Attribute	**W/Burial**	**Isolate**
Shaped	2	3
Unshaped	1	0
Number of Faces		
Uniface	1	0
Biface	2	3
Shape (plan view)		
Flat/Flat	2	2
Sl/Convex	1	1
Striations	2	3
Side Wear	2	3
End Wear	2	3
Central Pecking	2	1
Residue	0	1
Material		
Sandstone	2	0
Greywacke	1	3
Total	**3**	**3**

The sex and age distribution of handstones is indicated in Table 4-25. Of the three samples associated with burials, two are included with adult females, and one with an adult of indeterminate sex.

Table 4-25 Distribution of Manos by Sex and Age

Burial	Sex	Age	Specimens
21	I	18+	1
107	F	35-45	1
126	F	40-50	1
Total			**3**

Abraders

These implements are unmodified cobbles displaying wear in the form of ground or polished areas. Three abraders were recovered, two as grave associations and one isolate. Specimen 21-15 is a small sandstone pebble found with Burial 21, an adult of indeterminate sex, and specimen 121-1 is a rhyolite cobble recovered from Burial 121, an adult male. A Franciscan chert cobble (Specimen 350-4), recovered as an isolate, exhibits cinnabar residue and striations parallel and angled to the long axis.

Charmstones

A total of 39 complete and 5 fragments of unperforated charmstones were recovered at the Yukisma site. Of these, 38 were associated with 13 human burials (one was associated with an animal burial), and 5 were isolates or surface finds. For distribution and individual characteristics, refer to Table 4-26. All charmstones have been drawn in Figures C-11 through C-21, with photo in Figure C-63. The charmstones were subdivided according to the typology developed by Elsasser and Rhode in 1992 (Rhode 1996:228-244) into three categories:

Squat: (11 specimens) 10 are complete and associated with burials and one fragment is isolated. These correspond to the IIB1a typological group developed by Davis and Treganza (1959). Specimen 140-3 from Burial 140 is the only charmstone made of actinolite.

Piled Plummet: (31 specimens) 24 complete and 2 fragments are associated with burials, 3 complete and 2 fragments are isolates or surface finds. This is the most common form found at this site and encompasses great stylistic variation. Specimen 44-4 (Figure C-15 and C-69) was found unassociated in Locus C. It does not have a corresponding form in the categories presented by Elsasser and Rhode, but is included in this category due to its general characteristics.

Piled: (2 specimens) This group appears similar to Davis IIB1b with only one end piled and the distal end triangular or without the characteristic "nipple" present in the other two groups.

Table 4-26 Distribution of Charmstones by Type

TYPE	CATALOG	SEX	AGE	COMMENTS
SQUAT	71-1	M	17-20	
	73-4	M	18-21	burnt, tip missing
	73-5			burnt, tip missing
	73-6			burnt/, tip missing
	93-7	F	45-55	small "nipple," asphaltum, grooved
	140-3	M	31-40	actinolite, asphaltum, grooved
	140-4			knobbed, asphaltum
	140-5			knobbed, asphaltum, grooved
	175-3	M	25-35	
	175-5			asphaltum
Sub-total	10			
PILE PLUM-MET	2-4			large piles, fragmentary end
	73-2	M	18-21	burnt, tip missing
	73-3			burnt
	73-7			burnt, tip missing
	91-6	I	16-20	asphaltum, knobbed
	91-7			knobbed
	91-8			knobbed
	93-2	F	45-55	pecked "nipple"
	93-3			knobbed, asphaltum
	93-4			knobbed, asphaltum
	93-5			knobbed
	93-6			asphaltum
	97-11	M	18-23	pecked "nipple"
	130-8	M	18-25	
	130-9			grooved, asphaltum, knobbed
	134-3	I	15-19	knobbed, asphaltum
	134-4			knobbed
	148-1	M	30-40	knobbed, asphaltum
	160-1	M	20-29	grooved, asphaltum, knobbed
	175-2	M	25-35	knobbed, broken "nipple"
	175-4			knobbed, asphaltum, broken "nipple"
	175-6			knobbed, asphaltum, "killed"
	175-7			
	175-9			asphaltum, "killed"
	250-85			isolate, burnt, tip missing
	300-35			isolate
	44-4			isolate, Locus C, central constriction of bulbous body
Sub-total	27			

TYPE	CATALOG	SEX	AGE	COMMENTS
PLUMMET	130-10	M	18-25	knobbed
	175-8	M	25-35	Triangular distal end, asphaltum, "killed"
Sub-total	2			
Grand Total	**39**			
FRAGMENTS	13-9	M	31-40	poss. pile plummet
	178-8	I	2-4	poss. pile plummet
	250-166			isolate, base, poss. squat
	42-2			isolate, Locus A, surface, body, possible pile plummet
	42-3			isolate, Locus A, surface, proximal end, asphaltum, possible pile plummet
Frag.Total	**5**			

The material utilized for the charmstones was visually determined to be Greywacke sandstone, commonly found in the Franciscan Formation throughout western California. Only one specimen (140-3) was made of actinolite (Figure C-16, Figure C-63), a complex metamorphic silicate of calcium, magnesium, and iron.

Eighteen (41%) specimens have a remnant of asphaltum on the proximal end where the impression of a cord or twine is often visible. This suggests they were either suspended from a cord, or that a cord was used to attach additional objects to them. Schenck (1926:262) suggested that they could have been employed as handles for feather bunches used in dances. In addition, nineteen charmstones are either knobbed or grooved on the proximal end of the pile.

The age and sex distributions of charmstones associated with burials are summarized in Table 4-27 and Table 4-28.

Only 5% of the population (13 burials) were found with charmstones. Males are over-represented (9%), while only one female (Burial 93) is in the sample.

Significance tests show correlation at a 90% confidence level (P = 0.05218) only when sex and the presence/absence of charmstones within the grave is considered. With respect to age, adults are over-represented while the elder (Burial 93) and youth (Burial 178) categories are represented by one individual each. Charmstones were never present with infants.

When the population with charmstones is examined, an interesting pattern emerges between the number of charmstones within each burial and the age and sex distribution (category breakpoints: 1, 2, 4). There is a high linear correlation between age and amount of charmstones indicated by Pearson's R value of 0.49065 (P = 0.08868), where infants have none, youth only have one, and elders only have "many" (although chi-square tests are not significant). Furthermore, Burial 93, one of the three burials within the "many" category, is not only the only female, but also the only elder in this sample. Adults, on the other hand, appear to be associated almost randomly either with one or more than one of these implements.

Table 4-27 Distribution of Charmstones by Burial

Burial	Sex	Age	Specimens
2	Elk		1
13	M	30-45	1 (fragment)
71	M	17-20	1
73	M	18-21	6
91	I	16-20	3
93	F	45-55	6
97	M	18-23	1
130	M	18-25	3
134	I	15-19	2
140	M	31-40	3
148	M	30-40	1
160	M	20-29	1
175	M	25-35	8
178	I	2-4	1 (fragment)
Totals	**14**		**36 + 2 fragments**

A similar pattern was found at CA-ALA-329 where the majority of the charmstones were also associated with males older than 20; two cases were males younger than 20, nine cases were females older than 25, and two cases were associated with infants (Leventhal 1993:238). Leventhal (1993:238) suggested young teenage males had "a formal connection with these 'power' objects," that the presence of charmstones in infant graves signified ceremonial or lineage-related reasons, and that the presence of these objects in older female graves implies that knowledge and shamanic practices and/or qualities were publicly recognized with age.

Table 4-28 Burial Distribution with Associated Charmstones by Sex and Age

Male 17+	9	Female 50+	1	Ind. 17+	2
Male <17	0	Female <50	0	Ind.<17	1

Wilson (n.d.) mentions that at CA-ALA-328, six perforated and three unperforated charmstones were associated with a female, Burial 42, together with the largest assemblage of grave goods in that mound. Wilson cites Davis (1959:27) who proposed that this person was a shaman and, given the depth of this burial, was probably one of the very early, if not the original, inhabitants of the site.

The function of these charmstones has long been topic for speculation among archaeologists. The common occurrence of battered ends and non-association with burials suggests a utilitarian or profane function instead of, or in addition to, a unique ritualistic or sacred function (Gerow and Force 1968:77, Bickel 1981:247, Rhode 1995:228).

At the Yukisma these artifacts were found primarily associated with burials. Those found in isolation or on the surface are probably from graves disturbed due to early plowing or urban development. Furthermore, these objects show careful workmanship and only a few of them exhibit evidence of battered wear. This pattern differs from other sites in the Bay Area, where the majority of charmstones were not found associated with burials. Wilson indicated that, considering CA-ALA-328 and CA-ALA-329 together, 85% of the charmstones were not associated with burials, and at CA-ALA-342, CA-ALA-12 and CA-ALA-13 none were associated. In general, Wilson stated that perforated charmstones found in earlier components were more often associated with burials than the unperforated types found in later components.

Rhode (1996:230) notes that the piled plummet tradition that "placed unique secondary nippling on the distal end of plummet charmstones," appeared at the time of transition from the Berkeley into the Augustine Pattern. The piled plummet complex extends throughout San Francisco Bay, Carquinez Straits, Suisun Bay, into the Delta and south into the San Joaquin Valley and Tulare Lake region, often "found at sites along major watercourses and particularly common in the Tulare Lake area." At ALA-328 only the squat plummet is present in the upper levels, while the piled plummet and plummet are absent, but at ALA-329 and at ALA-342 these types occur with great frequency in the Late components (Wilson n.d., Leventhal 1993).

Of the seven burials with more than one associated charmstone, four have a combination of the three types together. The other three burials have either squat or piled plummet only. This distribution suggests that the three types appear to be contemporaneous at this site.

Stone Pipes

Seven tubular stone pipes were recovered in association with seven burials (Figure C-22 through C-24, and C-64). Two different materials were utilized for their manufacture, sandstone and serpentinite. The latter was mistakenly identified in the past by many archaeologists as steatite (Bickel 1981:248). This material ranges in color from a light green, marbled appearance to a dark, almost black color. Five pipes are of very fine grained serpentinite, two light green and three black, and two are of sandstone (Table 4-29). Five of them are flanged on the narrow end, resembling a bottle neck. Specimen 167-7 has a contracting neck, and specimen 93-7 exhibits a general barrel shape, with only transversally grooved lines demarcating the neck area. In all cases the drilling was apparently made from both ends, with both a lengthwise and revolving motion. The small internal orifice coincides with the beginning of the neck region. Their length varies from 6.5 cm to 27 cm.

Table 4-29 Stone Pipe Attributes and Distribution

Burial	Sex	Age	Attributes
19	I	35-50	Serpentinite, bottleneck, "killed"
33	M	27-37	Sandstone, bottleneck, "killed"
82	M	31-40	Serpentinite, bottleneck-intact
93	F	45-55	Serpentinite, grooved neck, intact
97	M	18-23	Serpentinite, bottleneck, intact
167	M	18-24	serpentinite, contracting neck, "killed"
170	M	25-35	Sandstone, bottleneck, intact
Total			7

Stone pipes occur only in 3% (n = 7) of the total population, where five are associated with 5% of the males, and one is associated with one female. The one female with a stone pipe is also an elder (Burial 93). The remaining pipe was recovered from a grave with an elder individual of indeterminate sex. Infants and youths are absent from this sample, suggesting this object was acquired only by adults. Correlation of presence/absence of pipes was not statistically significant according to age or sex.

Five pipes were recovered from the mouth or chest of the individual. One was found on the torso next to the right hand (Burial 82), and another was placed next to the pelvic and foot region.

Three pipes, from Burials 19, 33, and 167, were probably "killed" at the time of interment; the remaining four were intact.

Stone Beads

Seven stone beads were recovered from three burials (53, 65, and 130) (Table 4-30) (Figure C-67). Burial 53, a double burial, possessed five magnesite beads strung together with type K *Olivella* beads. They were similar in size to the type K beads (diameter = 4.0 mm, thickness = 2.2 mm, $\text{diameter}_{\text{perforation}}$ = 1.7 mm), and were very uniform.

Table 4-30 Stone Beads by Burial

Burial	Sex	Age	Quantity	Material
53	M	30-35	5	Magnesite
65	I	25+	1	Steatite
130	M	18-25	1	Magnesite
Total	**3**		**7**	

Burial 130 was associated with only one bead. Although also magnesite, the bead was much larger (diameter = 8.1 mm, thickness = 2.4 mm, $\text{diameter}_{\text{perforation}}$ = 3.1 mm) than those of Burial 53, and its perforation is ovoid in shape and not centered. The shape and off-centering could be due to wear. In addition, its edges were much more rounded.

Burial 65 was associated with a single steatite bead of intermediate size (diameter = 5.6 mm, thickness = 2.4 mm, $\text{diameter}_{\text{perforation}}$ = 2.2 mm). It was morphologically very similar to the magnesite beads of Burial 53.

Goldschmidt (1976:151) cites Jordan (presumably an informant) on the value and preparation of magnesite (*tulul*) beads. It was commonly referred to as "Indian gold." It was mainly mined in the Lake County area. The value was enhanced by baking in ashes, which would cause all manner of color changes.

C. King (1978:62) stated that the use of magnesite beads began in Phase 2 of the Late Period. King also characterized the use of magnesite beads as "decorative"

(1978:60), rather than as "bead money." In this fashion they were used to validate individuals of high social status, and were involved in interactions in which there were lags between the exchange of goods, services, or beads (presumably as collateral).

4.2.1.2 Bone Artifacts

Awls

Thirty-four complete and fragmentary bone awls were recovered (Figure C-25, C-26). Thirty of these are grave associations found with twelve individuals, and four are isolates. Most of these tools appear to have been manufactured from the lower limbs of large mammals, although a few were identified as bird bones (nine specimens in Burial 42 are radii from *Chen* species). The majority exhibit a general luster or polish with longitudinal, angular, or transversal striations. Specimen 175-12A has asphaltum residue on the proximal end where a cord imprint is visible. Table 4-31 indicates the specimen characteristics and the classification according to the comparative typology developed by Gifford (1940), while Table 4-32 shows the distribution by burial.

Presence/absence tests of bone awls distribution indicate they are more commonly found with males (8%) than females (3%). With respect to age, adults are over-represented, while the youth category is not represented at all. One infant grave (Burial 156) contained one bone awl. However, no significant correlation was observed in their distribution by age or sex.

Table 4-31 Awl Attributes and Classification

Catalog	Gifford Type	Comment
35-2A	A1cII	Tip missing
35-2B	A1cII	Tip missing
35-2C	A1cII	Tip missing
42-2	A1c	Burnt
42-3	A4aI	nine specimens
45-1A	A1c	Proximal end
45-1B	A1c	High polish
80-1	A1aII	
84-14	A	Tip fragment
93-11L	A1c	Burnt
132-3A	A1aV	High polish
132-3B	A1aV	High polish
132-7A	A1aV	High polish
132-9A	A1c	Burnt
132-9B	A1c	Burnt
156-1	A	Tip fragment
163-1B	A1cII	Tip missing
163-1C	A1cII	tip missing
175-12A	A1f	Asphaltum
175-12B	A2	High polish
219-1	A	Burnt tip frag.
225-7	A	Tip fragment
250-124 *	A	Burnt tip frag.
250-155 *	A1c	
250-165 *	A	Tip fragment
39-2 *	A	Burnt fragments
Total	**34**	

When the quantity of these implements is considered, males are similarly distributed across all categories (breakpoints: 1, 2, 5), while only one female was in the "few" and one in the "some" categories. "Many" bone awls appear to occur only with elder males. Two other elders, one male, one female, have only one implement. The only infant in this sample possessed only one bone awl. Adults are over-represented in the "some" category and under-represented in the "few" category.

Table 4-32 Awl Distribution by Burial

Burial	Sex	Age	Specimens
35	F	25+	3
42	M	35-50	10
45	M	25-35	2
80	M	40-50	1
84	M	16-20	1
93	F	45-55	1
132	M	16-20	5
156	I	1-2	1
163	M	21+	2
175	M	25-35	2
219	M	25-30	1
225	I	17+	1
Total	**12**		**30**

Strigils

Three rib implements similar to Gifford's types E and F were found as grave associations (Figure C-28). They are thin and narrow and vary in length from 12 cm to 14 cm. Two of them are split, exposing the inner tissue on one side. All are ground down to a smooth and polished surface with rounded ends. Gifford (1940) suggested these tools function as sweat-scrapers. The bones utilized to manufacture these tools were from medium to large land mammals, but species identification was not possible. They are all associated with adult individuals, two are females, and one of indeterminate sex (Table 4-33).

Table 4-33 Strigil Distribution by Burial

Burial	Sex	Age	Specimens
63	F	25-40	1
67	F	18-21	1
225	I	17+	1
Total 3			**3**

Pins

One bone "pin" was associated with a male individual, age 25-35 (Figure C-27). This implement is 7 cm long, round in cross section, and has a "groove-encircled head" similar to the B8 type illustrated by Gifford (1940:207). The proximal end is missing, so the original form of this tool is not known. Although unidentifiable as to species, it is probably from a small or medium-size land mammal.

Serrated Bone

A total of 27 complete and fragmentary serrated tools were recovered (Figure C-29 through C-31). Twenty-one were directly associated with nine individual burials, and six were isolate finds. These artifacts fall into Gifford's (1940:172) H typology. One serrated rib (probably from deer), 18 cm long, exhibits rounded serrations on one side-blade. These serrations extend from about 2 cm from one end to about half the total length of the tool. The ends have been ground round. Use of polish is evident on the entire surface, and it was affected by fire. The remaining 26 are serrated scapulae. Most are from deer, and some are antelope and elk corresponding to type H1 in Gifford. These tools are characterized by one or two serrated edges and worn edge concavities (Table 4-34). All have the spine and acromion process ground down, and the axillary border removed. None of the elk scapulae (four specimens) retain the glenoid cavity and coracoid which is presumed to be used as a "handle" in the other specimens. Out of 21 scapulae, mostly complete, 13 have one serrated side, 12 on the axillary blade edge, and one on the coracoid border. Eight scapulae show wear on both sides, seven have one serrated side and the other exhibits worn concave edges; only one has both sides serrated.

Twenty-one scapulae were sided; of these, 17 are right side and four are left. All specimens with wear on both sides are right scapulae. The four elk specimens are also from the right side.

Tests on presence/absence of serrated tools indicate they distribute almost proportionally equally among males (5%) and females (6%). The majority of the burials are of adult individuals, and only two are of elders, both females. No significant correlation by sex or age was found.

Table 4-34 Distribution of Serrated Bone Tools by Burial

Catalog	Sex	Age	Side	Serrations	Comments
5-9	F	25	R	A.B.	polish wear
29-2	M	25-40	?	?	fragment
54-3	F	34-50	R	A.B.	wear both sides
67-2	F	18-21	R	A.B.	wear both sides
93-11A	F	45-55	L	A.B.	burnt
93-11C			R	A.B.	burnt
93-11D			R	A.B.	burnt
93-11E			?	?	burnt
93-11F			R	A.C.	wear both sides, burnt
93-11G			L	No	burnt
93-11H			R	A.B.	burnt
93-11I/J			R	A.B.	wear both sides, burnt
93-11K			L	A.B.	wear both sides, burnt
93-11M					rib, burnt
147-3A		31-40	R	Both	fragmentary
147-3B			R	A.B.	
147-3C			L	A.C.	
163-1A	M	21+	R	A.B.	burnt
176-13	M	25-30	R	A.B.	wear both sides
231-4A	M	30-40	R	A.B.	no handle
231-4B			R	A.B.	no handle
250-38 *			?	?	fragment
250-164 *			?	?	fragment
250-167A *			R	A.B.	burnt, no handle
250-167B *			R	A.B.	burnt, no handle
250-205A *			R	A.B.	burnt
250-205B *			?	?	burnt
Total	**27**				

* - isolates
A.B. - serration on axillary blade
A.C. - serration on coracoid border
? - unknown

Similarly, no age or sex correlation was observed when the sample frequency category (breakpoints: 1, 2, 4) distributions were analyzed. In this case, males and females are equally likely to have "few," while only adult males were associated with "some." The only burial containing "many" implements was that of an elder female (Burial 93). The other elder in the sample was that of a female with only one serrated tool.

Wedges

Three antler wedges were recovered associated with three graves, two adult males (Burials 50 and 53) and one adult individual of indeterminate sex (Burial 83). These implements range from 11 cm to 25 cm in length and have rounded and sharp edges on the distal ends (Figure C-32). Gifford describes similar tools in his type HH. Ethnological accounts attribute to them the function of wood splitters.

Gouges and Smoothers

A split elk left tibia with a complete proximal end and rounded distal working edge was found with Burial 93, an elder female (Figure C-32). The utilized edge is sharp and shows transversal and longitudinal striations as well as a polished surface toward the tip. This tool is closest to Gifford's type C4.

Needles

Three needles were recovered from two burials, a male and a female adult (Burial 179, 2 specimens and Burial 187, 1 specimen) (Figure C-27). All specimens conform to Gifford's type P classification. These implements are biconically drilled at one end, and are pointed at the other end. Specimen 187-5 is classed within Gifford's type P3a. The two remaining specimens (179-3A, B) are formed from the splints that are a portion of the metacarpal bone of deer. Elsasser and Heizer (1966:51) speculated that these were not very effective needles; instead they were probably used as pendants for necklaces. Similar artifacts were recovered from CA-SLO-175 in a row in the neck area of Burial 2, as if they were strung together (Jones and Waugh 1995:105), and from Burial 5, an adult male, at CA-ALA-329 (Leventhal 1993).

Pendants

This category is represented by 16 complete and fragmentary pendants associated with three burials (Figure C-34). These specimens are fashioned from elk ribs, between 20 and 35 cm long, biconically drilled or grooved at one end and rounded at the other end. No similar artifacts are included in Gifford's classification of pendants, given as type Q.

The pendants associated with Burial 230 are very polished and darkened, probably by heat treatment. One specimen (230-1A) is incised on two of its flat faces. These incisions run diagonally in groups of three in a "V" pattern. On one face this pattern changes to a number of parallel lines; on the other face the pattern trails off due to wear.

Bone pendants were included with two adult females and one adult individual of indeterminate sex (Table 4-35).

Table 4-35 Distribution of Bone Pendants by Burial

Burial	Sex	Age	Specimens
63	F	25-40	9
185	I	25+	1
230	F	31-40	6
Total **3**			**16**

Bull-roarers

One possible bull-roarer was associated with the burial of a young female (Burial 227) of an approximate age of 15-19 years (Figure C-33). This artifact, 21 cm long, was purposely hollowed and exhibits an open orifice, approximately 2 cm in diameter, at one end. A groove forms a neck on the end opposite the opening, where a string was probably attached. In this manner, the artifact may have been swung to make sound. This tool was probably made from a sea mammal bone, but to date it has not been positively identified as such (Leventhal personal communication 1996).

Bipointed Objects

One bipointed tool was recovered from Burial 97, a male of 18-23 years of age. This artifact (97-3) is 11.8 cm long, circular in transverse section at one end, and flattened at the other end (conforming to type T1c in Gifford) (Figure C-27). Its surface is polished, probably due to wear.

Beads and Tubes

Undecorated Beads

Sixteen undecorated, unidentified bird bone tubes, ranging in length between 2.5 cm and 3.6 cm, were found with an adult male (Burial 182). Their lengths form a uniform series from shortest to longest (Figure C-35). Grooves at each end appear to have been made to cut beads. Gifford describes similar tools in his EE1a type as beads for stringing.

Decorated Tubes

One decorated bird bone tube interred with an adult male (Burial 52) was found on the right side of the cranium. This tool, of unidentified species, is covered with incised geometric designs with crosshatched triangles (Figure C-35). Traces of asphaltum are visible around the circumference toward one end. Gifford's EE2b illustrates similar artifacts. Several possible functions have been suggested for this type of implement: as personal decoration, ear sticks, nose sticks, for games, or drinking tubes.

Undecorated Tubes

A number of bird bone tubes were found with one or both ends intentionally severed and some evidence of polish. These specimens may have been intended for the manufacture of whistles. They were fashioned from crane (*Grus sp.*), swan (*Cygnus sp.*), and goose (*Chen sp.*) tibiae, ulnae, and radii.

Thirty-nine complete and fragmentary tubes were recovered from seven graves. Only the minimum number of discernible elements are included in this count. Very fragmented specimens are indicated with a "+" (Table 4-36) and not included in the total count. Out of the thirty-seven identified specimens, crane was more common (76%) than swan (22%) and goose (3%). The majority of the tubes are from tibiae (67%). Ulnae (24%), and radii (8%) are much less common. Almost equal numbers of specimens are from the right and left side.

Table 4-36 Distribution of Bone Tubes by Burial

Burial	**Sex**	**Age**	**Specimens**
42	M	35-50	11+
49	M	21-35	2
63	F	25-40	2
75	I	13-15	1
93	F	45-55	2
103	F	45-55	3+
134	I	15-19	18+
Total	**7**		**39+**

Table 4-37 Distribution of Undecorated tubes by Element and Species

	Cygnus	***Grus***	***Chen***	**Row Total**
Ulnae	2R, 2L	1R, 3L	1R	9
Tibiae	2R, 1L	10R, 10L, 2?		25
Radii	1?	2?		3
Total	8	28	1	37

The occurrence of bone tubes is limited to seven burials (3% of the total population), making this a very small sample for reliable testing. Cross-tabulations of presence/absence of bone tubes indicate no deviation from the expected values, denoting no correlation with age or sex, where males and females are equally likely to have them, and are almost randomly distributed among all ages (except infants).

If the actual number of specimens is considered, then males are equally likely to have one or many, while females only have "some" (breakpoints: 1, 2, 4). Only one individual in the youth category had one specimen (Burial 75), two elder females (Burials 93 and 103) had "some," and two individuals (one male and one of indeterminate sex) had "many." Similarly, there is no significant correlation with age (Table 4-36). The largest number of specimens was associated with a young adult of indeterminate sex (Burial 134).

Whistles

This group is the most frequently found artifact associated with burials at this site after *Olivella* beads and *Haliotis* ornaments. An approximate minimum number of 129+ complete and fragmentary whistles was associated with 16 burials (7%).

These artifacts are exclusively made from bird bone ulnae with both ends severed and a single cut perforation into the shaft, corresponding to Gifford's type FF2. Species identification was possible for 88 (68%) whistles. They are distributed as follows: 17 (19%) crane (*Grus sp.*), 2 (2%)

sandhill crane (*Grus canadensis*), 45 (51%) swan (*Cygnus sp.*), 9 (10%) whistling swan (*Cygnus colombianus*), 10 (11%) pelican (*Pelecanus sp.*), 1 (1%) brown pelican (*Pelecanus occidentalis*), and 4 (5%) great blue heron (*Ardea herodius*). Swans are the most commonly utilized species for the manufacture of whistles. Siding was possible on 70% of the speciated whistles, yielding an equal number of right and left ulnae represented in the collection.

They range in length from 8 cm to 23 cm. The hole is more commonly placed one third of the length from the proximal end, although they also occur in the middle. The placement of the orifice in the middle of the tool seems to be somewhat related to length, since this occurs in the majority of the short whistles (between 8-15 cm). It has been suggested that the positioning of the hole is determined by the location of the nutrient foramen (Morejohn and Galloway 1983). In this population of whistles the majority of complete specimens did not have a visible foramen; thus 10% of these have the foramen apart from the sound orifice.

A few whistles preserve some form of decoration. Four specimens associated with Burial 90 have asphaltum and a row of shell pieces around the shaft below the orifice, and another row near the distal end (Figure C-37). Burial 105 had two decorated whistles with asphaltum and three rows of M series *Olivella* beads (Figure C-37). One whistle from Burial 93 exhibits traces of asphaltum. Cordage impressions are visible in traces of asphaltum on two whistles from Burial 164, and two from Burial 166. Many specimens retain their asphaltum stops and plugs near the orifice and distal ends.

The occurrence (presence/absence) of whistles as grave associations is more common with males (10%) than females (6%). Although no significant correlation is observed with sex, there is a slight dependency according to age (P = 0.15980). Only adults and elders have whistles, where adults are over-represented (Table 4-38).

Table 4-38 Distribution of Bone Whistles by Burial

Burial	Sex	Age	Specimens
33	M	27-37	15
62	F	17-21	5+
63	F	25-40	1
67	F	18-21	1
90	F	20-25	15
93	F	45-55	3
94	M	25-35	14+
97	M	18-23	3
105	M	35-45	2
134	I	15-19	12+
162	M	25-35	1
164	M	35-45	4+
166	M	15-23	2
182	M	25-35	18+
224	M	21-26	10+
225	I	17+	9+
Total	**16**		**129+**

The number of bone whistles included with each individual in the sample does not significantly correlate with age or sex. Males and females are similarly likely to have "few" whistles, while males are more likely to be associated with "some" or "many" (breakpoints: 1, 5, 13). Burial 90 was the only female adult with fourteen + bird bone whistles.

4.2.1.3 Shell Artifacts

Beads

Spire Lopped (Type A)

A total of 14,209 spire lopped beads was recovered from CA-SCL-38. Of these only 23 were isolate finds; the remainder (14,186) were associated with 82 burials (34% of all burials). These are classified as type A and described by Bennyhoff and Hughes (1987) as almost complete shell with the spire removed or ground down. Further subdivision according to size following their criteria and characteristics resulted in the following types: A1, Simple Spire Lopped (a, small; b, medium; c, large), A4, Punched Spire Lopped, A5, Appliqué Spire Lopped, and a category not included in Bennyhoff and Hughes (Spire-Lopped with Cut Sections). These last beads are not commonly found in a burial context. They have been found elsewhere in non-burial settings (Hartzell, 1991).

Simple Spire-Lopped (A1): A total of 13,049 of these beads was recovered, associated with 81 burials. Table 4-39 indicates the breakdown according to size. They represent

92% of the total spire-lopped beads recovered. According to Bennyhoff and Hughes, in Central California they can occur in any period.

Punched Spire-Lopped (A4): Punched beads present difficulties in distinguishing between the holes that are man made, caused by accidental breakage, or by borings of predatory marine mollusks. In this population the perforations appear predominantly on the same area of the body whorl on an otherwise well preserved or mostly intact bead. A total of 551 (4%) A4 type beads was identified co-cccurring with A1 types in 44 burials. Their temporal significance is uncertain.

Appliqué Spire-Lopped (A5): This type, in addition to spire removal, exhibits an aperture side ground flat at an angle diagonal to the shell axis. A few examples of this type were recovered, six large spire-lopped beads in Burial 176, and 102 medium beads in three burials (Burial 162, 17 beads; 163 ,35 beads; and 164, 50 beads). None of the small variety present this characteristic. In the San Joaquin Valley and the Delta this type occurs during the Protohistoric to Historic Period.

Spire-Lopped with Cut Sections (no type): A total of 478 complete and fragmentary beads in 45 burials show areas of the outer lip and body whorl cut off in straight lines, possibly for the manufacture of type M beads. This pattern occurs with equal frequency among the three sizes. This finding shows that type M beads were manufactured from a slightly different area of the shell than that illustrated by Bennyhoff and Hughes (1987:89, Fig 1). The presence of these beads at the site suggests local manufacture in addition to procurement by trade.

Table 4-39 Associated Type A Bead Types and Sizes

Type	**Small**	**Medium**	**Large**	**Total**
A1	3779 (90%)	8021 (93%)	1249 (92%)	13049 (92%)
A4	217 (5%)	275 (3%)	59 (4%)	551 (4%)
A5	0 (0%)	102 (1%)	6 (1%)	108 (1%)
A?	188 (5%)	243 (3%)	47 (3%)	478 (3%)
Total	4184	8641	1361	14186

Distribution of all Spire-Lopped beads according to age and sex shows statistical significance at various levels of testing. Initially, when presence is considered, the number of males with beads is higher than expected, and the number of females is slightly less than expected. In this case, the deviation is not statistically significant. On the other hand, presence/absence with respect to age indicates a slightly higher correlation, with a $P(\chi^2, df)$ of 0.09500 (at 90% level of confidence). In this case all ages are represented; however, adults are over-represented at the expense of elders and youths.

In the breakdown of the sex vs. frequency categories (breakpoints: 1, 200, 500) females are over-represented for the "few" category, and males are correspondingly over-represented in the "many" category. Burial 37 is the only female adult with "many" spire-lopped beads. Distribution of beads by age indicates all age groups have a similar probability of being interred with "few" beads. In the "some" category all ages are also represented; however, there is an over-representation of elders and an under-representation of adults in this category. All elders with "some" beads are males. Burial 156 is the only infant in the "some" category. "Many" beads occur mainly with adult males (Burial 37 is the only female in this category). Burial 164 is the only elder male with "many" beads. Infants and youths were not found associated with "many" beads. Measures of association of number of spire-lopped beads by age and sex were not statistically significant.

Callus Beads (Type K)

A total of 2,264 type K beads was interred with 7 (3%) burials (Table 4-40) (Figure C-66). Sixty percent of these correspond to the K2 or bushing type, 20% fall into the K1 or cupped class, and the remaining 20% did not fall into any of the types. Further analysis of the unclassified beads shows that they do not present any strong similarity, which could have indicated a new type, but were rather slight variants of the other classes. This distribution points to the normal variation in their manufacture. These results were roughly common to all burials with presence of round beads.

Table 4-40 Type K Beads by Burial

Burial	Sex	Age	Quantity
13	M	30-45	568
50	M	18-21	8
52	M	18-23	1
53	M	30-35	1224
65	I	25+	356
80	M	40-50	92
167	M	18-24	15
Total	**7**		**2264**

It is the preliminary opinion of Milliken (personal communication 1996), who inspected the bead samples and had access to the metric data, that the type K beads are K2, with differences due to manufacturing or to material variations. This variation occurs within bead samples recovered from individual burials, and so any differences are probably not due to temporal variations. Further statistical analysis to discriminate different types is necessary.

The inclusion of type K beads was statistically dependent on the sex of the individual (P = 0.04588). No sexed female graves contain type K beads, although one was indeterminate (Burial 65). Even though there is no statistical correlation with respect to age, infants and youths are not represented, and only one elder (Burial 80) possesses these beads.

In addition, adults are equally likely to be associated with any amount, either "few," "some," or "many" (breakpoints: 1, 50, 1000). The only elder with such beads (Burial 80) was associated with "some" (n = 92).

Thick Rectangle (Type L)

These are rectangular to square beads with central perforation. All the type L beads found were of the L2b subtype described by Bennyhoff and Hughes as:

> *Small Thick Rectangle L2*
> *Rectangular to square bead, less than 10.1 mm long, with central perforation...non-shelved variants (L2b)...*
> *Size: Length 5.0-10.1 (x=7.0);width 4.0-9.0(x=5.0); perforation diameter 1.5-2.5 (x=2.0).*

A total of 2,749 beads associated with three burials (Burials 166, 178, and 179) were visually determined to be consistently larger than the majority of the rectangular beads recovered from the overall burial complex (Figure C-65). Burial 179 contained the largest sample of these type of beads (n = 2,065). Application of the SPSS classification procedure to the samples resulted in some type L beads, and a large percentage of beads that did not conform to the attributes for L or M types defined by Bennyhoff and Hughes. Only 37% of the sample was initially classified. Although the length and width satisfied the conditions, the perforation diameters were too small to be type Ls and too large to be M types. The curvature parameter previously explained in Section 3 Methodology (p. 50) was used to attempt to place these beads into a type. In sampling from the beads that were retained from re-interment, it was found that 75% of type M beads had a curvature parameter less than 0.3, while L types all have a curvature parameter greater than 0.3. This attribute would seem to be a more reliable discriminant than the perforation diameter alone.

Radiocarbon dates of 4230 ± 200, 880 ± 280, and 1710 ± 200 B.P. were obtained for Burials 166, 178, and 179 respectively. The temporal assignment by Bennyhoff and Hughes for this type ranges from 1700 B.C. to 500 B.C., which is not in agreement with the obtained dating. The temporal manifestation of this bead type at CA-SCL-38 and their anomalous characteristics may represent a transitional stage between type L and type M beads. These results are preliminary in nature; refinement of the classificatory system and its significance needs further development.

Milliken (personal communication) hypothesized that the Santa Clara Valley could be the origin of the M types and that these L types and others that he has observed at Tamien Station (CA-SCL-690) could be their predecessors.

Thin Rectangle (Type M)

Bennyhoff and Hughes (1987) describe the type M beads as:

> *"Thin, rectangular, square, or trapezoidal wall beads with central or end perforations, usually drilled conically from the interior with exterior retouch. ...Type M1 is distinguished from the ancestral type F3 by sharper corners and a progressive shift from square to a rectangular shape. Analysis to date indicates that placement of the perforation (end versus central) is the most important temporal marker for Class M."*

Type M is subdivided into two main groups: M1, called sequins, which are centrally perforated; and M2, denominated pendants, which are end perforated. These two categories are further subdivided according to shape into: a, normal; b, rhomboid; c, narrow; and d, wide (although they were not used in this study).

At Yukisma, 11,025 type M beads were found in association with 22 burials, and 6 were recovered unassociated (Figure C-65).

As mentioned above, the placement of the perforation is temporally significant. Bennyhoff (1983) determined three sub-phases of Phase 1 of the Late Period, based on seriating the *Olivella* Thin Rectangles beads from CA-CCO-138 according to depth. He found that centrally-perforated beads (M1) were at the deepest levels, and pendants (M2) were in the shallowest graves, while graves that were at intermediate depth had a combination of M1 and M2 beads.

A preliminary attempt to classify these beads at CA-SCL-38 into types M1 and M2 was made based on Bennyhoff's results. Not all the beads fell into one or the other category, as explained in the Methodology, and remained unclassified. In Table 4-41 percentages of each subtype per burial are shown. These were obtained from measurements performed on a 10% sample of each grave bead lot (or 5% if the total was larger than 1,500 beads). For statistical purposes graves with fewer than 10 beads were not included.

Table 4-41 M1/M2 Bead breakdown by Burial

Burial	% of M1	% of M2	Total Beads
13	77	23	17
50	77	7	838
51	0	100	1042
69	88	6	3085
84	95	0	790
87	0	100	323
88	88	8	788
93	90	0	458
94	61	25	752
97	100	0	1022
105	95	5	784
168	90	6	1021

Distribution of L and M Beads

A fraction (10%) of all burials (n = 25) was associated with type L and type M *Olivella* beads. For the following analysis both these types were aggregated. Males are more likely to have them (17% of all males) than females (8% of all females). Chi-square analysis points to a correlation between presence/absence and sex ($P = 0.09217$), where males are over-represented and females are under-represented. Distribution by age indicates similarity between adults and elders, while the youth group contains only two cases, and infants are not represented. A high χ^2 value suggests the occurrence of beads is not correlated with age.

When the variable is broken down according to frequency, including only individuals with beads, females are more commonly found with "few," and males are more likely to be found with "some" or "many" (breakpoints: 1, 500, 1500). Burial 93, an elder, is the only female with "few" beads; the remainder are males. Pearson's R value of 0.41380 ($P = 0.12431$), and additional tests, Kendall's τ_b and τ_c, yielded values of 0.41400 and 0.37190 respectively denoting the strength of the sex correlation.

Occurrence of beads with age is not statistically significant. Adults and elders are equally likely to have 1,000 or less beads; however, only two elders, both males, have more than 1,000 beads. Burial 69, an elder male, possesses the largest number of rectangular beads ($n = 3,085$). Infants are not represented in the sample, and only two youth individuals (Burials 169 and 178, both under six years of age) have less than 1,000 beads.

Pendants

Haliotis Shell Pendants

Approximately 575 complete and fragmentary *Haliotis* pendants were recovered (Figure C-39 through C-47), mostly as grave associations with 60 burials (only 3 were isolates). Table 4-42 describes their distribution by burial.

Table 4-42 Distribution of Pendants by Burial

Burial	Sex	Age	Complete	Fragments	Minimum Number
3	I	8-10	1		1
13	M	30-45	2	1	3
21	I	18+	1		1
40	I	adult		1	1
43	F	35-55	1	2	3
50	M	18-21	2	1	3
51	M	30-40	4	4+	4
52	M	18-23	21	+	21
53	M	30-35	14	32	35
58	I	16-21	15	30	30
63	F	25-40	3	5+	8
64	M	21-29	35	+	35
65	I	25+	1	3+	4
67	F	18-21		+	1
71	M	17-20	8	19+	27
73	M	18-21		2	2
76	M	40-50	6	1+	6
78	F	40-50		1	1
81	F	35-50	8	1+	9
84	M	16-20	39	54+	83
86	M	35-50	20	3+	23
87	M	35-50	1		1
88	M	21-35	11	4+	14
93	F	45-55	7	6+	12
94	M	25-35	2		2
95	M	15-17	4	3+	7
97	M	18-23	2		2
98	F	18-22	1		1
99	F	25-35	1		1
100	I	25+	2		2
105	M	35-45	7	7+	13

116	F	23-30	2	2+	4
125	F	45+		2+	2
130	M	18-25	4	3	7
132	M	16-20	4	2+	6
133	I	13-18	3	5+	6
134	I	15-19	1	+	1
137	I	3-4	1	5	5
139	I	21-30	2	7+	7
140	M	31-40		1+	1
147	M	31-40	4	3	7
148	M	30-40	2	+	2
156	I	1-2	6	8+	12
159	I	4-5		3+	3
162	M	25-35	1		1
163	M	21+	25	23+	26
164	M	35-45	13	+	13
168	M	18-23	1		1
171	M	34-45	36	15+	46
175	M	25-35	26	8	34
178	I	2-4	1		1
189	F	35-50	3		3
194	M	25-35		+	1
198	M	30-50		+	1
219	M	25-30	1		1
221	F	25-35		3+	3
225	I	17+	3		3
230	F	31-40	2		2
232	F	35-50	4		4
250 *			1	1	2

(*) isolates

Little significance was seen in age and sex distribution of presence/absence of pendants. Males are slightly over-represented (32%) with respect to females (22%). Although adults are more likely to be interred with these ornaments, all four age groups are represented. Burial 156 is the only infant in the population with pendants. Youth and elder categories are under-represented.

Statistical tests based on the three frequency categories (breakpoints: 1, 6, 30) indicate a gender dependency at a 90% level of confidence (P = 0.06175). Contingency tables imply females are more likely to be associated with "few" pendants, while males are more commonly found with "some" and "many" ornaments. Females are absent from the "many" category. Age distribution, on the other hand, is not significantly correlated. Infant and youth groups are represented, but in no case were they interred with "many" pendants. Elders are over-represented in the "some" category, and more adults than expected have "many." Burial 171 is the only elder male that was found with "many" pendants. Female elders, on the other hand, were more commonly buried with "few" or "some."

Variation of pendant shape within a burial seems to be limited to a maximum of three types. Only three burials, all males, one elder and two adults, contained a combination of three different shapes. Burial 64 was interred with circular, trapezoidal and banjo pendants; Burial 86 and Burial 171 were found with rectangular, circular, and trapezoidal ornaments. Burial 84, a young male, was recovered with the largest quantity of pendants (n = 83), all rectangular.

For descriptive purposes, *Haliotis* pendants were further divided according to shape into the following categories:

Rectangular Pendants: (Gifford S or Z type) This group is the most numerous in the ornament assemblage (Figure C-39). A total of 345 (61%) was found with 44 (73% of all burials with pendants) burials. They range in size from 1.5 cm to 6.5 cm long and from .3 cm to 4.5 cm wide. The most common forms are those with a single perforation or two perforations on opposite edges. Only one specimen (95-9) exhibits two holes next to each other close to one edge. Edge incising in the form of short lines parallel or perpendicular to the edge, "v" shaped lines, and crosshatching, occurs on 66% of these pendants. The remainder are plain-edged. Burials 53, a double interment, 58, and 71 contained more than 25 rectangular pendants within their graves. Burial 84 was associated with 83 of these pendants.

Cross-tabulations of presence/absence with respect to sex indicate an equal distribution between males and females. Similarly, with respect to age, all four age groups are represented; however, rectangular pendants are more likely to be found with adults. Only one infant, Burial 156, was interred with 11 rectangular pendants.

When the sample of burials with pendants was further subdivided according to amount (breakpoints: 1, 7, and 20), the following pattern emerges: females are more often associated with "few" pendants, while only males have "many" pendants. More elders than expected, were buried with "some" pendants, while only adults have "many" pendants (one of indeterminate sex, Burial 58, and three males).

Presence/absence of pendants is not statistically correlated with respect to sex. The other parameters were also not significantly correlated.

Circular Pendants: (Gifford type K) A total of 100 (17%) pendants was recovered (Figure C-41), associated with 11 (18% of all burials with pendants) burials. Their diameters range from 2.5 cm to 8 cm. Perforations are located in the periphery and can be single or double, close together or opposing each other. Parallel or perpendicular edge incising is the most common form of decoration, and is found on 87 (87%) ornaments. Nine of these pendants are incised with a pattern of "v" shaped lines. Burials 171 and 175 had more than 30 round pendants. Burial 171 yielded a radiocarbon reading of 340 ± 300 B.P.

Cross-tabulations with respect to presence/absence indicates an over-representation of males (9%), while only one female (2%) is associated with this type of pendant. A $P(\chi^2, df)$ of 0.05218 indicates a correlation with respect to sex (close to 95% level of confidence). Distribution with respect to age points to restriction to adult and elder individuals, where elders are over-represented. However, they are not statistically correlated.

The amount category of pendants with respect to sex is not significantly correlated (breakpoints: 1, 10, 30). Males are likely to be buried with any amount, while the only female represented had two circular pendants (Burial 232). A $P(\chi^2, df)$ of 0.09110 denotes a correlation, at a 90% level of confidence, of circular pendant distribution with respect to age. Adults are over-represented in the "few" category, while elders are over-represented in the "some" category. One adult (Burial 175), and one elder (Burial 171) have "many" circular pendants (Kendall's τ_b and τ_c values of 0.50518 and 0.56000; and Pearson's R value of 0.49099).

Semi-circular Pendants: (Gifford AB type) One specimen resembling a split disk (Figure C-40) was the only *Haliotis* ornament associated with Burial 87, an adult male. This item bore a single perforation near the middle of the straight side, and was incised with lines perpendicular to the edge.

Trapezoidal Pendants: (Gifford Q and AA types) A total of 93 (16%) trapezoidal pendants (Figure C-42, C-43) was found with 8 (13%) individuals. These ornaments exhibit great variation in shape and size. Most are singly perforated, thus few present two holes on opposite edges. Of these specimens, 70% display incised edges, most with lines perpendicular to the edge, but some with a "v" shaped or oblique design.

Presence/absence of trapezoidal pendants distribution indicates a correlation with sex (P = 0.03052). This type is only associated with males (7% of the total male population). Age distribution, although not statistically significant, indicates an over-representation in the adult category. Only one infant (Burial 156) and one elder (Burial 171), in both cases associated with one pendant each, represent those categories.

When the frequency of pendants is considered (breakpoints: 1, 2, 20), males are represented in the three categories. Similarly, adults are equally likely to have any amount, while the only infant and elder in the sample have "few." Neither age nor sex were statistically correlated with the quantity of trapezoidal pendants.

A radiocarbon date of 440 ± 230 B.P. was obtained from Burial 64, an adult male found with 29 pendants.

Banjo Pendants: (Gifford N type) This type of ornament has taken its name from its resemblance to the musical instrument (Gifford 1947:20) (Figure C-44, C-45, C-68). They are also known as effigy pendants because of anthropomorphic or zoomorphic characteristics. It is believed that they were related to the Kuksu cult in Central California where this ornament represented the dancer with its headpiece, from here also the "big-head" connotation (Gifford 1947). Leventhal (1993) describes their geographical distribution as extending from San Jose in the south to a few miles north of Knight's Landing in Colusa County, and east from San Francisco Bay to Sacramento. The banjo pendants' geographical distribution suggests inter-tribe interaction that connects a wide range of ethnographic tribal groups, cross-cutting linguistic boundaries. Gibson and Fenenga (1978) quote Bennyhoff as describing these ornaments as temporally diagnostic of Phase 1 and early Phase 2 of the Late Horizon. Gibson and Fenenga developed a scheme of effigy ornament evolution by comparing available data from selected Central California sites. According to this evolution, its morphology changes from an emphasis on zoomorphic forms to an emphasis on anthropomorphic forms.

At CA-SCL-38 20 (4%) banjo pendants were recovered, associated with 7 (12%) burials (5 adult males, 1 adult female, and 1 adult of indeterminate sex). The break-down according to Gifford's typology is as follows:

Table 4-43 Distribution of Banjo Pendants by Burial

Burial	Sex	# spec/condition	Gifford Type
51	M	1 fragment	?
		1 fragment	N4aI?
64	M	1 complete	N1aII
		1 end missing	?
		1 end missing	N1aII?
		1 end missing	N1aIII?
		1 complete	no equivalent
65	I	1 fragment	N1bI
		1 fragment	N1bII
		1 fragment	?
		1 fragment	N1aI
71	M	1 complete	N6aII
		1 complete	N6bIII
164	M	2 complete	N1aIII
		2 complete	N1bII
189	F	2 complete	N4aI
219	M	1 complete	N2aI

Half of these pendants display edge incising; two display "v" shaped lines, while the rest have lines perpendicular to the edge. Perforations are mostly single, placed on the "head" or broadest area of the pendant. Only five of them bore two perforations, one on the "head," and an additional one at the narrow end.

The distribution of presence/absence of banjo pendants was not significantly correlated with age or sex. However, cross-tabulations suggest an over-representation of males associated with these pendants; only one female grave (Burial 189) contains two pendants. Distribution according to age denotes these objects were only discovered with adults and elders, where adults are over-represented.

The frequency of banjo pendants within a grave was also not significantly correlated to age or sex. Nevertheless, males and adults tend to be represented in all three categories (breakpoints: 1, 2, 3). Two male adults and the only female (an elder) in the sample are in the "some" category. Two males, one adult (Burial 64) and one elder (Burial 164), and an individual of indeterminate sex (Burial 65) contained "many" banjo pendants.

The temporal significance of these artifacts will be discussed in a later section (4.3.3 Analysis of Temporally Sensitive Artifacts).

Crescent Pendants: (Gifford AP type) Seven crescent pendants (Figure C-46) were associated with 4 (6%) burials (Burials 21, 63, 132, and 230), and one fragment was an isolate. Gifford described them as being manufactured from the flat curved rim of the shell by cutting away all traces of the main whorl. Five ornaments have one broad proximal end and a distal end that tapers to a point. Three of these are singly perforated at the broad end (specimens 21-12, 63-8I, and 230-5A), and two (specimens 132-5C and 132-5D) are not perforated. Specimen 63-8G has two broad ends with what appear to be two perforations in the center. This group does not exhibit any other type of decoration.

Their sex distribution, two females, one male and one indeterminate, all adults, does not indicate a strong gender preference. Only two pendants of this type occur per grave except in Burial 21 with only one.

Radiocarbon dates for samples from Burials 21, 63 and 230 yielded 860 ± 150 B.P., 1160 ± 150 B.P., and 1210 ± 120 B.P., respectively. According to the chronological sequence proposed for Central California (Milliken and Bennyhoff 1993:386), these dates fall into the Middle/Late Period Transition.

Triangular pendants: (Gifford U type) Four triangular pendants are included in 4 (5%) burials. Three are complete (Burials 3, 13, and 73) and one is fragmentary (Burial 125). All of these have plain edges, with no decoration. They all bear one perforation on the edge opposite to the point. Two specimens were associated with two adult males, another was included with a female 45+ years of age, and the remaining was associated with a child 8-10 years old.

Clam Shell Pendants

A total of 20 clam shell pendants (Figure C-47) were found associated with 3 adult male burials (Burials 163, 168, and 224). These items are half valves, uncut and undecorated, although polished. A single perforation was placed at one end. Burial 168 contained 17 (85%) pendants placed around his feet. A Napa obsidian point found with this person yielded a hydration reading of 2.2 microns. Based on Origer's conversion formula which calculates calendar years upon hydration rim values, this reading indicates an approximate date of 740 B.P.

4.2.1.4 Artifact Summary

Table 4-44 summarizes and compares the result of the analysis of significant relationships between artifact distribution and the primary indicators of mortuary differentiation, age and sex. The two outcomes derive from two separate statistical runs, initially with a binary variable of presence/absence of the artifact (Age/Sex vs. Presence), and secondly discriminating according to the number ("few," "some," and "many") of that particular artifact (Age/Sex vs. Amount). The frequency of cases utilized is different for each column. In the "Age vs. Presence" column the entire sample (n = 244) is computed, whereas in the "Age vs. Amount" column, the cases that do not have that artifact are excluded. For "Sex vs. Presence" cases of indeterminate sex are also excluded, whereas in "Sex vs. Amount" cases of indeterminate sex and cases that do not have that artifact are excluded.

All $P(\chi^2, df)$ values significant at the 95% level of confidence, are shown in **bold**. Those significant at the 90% confidence level are in *italics*.

In only two cases was a correlation found at the 95% level of confidence. Both correlations were with respect to sex, type K beads and trapezoidal *Haliotis* pendants, and both artifacts occur only with males. Based on the higher number of correlations for sex than for age, both at the 95% (2 and none) and 90% (4 and 3) levels of confidence, it seems that the sex of an individual is a better predictor of artifact ownership than age.

Table 4-44 Artifact Distribution Significance by Age and Sex

Artifact	Age vs. Presence	Age vs. Amount	Sex vs. Presence	Sex vs. Amount
Flaked Informal Tools	0.98985	0.89739	0.34686	0.67271
Obsidian Tools	0.29605	n/a	0.15817	n/a
Mortars	0.55473	n/a	0.47319	n/a
Pestles	0.36490	*0.07968*	0.35069	0.51042
Charmstones	0.19259	0.31644	*0.05218*	0.27354
Stone Pipes	0.69318	n/a	0.25271	n/a
A Beads	*0.09500*	0.68085	0.12076	0.21316
M Beads	0.63927	0.32607	*0.09217*	0.12431
K Beads	0.43162	0.45943	**0.04588**	n/a
Pendants	0.27371	0.62386	0.15915	*0.06175*
Banjo Pendants	0.69318	0.79189	0.25271	0.54881
Rectangular Pendants	0.51263	0.18970	0.96116	0.29242
Circular Pendants	0.52317	*0.09110*	*0.05218*	0.43460
Trapezoidal Pendants	0.26335	0.61506	**0.03052**	n/a
Bone Awls	0.46173	0.17012	0.20312	0.85535
Bone Serrated Tools	0.49752	0.12378	0.73169	0.60049
Bone Tubes	0.88807	0.40601	0.57446	0.22313
Bone Whistles	0.15980	0.23790	0.40183	0.62709

In addition, the several artifacts that do evidence some type of correlation with, or restriction with respect to, age and sex could indicate the marker nature of the artifact. These artifacts may be markers of status, of authority, or both. In particular, two artifact types are restricted to males (type K beads and trapezoidal pendants), and another four types (charmstones, stone pipes, *Haliotis* circular pendants, and *Haliotis* banjo pendants) are restricted to males (mostly adult and elder) and elder females.

Of the artifacts that were analyzed, the most restrictive (that is, that have least representation among the population) are pipes, type K beads, *Haliotis* banjo, circular and trapezoidal pendants, and undecorated bone tubes.

Furthermore, there is the range of artifacts that have not been dealt with due to the low incidence among the population. It is precisely these artifacts that have the highest likelihood of representing some differential markers of status or authority. Of these, it is unlikely that technomic artifacts, no matter how rare, are such markers. These artifacts have been recombined into a single class (utilitarian bone) for subsequent analyses. The sociotechnic and ideotechnic classes then remain. These artifacts (possible bullroarer, bone beads, decorated tubes, and stone beads) are in addition found with some otherwise peculiar burials.

All the artifacts in these categories were associated with adult males, except for the bullroarer which was associated with a young adult female. Bone beads and decorated tubes were also merged into one category (bone ornaments) in subsequent steps.

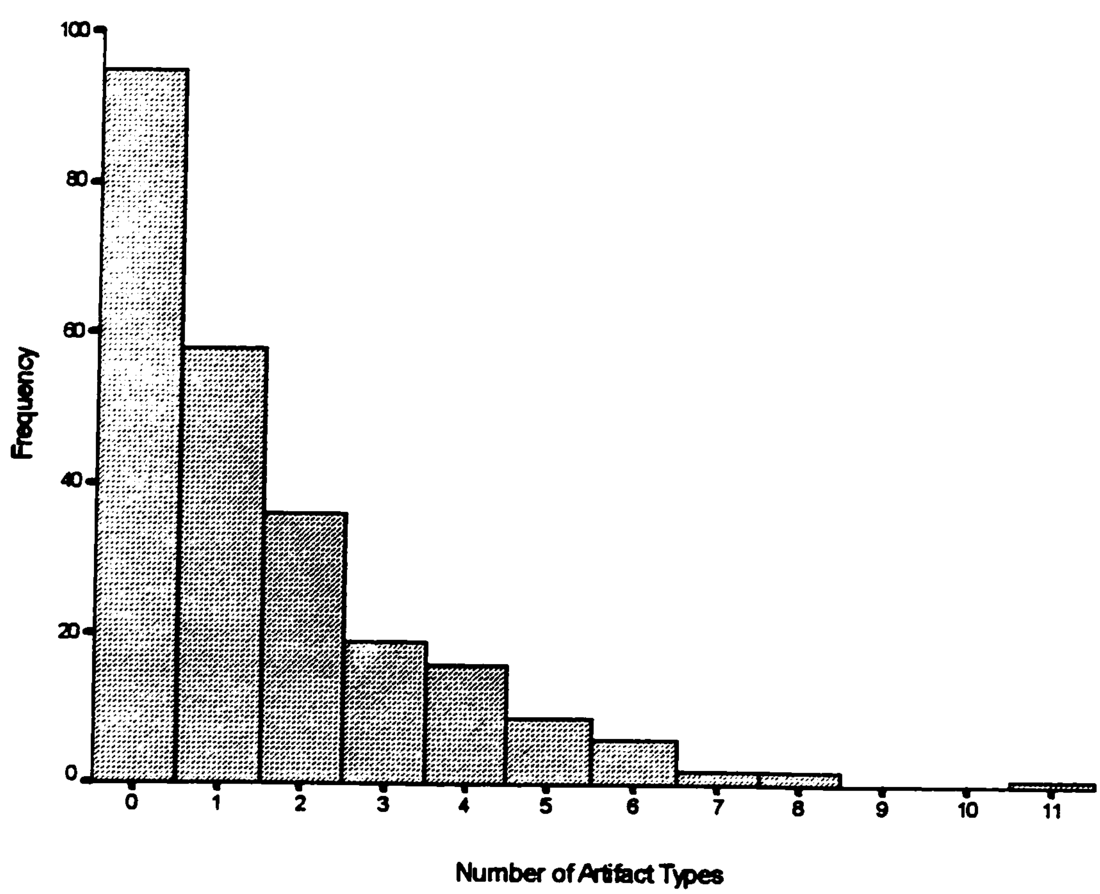
4.2.1.5 Assemblage Diversity

Twenty-eight artifact types were observed at CA-SCL-38. These include: 1) mortars, 2) pestles, 3) charmstones, 4) stone pipes, 5) manos, 6) abraders, 7) stone beads, 8) flaked obsidian tools, 9) flaked informal tools, 10) banana stone, 11) incised stone, 12) awls, 13) strigils, 14) pins, 15) serrated tools, 16) bone and antler wedges, 17) gouges, 18) needles, 19) bipointed objects, 20) bone ornaments (pendants, decorated tubes, and beads), 21) undecorated bone tubes, 22) bone whistles, 23) type A beads, 24) type K beads, 25) type M and type L beads, 26) *Haliotis* and clam shell pendants, 27) banjo pendants, and 28) whole abalone shells. Flaked stone debitage is not included in this count, since its occurrence is characterized by a random distribution (thus, its inclusion in the graves may have been accidental rather than intentional).

Artifact diversity within a grave ranges from 0 to 11 types. A total of 95 individuals (39%) was found with no artifacts, while 149 individuals (61%) were interred with one or more type of implements. The assemblage diversity distribution resembles a Poisson distribution where fewer individuals were interred with greater diversity of implements.

A total of 58 individuals (24%) were included with one implement type (Figure 4-5), 36 individuals (15%) had two types, 19 individuals (8%) had three types, 16 individuals (7%) had four types, 9 individuals (4%) had five types, 6 individuals (2%) had six types (Burials 13, 50, 67, 130,

Figure 4-5 Artifact Diversity Distribution



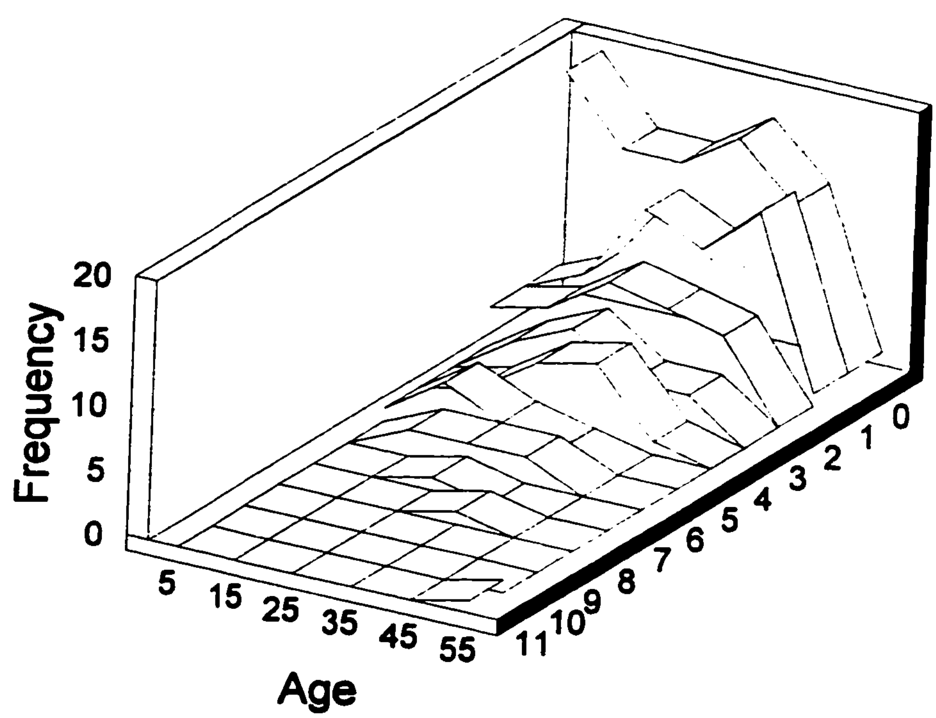
164, 167, four males, one elder Burial 164, and one female, Burial 67), two individuals (1%) had seven types (Burial 97, an adult male, and Burial 225, an adult of indeterminate sex). Two individuals (1%) had eight types (Burial 21, an adult of indeterminate sex, and Burial 63, an adult female). One elder female (Burial 93) displayed the greatest diversity of artifacts (11 types).

The distribution of overall presence/absence of artifacts was somewhat correlated with sex (P = 0.10537). Cross-tabulations show an over-representation of males associated with artifacts (65% of sexed individuals), while females are under-represented (35% of sexed individuals). The correlation with age, on the other hand, was strongly statistically significant (P = 0.01371). Contingency tables indicate an over-representation of adults, while infants and youths are under-represented. Elders are equally likely to have absence or presence of artifacts.

However, the number of types of artifacts included in the graves was statistically correlated (at a 90% level of confidence) with respect to sex (P = 0.09065). A Mann-Whitney rank test showed that the males as a whole had significantly higher diversity (P = 0.0351) than females. More males than expected were observed to have 3, 5, or 6 different types, but only females (one in each category) possessed the greatest varieties, 8 and 11 different types. Although a few deviations from the expected values were observed, the age category and artifact diversity were not significantly correlated. The youth category more often than expected lacks artifact association, but if it is present, appears more commonly associated with 5 types, suppressing the association with only one type. Two youths, Burial 75 aged 13-15, and Burial 178 aged 2-4, are associated with 5 types. Adults appear more likely to possess 3 or 4 different types, while elders are more commonly found with only one type of artifact. Only three infants (n = 9 total in the sample) were found associated with artifacts, and they constitute two double burials. Burial 119, interred on the mortar placed over Burial 120, was associated with only one type A bead. Burials 155 and 156, a double burial, are the infants possessing the most varied assemblage. Burial 156 possessed three types (type A beads, bone awls, and *Haliotis* pendants), while Burial 155 had two types (type A beads and informal tools).

If diversity of artifact types is an indicator of wealth, is wealth enhanced by age? To answer this question those individuals whose mean age is known were selected, and the age distributions, segregated by the artifact diversity, were plotted (Figure 4-6). Infants and children have none or few, while individuals between 20 and 40 more commonly have one to four different types. There is a dramatic change in age for individuals with five types, where the peak of the distribution is at a much younger age, around 15. Six types distribute equally between ages 15 and 35. The high remaining diversities (7, 8, 11) appear to increase with age.

Figure 4-6 Age Distribution by Artifact Diversity

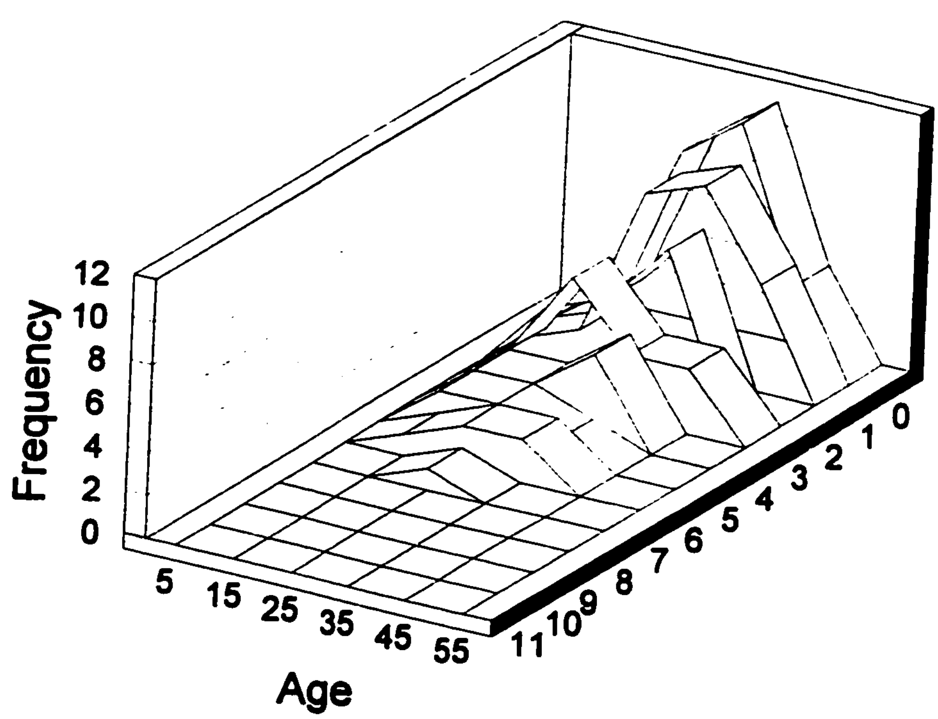


To determine if the distributions described for the population as a whole are similar according to the gender of the individual, the procedure was repeated for those individuals of known sex. In other words, again assuming diversity is an indicator of wealth, how does age impact wealth in males and females?

Referring to Figure 4-7 and Figure 4-8, male age distributions appear similar for all diversities. The frequency decreases steadily downward as diversity increases. For all values of the diversity, the frequency of males peaks at middle age (25-35), decreasing to zero at both extremes, young and old.

Female distributions behave very differently. Most females had diversity values less than 3. For these females,

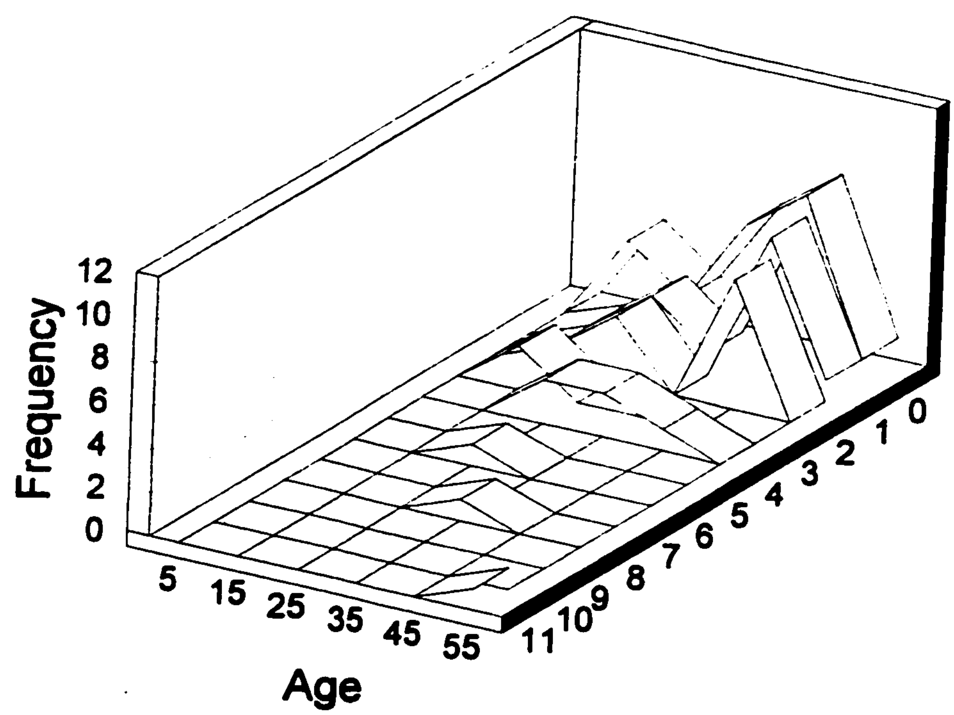
Figure 4-7 Male Age Distribution by Artifact Diversity



the age distributions for values of 0, 1, and 2 are very similar. But a small number of females (value 3 or higher), probably a select group, show a strong positive linear correlation of age and diversity.

In addition, a plot of L and M type beads vs. diversity shows that there seem to be two groups of individuals. One group (Burials 69, 179, 168) has very high ($n > 1000$) numbers of beads, but low diversity (2), while the other has lower ($n < 1000$) numbers of beads, but higher diversities ($1 \leq d \leq 7$). For these latter there is a linear relationship

Figure 4-8 Female Age Distribution by Artifact Diversity



between number of beads and artifact diversity. Of the first group (all males) two are elders.

Bean (1992:25) suggested that it is often assumed that acquired knowledge, as a product of advancing age, and power go hand in hand. In south central and southern California groups, advanced age (in males) is an indication of power, while in north central California power decreases with advanced age and loss of physical strength. The present results show agreement with the model described for this area of central California.

The evidence indicates that the acquisition of wealth or power, as manifested in the artifact diversity found as grave offerings, perhaps obeyed different rules based on the gender and age of the individual.

Is the artifact diversity affected by the disposal? That is, does the cremation process destroy artifacts and therefore artificially lower the diversity? A Kruskal-Wallis 1-way analysis of variance on the diversity when grouped by the disposal shows no significance ($P = 0.9908$). There is thus no indication that the diversity distributes differently for inhumations or cremations. However, there is a significant difference ($P = 0.0479$, M-W rank test) between the diversities for tightly flexed ($d = 1.7 \pm 1.8$) and semi-flexed inhumations (2.6 ± 2.5).

4.2.2 Faunal Remains

4.2.2.1 Associated Bone

Table 4-45 and Table 4-46 summarize all mammal species present at the site in association with burials and isolates, by the number of elements (complete and fragmentary) and by weights for each species. Table 4-47 presents all identified avian species associated with burials, and isolates (Wilson n.d.).

Table 4-45 Mammal Species with Burials

Species	**Common Name**	**Elements**	**Weight (grams)**
Cervus nannodes	Tule elk	70	2456.8
Odocoileus hemionus	Black tailed deer	20	560.9
Antilocapra americana	Antelope	4	78.9
Odocoileus/Antilocapra	Deer/Antelope	20	230.8
Unident. *Artiodactylae*		9	67.8
Ursus horribilis	Grizzly bear	2	181.0
Ursus americanus	Black bear	1	8.0
Felis concolor	Mountain lion	1	2.1
Lynx rufus	Bobcat	1	11.3
Canis latrans	Coyote	2	5.8
Canis sp.	Dog/Coyote	13	80.8
Urocyon cinereoargenteus	Grey fox	2	10.1
Procyon lotor	Raccoon	2	9.6
Lepus californicus	Jackrabbit	37	79.2
Sylvilagus audubonii	Brush rabbit	4	3.2
Sciurus niger	Fox squirrel	4	5.9
Sciurus griseus	Grey squirrel	1	1.2
Sciurus sp.	Squirrel	1	1.3
Thomomys botae	Pocket gopher	16	12.2
Enhydra lutris	Sea otter	7	60.3
Total		217	3995.2
Unidentified			7870.5

Table 4-46 Mammal Species Isolates

Species	**Common Name**	**Elements**	**Weight (grams)**
Cervus nannodes	Tule elk	35	1276.9
Odocoileus hemionus	Deer	42	1380.4
Antilocapra americana	Antelope	3	122.2
Odocoileus/Antilocapra	Deer/Antelope	60	1169.7
Unident. *Artiodactylae*		16	313.0
Ursus horribilis	Grizzly bear	2	41.0
Ursus Americanus	Black bear	1	37.4
Canis latrans	Coyote	4	36.9
Canis sp.	Dog/Coyote	5	27.8
Mephitis mephitis	Striped skunk	2	7.6
Sylvilagus audubonii	Brush rabbit	2	4.0
Sciurus niger	Fox squirrel	1	0.7
Sciurus sp.	Squirrel	2	2.0
Enhydra lutris	Sea otter	33	510.9
Zalophus californianus	California sea lion	1	7.5
Total		209	4941.6
Unidentified			9082.2

Table 4-47 Avian Bones

Species	**Common Name**	**Associated**		**Isolates**	
		#	**wt**	**#**	**wt**
Chen caerulesce	Snow Goose	3	8.5	2	5.6
Chen caerulescens caerulescens	Lesser snow goose	3	4.7	2	5.4
Chen rossii	Ross' goose	3	2.7	2	4.0
Branta canadensis minima	Lesser Canada goose	1	1.9		
Chen sp.	Goose	26	60.9	8	18.3
Anas platyrhynchos	Mallard duck	3	6.9		
Aythya valisneria	Canvasback duck	1	1.1		
Anas sp.	Surface feeding duck	3	6.2	2	5.3
Anseriformes	Ducks/Geese			1	5.0
Grus canadensis	Sandhill crane	16	232.6		
Grus sp.	Crane	4	39.8		
Cygnus sp.	Swan	1	5.7		
Buteo jamaicensis	Red tail hawk	1	0.4		
Buteo regalis	Ferruginous hawk	14	85.2	1	1.2
Buteo sp.	Hawk	7	6.2		
Aquila sp.	Eagle	1	2.2		
Gavia immer	Common loon	2	4.2		
Gavia sp.	Loon	1	0.8		
Pelicanus sp.	Pelican	1	3.6	1	1.2
Aechmorphus occidentalis	Western grebe	1	0.1		
Phalacrocorax penicillatus	Brandt's cormorant			1	2.2
Gallus	Domestic chicken	2	4.9		
Totals		94	478.6	20	48.2
Unidentified			330.6		117.2

A total of 291.8 grams of unidentified bone was recovered from Control Units 5 and 9. In addition, 2.6 grams of fragments from fox squirrel (*Sciurus niger*), 0.7 grams from brush rabbit (*Sylvilagus audubonii*), and 76.2 grams from Tule elk (*Cervus nannodes*) were also retrieved.

4.2.2.2 Animal Features

Two animal burials were recovered, neither of which was located in the central concentration. Burial 2 consisted of 10 juvenile elk bones. These remains appeared to form part of a large vitrified clay feature and were associated with a charmstone and a small pestle. Burial 22 was an almost complete skeleton of a grizzly bear. Initial analysis identified cut marks on several elements. This appears to be an immature individual, since the innominate and scapula crest epiphyses and the vertebral centra epiphyses are incompletely fused (Maverick personal communication). Based on the rarity of preserved skeletal remains of grizzly bears in California, it was decided by the Muwekma Ohlone Tribe to retain this individual for further studies.

4.2.3 Summary

The inclusion of faunal elements as grave associations has been interpreted in the past as food offerings left for the deceased, or as the remains of food that was consumed during the mortuary ceremony. Cambra et al. (1996) alluded to ethnographic and ethnohistoric accounts that describe a complex pre-contact cosmological view by Central California native peoples. Animism and totemism were aspects of their ritualistic and religious lives. These totems represented moieties, clans or families in life and death. An analysis of the archeological record in conjunction with ethnographic work should be used to better understand this aspect of religious beliefs and their manifestation in the mortuary behavior (1996).

Given the ethnographical acounts of deer and bear moieties among the Ohlone (Levy 1978) it is interesting to find that the only animal features at the Yukisma site consist of these species. The spatial analysis of associated bone, discriminated by species might shed light on some aspects of horizontal distinction, or even if there were asymmetries in the socio-political standings of the moieties. Wilson (n.d.) has taken some preliminary steps in this direction, and encountered some patterns which may be relevant.

4.3 Chronology, Temporal Assignment of Site

Temporal placement of CA-SCL-38 has been initially established by radiocarbon dating, and obsidian hydration and source analysis. Further typological analysis of temporally sensitive artifacts (beads, pendants) will be included in order to refine the chronological sequence.

4.3.1 Radiocarbon Dating

A total of 23 organic samples from burial contexts and other features were submitted to Washington State University Radiocarbon dating laboratory for radiocarbon analysis. Sam-

Table 4-48 Un-corrected Radiocarbon Dates

	Burial	C-14 Age/B.P.
Late Period Phase 2B		
(A.D. 1700-1800)	144	230 ± 50
Late Period Phase 2A		
(A.D. 1500-1700)	171	340 ± 300
	51	440 ± 160
	64	440 ± 230
	13	450 ± 50
Late Period Phase 1C		
(A.D. 1300-1500)	40#	470 ± 220
	93	620 ± 60
Late Period Phase 1B		
(A.D. 1100-1300)	22+	680 ± 70
	91	690 ± 220
	107	735 ± 85
	814-2*	830 ± 70
Late Period Phase 1A		
(A.D. 900-1100)	21	860 ± 150
	178	880 ± 280
Middle/Late Period Transition		
(A.D. 700-900)	167	1130 ± 170
	63	1160 ± 150
	814-1*	1250 ± 130
	230#	1210 ± 120
Middle Period Late		
(A.D. 300-500)	117	1540 ± 180
Middle Period Intermediate		
(A.D. 100-300)	179	1710 ± 200
	850*	1790 ± 180
Early/Middle Period Transition		
(500-200 B.C.)	240#	2190 ± 170
Early Period A		
(3000-2000 B.C.)	166	4230 ± 200

* non-burial features (catalog number given)
\+ grizzly bear burial
\# cremations

ple 4848 obtained from Burial 4 yielded a result of 108 ± 1.39 B.P. which falls into Modern time. This result was probably due to contamination. Table 4-48 and Figure 4-9 summarize the uncorrected radiocarbon dates arranged according to Bennyhoff and Hughes Dating Scheme B1 (1987:146).

The radiocarbon date obtained for Burial 166 may be aberrant, although it is associated with a variant of type L *Olivella* beads, temporally earlier than the type M *Olivella* beads. If this date is ignored, the site seems to have been in fairly continuous use for 2,000 years dating from approximately 200 B.C.

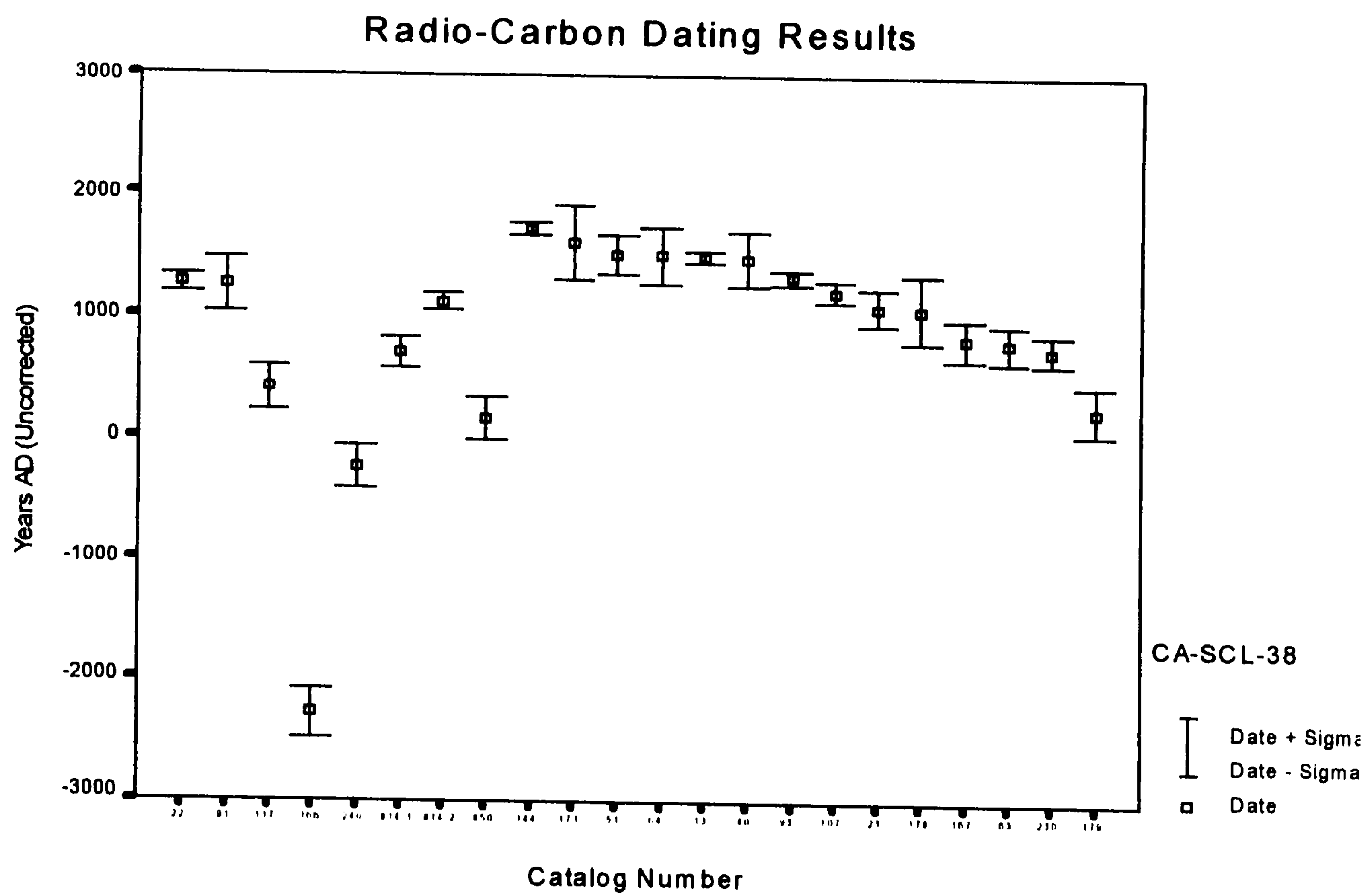


Figure 4-9 Radio-Carbon Dating Results

4.3.2 Obsidian Hydration

Twenty-five obsidian samples were recovered from CA-SCL-38; all were submitted for X-ray fluorescence trace element source analysis to the Northwest Research Obsidian Studies Laboratory, directed by Craig E. Skinner. Two obsidian North Coast Range sources were identified, Napa Valley (24 samples) and Annadel (1 sample). Obsidian hydration studies were conducted for all samples by Glen Wilson at the San Jose State University Anthropology Obsidian Hydration Laboratory. Analytical results are presented in Table 4-49.

Table 4-49 Obsidian XRF Sourcing and Hydration Results

Catalog	**Burial**	**Description**	**Material**	**Hydration band (microns)**
1-1	1	Biface fragment	Napa	1.9
4-1	4	Biface fragment	Napa	2.3
10-1	10	Biface fragment	Napa	2.3
21-1	21	Proj. Point serrated	Napa	2.0
21-21	21	Biface fragment	Napa	2.0
42-5	42	Biface fragment	Napa	2.2
58-4	58	Flake	Napa	1.7
72-1	72	Proj. point serrated	Napa	1.5
73-14	73	Biface fragment	Annadel	1.7
82-3	82	Serrated lanceolate	Napa	1.8
86-8	86	Stockton serrated	Napa	2.9
86-9	86	Stockton serrated	Napa	1.9
92-6	92	Stockton serrated	Napa	2.1
100-4	100	Flake	Napa	2.0
140-6	140	Stemmed point	Napa	1.9/2.2
144-4	144	Proj. point serrated	Napa	2.0
144-10	144	Flake	Napa	1.5
149-1	149	Proj. point serrated	Napa	1.8
150-1	150	Proj. point serrated	Napa	1.8
152-3	152	Proj. point serrated	Napa	1.7/1.8
171-7/21	171	Biface fragment	Napa	1.8/1.9
218-1	218	Proj. point serrated	Napa	1.6
225-6/14	225	Proj. point fragment	Napa	1.9/2.3

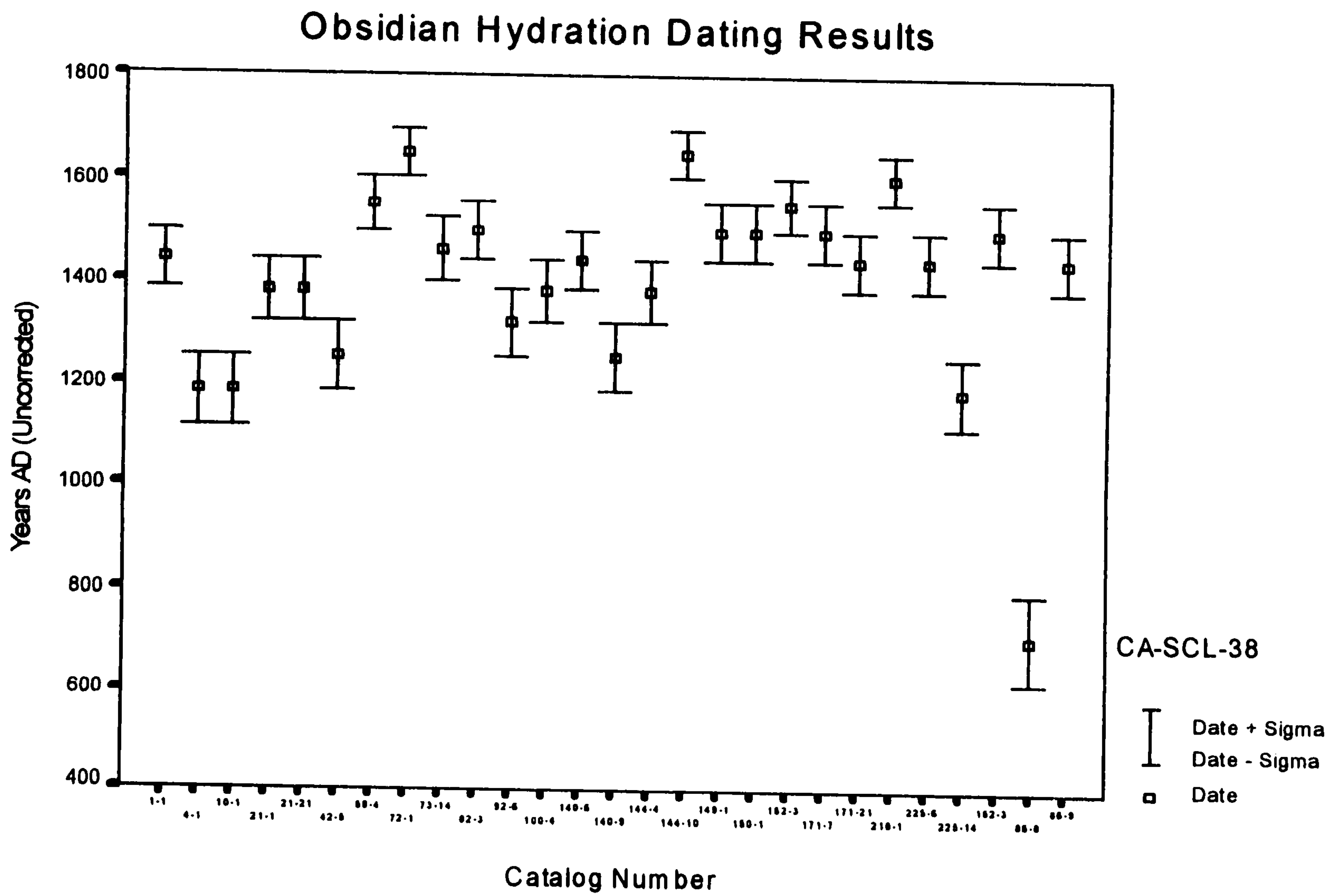


Figure 4-10 Obsidian Hydration Dating Results

4.3.3 Analysis of Temporally Sensitive Artifacts

Of the temporally sensitive artifacts, only beads and pendants will be dealt with here. Although other artifacts are also valuable in the determination of the chronological sequence of burials, this type of fine grained study will be left for a later date.

The temporal characterization of *Olivella* bead types by Bennyhoff and Hughes is presented in Table 4-50. Of those burials that were dated, those with type L beads were all earlier than A.D. 1100. In addition, those with crescent pendants were also earlier than A.D. 1100 (Burials 21, 63, and 230). The two burials with banjo pendants (51 and 64) roughly agreed in dating with the evolution scheme by Gibson and Fenenga (1978).

Table 4-50 Bead Temporal Characteristics and Burials

Bead Type	**Periods/Phases**	**Burials**
A1a	Early, Late/1	9, 13*, 21, 35, 37, 38, 41, 45, 50, 51*, 52, 54, 60, 62, 63*, 65, 67, 69, 71, 73, 75, 80, 86, 87, 88, 90, 92, 95, 97, 100, 105, 105A, 112, 130, 132, 137, 139, 140, 147, 153, 155, 156, 159, 161, 163, 164, 166*, 167*, 170, 176, 180, 182, 190, 224, 231, 241
A1b	Early, Middle, Late	9, 13*, 21*, 24, 35, 37, 40*, 41, 43, 45, 50, 51*, 54, 61, 62, 63*, 65, 67, 69, 72, 75, 80, 82, 83, 86, 87, 88, 90, 91, 92, 93*, 95, 96, 105, 112, 120, 124, 125, 130, 132, 137, 139, 140, 147, 149, 156, 162, 163, 164, 165, 166*, 167*, 170, 173, 176, 178*, 182, 190, 210, 218, 221, 223, 224, 225, 230*, 231
A1c	Middle, Protohistoric	3, 9, 13*, 21*, 30, 37, 43, 46,

		51*, 54, 61, 67, 69, 72, 73, 80, 82, 86, 88, 90, 92, 95, 97, 105, 112, 125, 130, 139, 149, 162, 170, 176.
A4	uncertain	9, 13*, 21*, 35, 37, 41, 45, 50, 51*, 54, 67, 69, 72, 80, 82, 86, 90, 92, 93*, 95, 97, 105, 112, 120, 124, 125, 130, 132, 137, 139, 149, 156, 162, 163, 164, 167*, 170, 173, 176, 178*, 182, 190, 224, 231
A5	Protohistoric, Historic	162, 163, 164, 176
K1	Late/1B	13*, 50, 52, 53, 65, 80, 167*
K2	Late/2	13*, 50, 53, 65, 80, 167*
L2	Early, Middle	166*, 178*, 179*
M1	Late/1A	63, 68, 71, 93*, 97, 106, 163, 164, 167*, 169, 184
M2	Late/1C	51*, 87
M1 & M2	Late/1B	13*, 50, 69, 88, 94, 105, 168

* Burials with radiocarbon dating

Another temporally sensitive artifact is banjo pendants. Of the banjo pendants recovered from CA-SCL-38, twelve were seriated according to the scheme presented by Gibson and Fenenga (1978:148) (Table 4-51). All the pendants fall into the Late Period Phase 1.

Table 4-51 Banjo Pendant Chronology

Burial	**Type**	**Phase**
51*	N4aI?	Early 1B
64*	N1aII	Early 1C
	N1aIII?	Early 1C
65	N1bI	Late 1C
	N1bII	Late 1C
	N1aI	Early 1C
71	N6aII	Late 1B
	N6bIII	Late 1B
164	N1aIII	Early 1C
	N1bII	Late 1C
189	N4aI	Early 1B
219	N2aI	Late 1C ?

* Burials with radiocarbon dating

Types N4 and N6 are estimated to represent earlier manifestations of this ornament type. Further temporal seriation provided by radiocarbon results, other temporally sensitive artifacts, and comparisons with other Bay area sites, is necessary for a better understanding of their stylistic changes through time.

Stone beads are also temporally sensitive artifacts. C. King (1976:62) placed their use in Phase 2 of the Late Period. In addition King stated an increase in the diameters of decorative beads, including those of magnesite and steatite, through Phase 2 of the Late Period. This is consistent with the occurrence of magnesite beads and their characteristics in Burials 53 and 130 (supra 4.2.1.1 Stone Beads p. 157).

4.3.4 Summary

Preliminary data indicate site utilization that extends for at least 2,000 years, from ca. 240 B.C. to A.D. 1770, if the oldest, possibly aberrant, radiocarbon date is excluded. According to the B1 dating scheme, this chronology represents constant utilization from the Early/Middle Period Transition to the Proto-historic Period.

Cartier (1988) submitted a sample of *Cerethidea* shell from the 10-20 cm level of his test unit 2, obtaining a date of 500 ± 60 B.P., also consistent with rest of the site chronology.

The obsidian hydration results are compatible to those of radiocarbon dating and artifact typing. However, the obsidian hydration dates show a much more restricted range, mainly from A.D. 1200 to A.D. 1700. There is no clear explanation for this dating. In addition there were no projectile points of other materials recovered at the site.

It is interesting to note that, although the radiocarbon series presents a fairly even utilization from the Middle/Late Period Transition through the Late Period Phase 2B, there are a large number of temporally diagnostic artifacts that are common to these periods in the Bay Area, that are not found at CA-SCL-38. These artifacts include *Olivella* beads of types C3, C7, C8 Split, D Split Punched, E1, and E2. In addition, there are more types diagnostic of the Early Period (G & F *Olivella* bead series) that are also absent. These types have been found at CA-ALA-329 (Leventhal 1993), CA-SCL-6W, CA-SCL-302, CA-SCL-690, as well as other sites (Cartier, Bass, and Orman 1993). The temporal utilization of these sites overlaps that of CA-SCL-38.

Bennyhoff's temporal transition from the occurrence of M1 type beads alone, through a mix of M1 & M2 types, to M2 type beads alone can be investigated using Table 4-41 and the radiocarbon dating results. There was partial support for this transition, but not a clear enough result to provide strict grave temporal seriation based on the M1/M2 ratio at the Yukisma site.

According to Bennyhoff and Hughes (1987:137-139) type L *Olivella* beads have a temporal emphasis in the Late Phase of the Early Period. Three radiocarbon dated burials (166, 178, and 179) were associated with type L beads, in fairly large lots. They span from the Early Period through the Late Period Phase 1A, overlapping M1 type beads. Cartier (Cartier, Bass, and Orman 1993) found a few possible type L beads in sites dated from the Early Phase of the Middle Period and the Middle/Late Period Transition. Given the paucity of type L beads recovered from other sites, compared to the relatively large lots found at CA-SCL-38 would point to possible high status for the individuals possessing them. On the other hand, the difficulties found in identifying the type L beads could point to the necessity of reevaluating type M beads from other Bay Area sites. Moreover, if type L beads do occur into the Late Period their temporal distribution in the Bay Area needs further consideration.

Three radiocarbon dated burials (40, 230, and 240) that are cremations were recovered from the Yukisma site. They were dated to the Late Period, Middle/Late Period Transition, and to the Early/Middle Period transition (Table 4-48), respectively. Although it was previously believed that cremation was a Late Period phenomenon (Lillard, Heizer, Fenenga 1939:4), it has been found to extend much earlier in time (Gerow 1968, Uhle 1907, Schenck 1926, Wallace and Lathrap 1975, Coberly 1973, Leventhal 1993), in support of the above results.

Although the site level utilization is consistent and fairly definite, more work is still necessary to produce a better chronology for purposes of burial seriation. The absence of significant classes of artifacts still poses questions regarding the function of the site within a greater Bay Area context.

5. Multivariate Analysis

5.1 Cluster Analysis

5.1.1 Spatial Clustering

The spatial clustering analysis was carried out first. The agglomeration schedule was examined, but yielded no optimal solution for the number of clusters. Therefore, after visual inspection of the resultant distributions, the eight cluster solution (Figure 5-1) was chosen as a reasonable compromise between cluster delimitation and system complexity. The two largest of the resultant clusters were further sub-divided.

Examining the spatial distribution of the clustering, the following pattern is evident: spatial cluster (SC) 5 is located most centrally containing the most dense concentration of graves. Surrounding this central cluster is a roughly semi-annular region composed of SC 1, SC 4, and SC 6, where the burial density drops noticeably. Lastly, in the outer periphery, are SC 7, SC 2, SC 3, and SC 8, again forming a portion of a rough annulus, where the burial density is lower still. The clusters appear to form three concentric circles.

Figure 5-1 Spatial Cluster Distribution

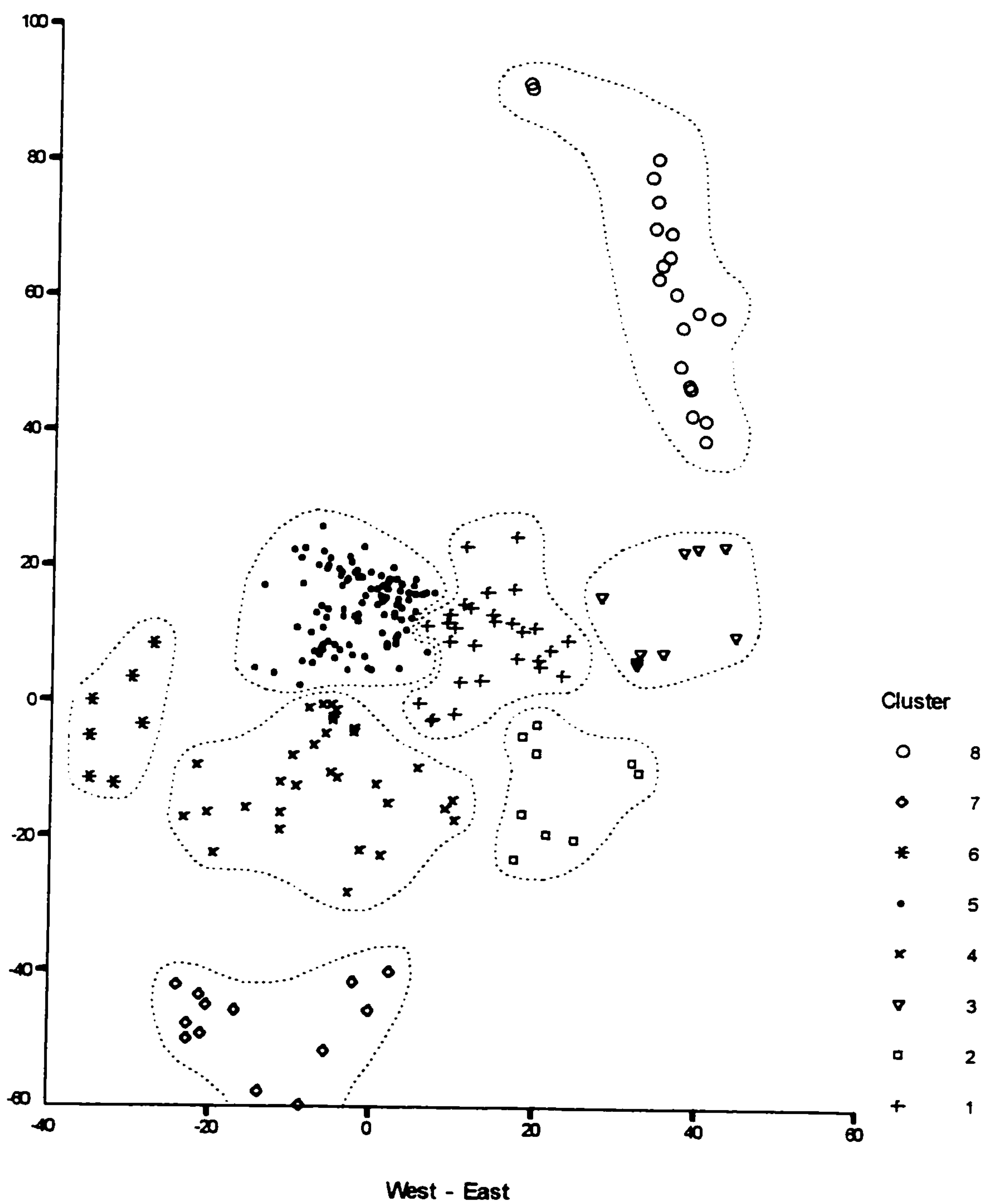


Figure 5-2 Spatial Sex Distribution

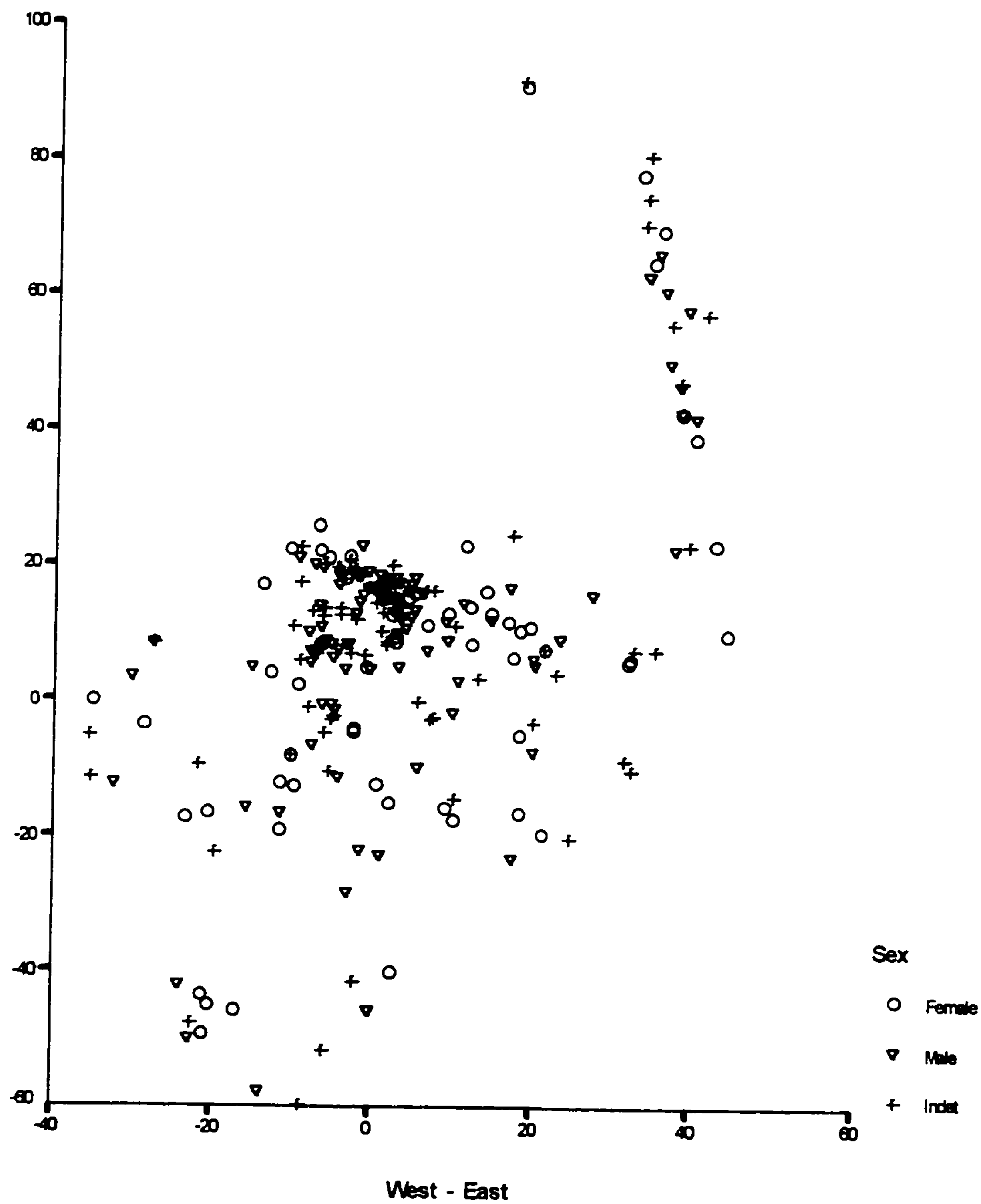
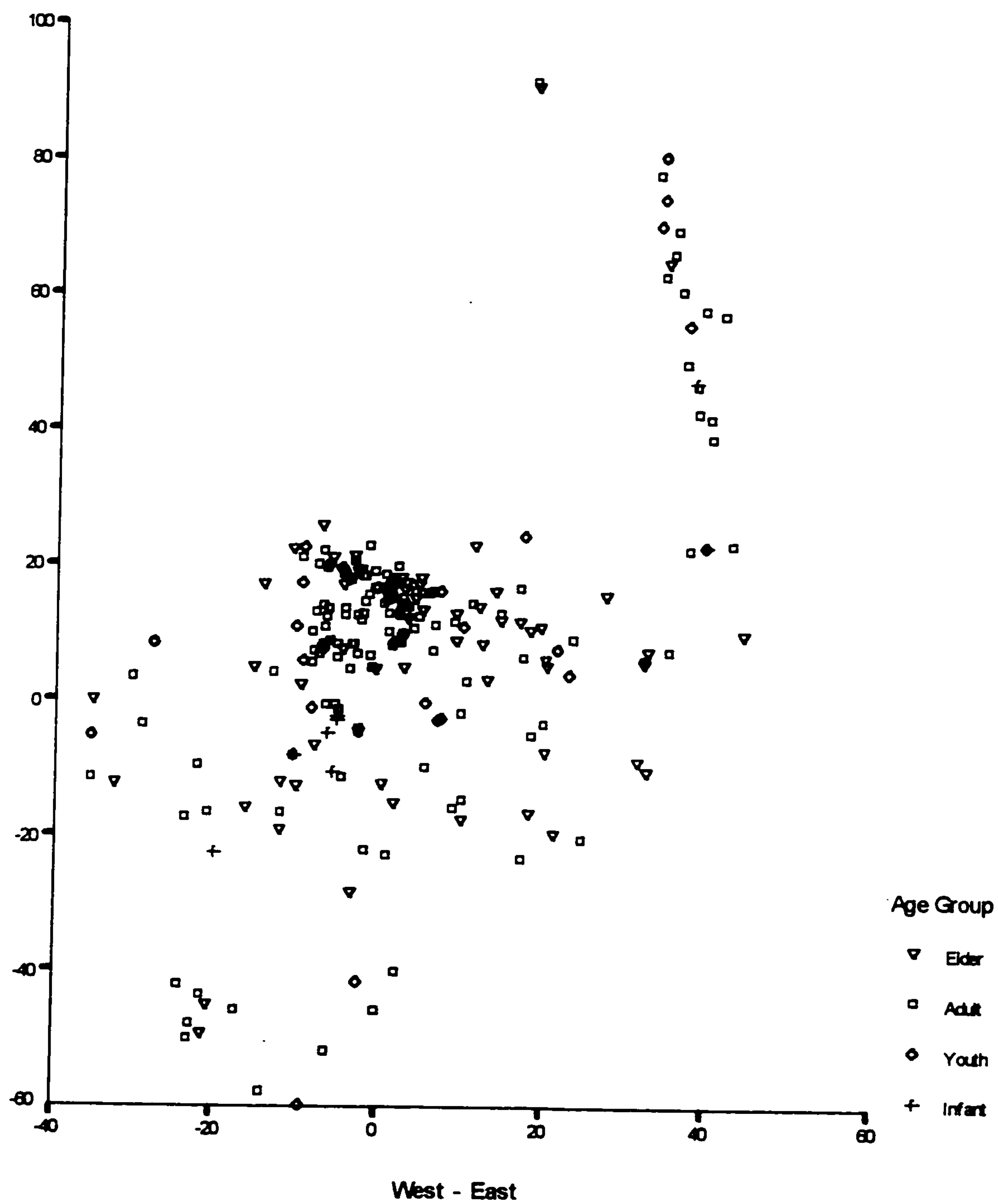


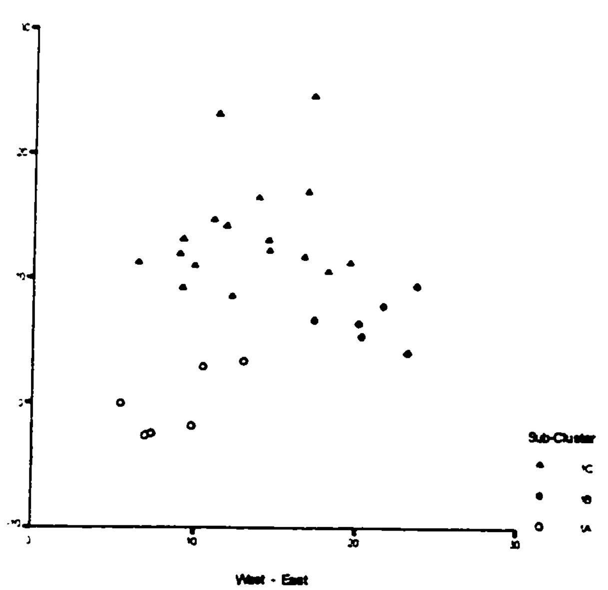
Figure 5-3 Spatial Age Distribution



Cross-tabulations were performed to examine the age and sex structure of each cluster. A solid dependency was found between the age of the individual and the cluster in which the grave was located (P = 0.00060); a similar correlation, although not as strong, was observed with the sex of the individual (P = 0.06629). For the site as a whole, the ratio of females to males (F/M) is 0.653. Individual cluster structure is described below:

<u>SC 1</u>: This cluster is formed by 31 individuals. The age structure evidences an over-representation of youths and elders in detriment of adults. Infants are absent in this cluster. Of the elders, 57% are females, 36% are males, and one is of indeterminate sex. Of the sexable individuals of the entire population, 19% of the females, and only 11% of the males are represented in this cluster (F/M = 1.09). This is an over-representation of females with respect to the entire burial population. A sub-clustering

Figure 5-4 Spatial Cluster 1



resulted in three spatial sub-clusters (SSC): SSC 1A, SSC 1B, and SSC 1C, of 6, 8, 17 individuals respectively (Figure 5-4).

The sex and age cross-tabulations do not show definite significance, but SSC 1C is over-represented in both elders and females (F/M = 2.0). Females are concentrated in the center of the cluster (Figure 5-5), while males appear dispersed throughout. Youths, on the other hand, are located around the periphery of the cluster (Figure 5-6), and make up half of the individuals in SSC 1A.

Figure 5-5 Cluster 1 Sex

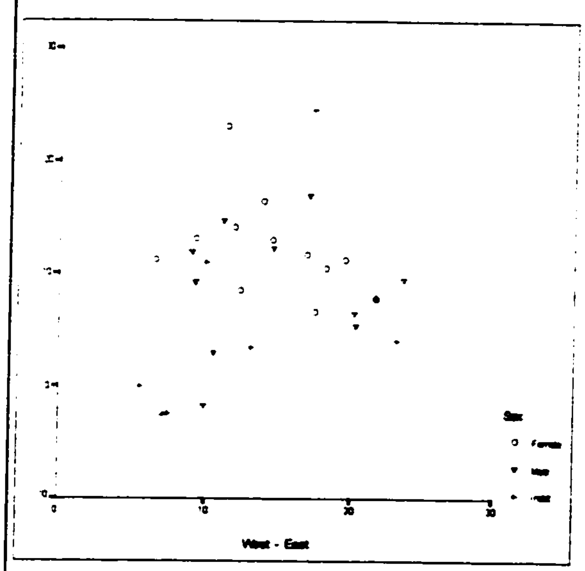
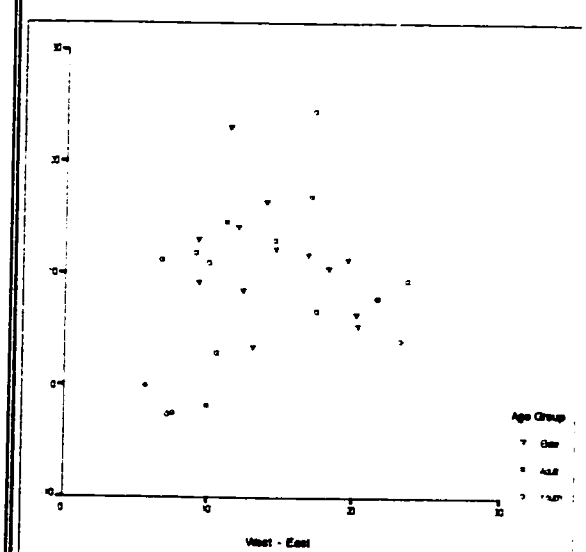


Figure 5-6 Cluster 1 Age



SC 2: This cluster, formed by 9 individuals, exhibits an over-representation of elders. Of these, 40% are females, 20% are males and 40% are individuals of indeterminate sex.

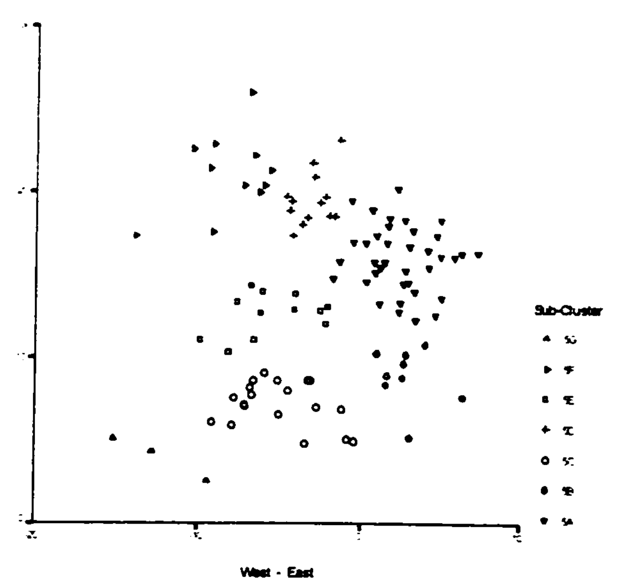
Of those individuals with known sex, 5% of the females, and only 2% of the males are represented in this cluster (F/M = 1.5). No infants or youths were recovered from this location.

SC 3: A total of 10 individuals make up this cluster. Although a small cluster, it presents some large deviations from the site norms, favoring elders and females. Females represent 6% of the total site, and males represent 2% of the overall sexed sample (F/M = 2.0, largest of any cluster). These graves appear to be distributed almost coinciding with the four cardinal points. Four individuals, a male, a female and a double burial with two children, were located in the north of the cluster. Another group of four individuals, two adjacent females (possible double burial), and two individuals of indeterminate sex were to the south. Also, an elder male was located to the west, and an elder female to the east.

SC 4: This cluster is composed of 34 (14%) individuals. Cross-tabulations indicate an over-representation of infants (n = 6, 67% of the total infant population), and females, while youths and males are under-represented. Comprising this group are 20% of all the females in the cemetery, while only 12% of the total population of males are represented (F/M = 1.08). Adult and elder females are equally represented, while of the males in this cluster, 75% are adults, and only 25% are elders. Four males (multiple burial) are located to the north, three males to the south, and two females each to the east and west. The remaining individuals are dispersed in the center of the cluster. The infants appear randomly scattered.

SC 5: This cluster contains 114 individuals. Adults and males are greatly over-represented, while infants, elders, and females are under-represented. Of the total male population, 57% was found in this cluster, while only 30% of the female population was in this location (F/M = 0.34). Additional sub-clustering resulted in seven clusters, SSC 5A, through SSC 5G; of 43, 9, 20, 14, 14, 11, and 3 individuals respectively. A statistically significant correlation with sex was noted at the 90% level of confidence (P = 0.06563). SSC 5A and SSC 5C have a higher than expected incidence of males (F/M = 0.24 and 0.15 respectively). Females, on the

Figure 5-7 Spatial Cluster 5



other hand, are over-represented in SSC 5F only. In SSC 5E, out of 14 individuals (13 adults), only 4 were sexed, all males; the remaining, including the lone youth, were of unidentifiable sex. This high proportion of unsexed individuals is related to the fact that 18% of the cremations are in this cluster, in which cases deterioration of bone often prevents a positive identification of the sex of the individual.

No significant correlation was observed with respect to age. Only one infant is present in SSC 5A. Youths and elders are over-represented in SSC 5F, whereas SSC 5E is almost completely composed of adults (except for one child).

Figure 5-8 Cluster 5 Sex

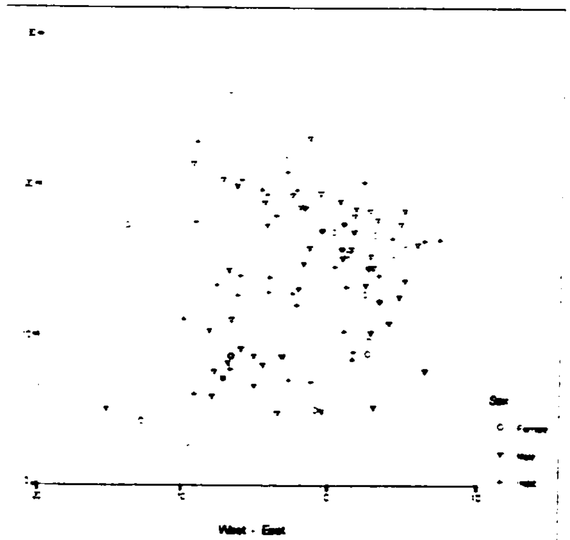
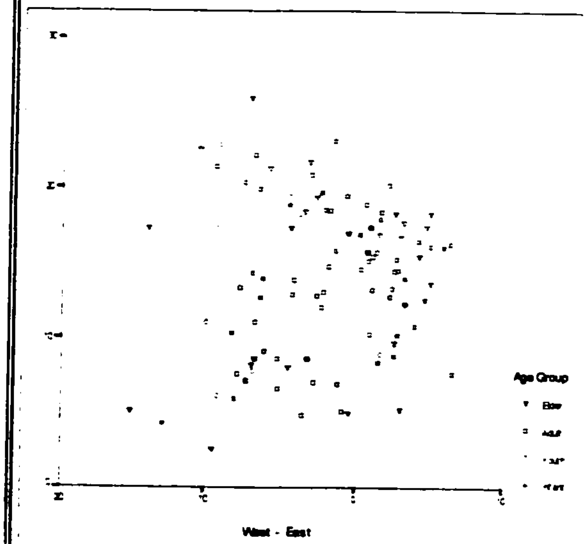


Figure 5-9 Cluster 5 Age



SC 6: Nine individuals are included in this cluster. No major deviations from the expected values are noted, with only a slight over-representation of youths. Four individuals are located in two double burials, with one adult each. Males and females are present in almost the same proportions as the entire sample (F/M = 0.67). Males are located to the north and south, and females to the east and west. Infants are not present.

SC 7: Thirteen individuals comprise this cluster. Cross-tabulations indicate that females, youths, and adults are over-represented, while males and elders are under-represented. Infants were absent from this grouping. Within this cluster, two groups are discernible, a northwestern section where graves appear more tightly clustered and females are more numerous, and a more scattered group which contains the two youth individuals.

SC 8: This cluster is formed by 22 individuals. Although all age groups are present, there is an over-representation of adults. Females and males are almost equally represented (F/M = 0.75). Similarly to SSC 5E, in SC 5, there is a high concentration of cremations affecting 45% of all the individuals in this group (or 30% of all cremations in the site).

Diversity and spatial clustering do not present a strong correlation, although cross-tabulations point to some marked differences among clusters. Table 5-1 illustrates these results.

Table 5-1 Spatial Cluster Artifact Diversity

Spatial Cluster	0	1	2	3	4	5	6	7	8	11	Tot	
1	12	10	6	6			1				31	1.1±1.3
2	6	3									9	.33±.50
3	7		2		1						10	.8±1.4
4	16	10	5	2		1					34	.9±1.2
5A	7	5	8	9	7	3	2		2		43	2.8±2.1
5B	2	5		1		1					9	1.4±1.6
5C	2	6	4	2	2	1	3				20	2.6±2.0
5D	3	2	4	1	1	1		1		1	14	2.9±3.1
5E	3	5	2	1	1	2					14	1.9±1.8
5F	6	4	1								11	.55±.69
5G	2	1									3	.33±.58
6	4	3	1		1						9	1.0±1.3
7	10	2	1								13	.31±.63
8	13	2	2	1	3						22	1.3±2.0

Striking differences are noted when comparing the diversity distribution among the clusters. The mean diversity values for each cluster allow identification of how "poor" or "rich" each cluster is. SC 5 contains individuals with the greatest artifact diversity, while individuals with no artifacts are extremely under-represented. For this central cluster, within SSC 5F and SSC 5G, more than half of the individuals have no associations. However, SSC 5A and SSC 5D are composed of individuals with the more diverse artifact assemblages. SSC 5C, formed mainly of males (87%), shows an over-representation of members with six artifact types. SSC 5E, composed mainly of cremations, slightly favors burials with a diversity of 1.

SC 2, SC 7, and SC 3 show mean values < 1; in addition, approximately 70% of their members have no artifact associations. The remaining clusters present a "medium" range of artifact variety.

Table 5-2 Spatial Loci Characteristics

Locus	Sex	Age	Diversity
Central			
SC5	+M (3:1)	+A, -I, -E	2.3 ± 2.1
Inter.			
SC 1	+F (1:1)	+Y, +E, -A	1.1 ± 1.3
SC 4	+F (1:1)	+I, -Y	.9 ± 1.2
SC 6	none	none	1.0 ± 1.3
Periphery			
SC 8	none	+A, -E	1.3 ± 2.0
SC 3	+F (1:2)	none	.8 ± 1.4
SC 2	+F (1:1)	+E	.3 ± .5
SC 7	+F (1:1)	+A, -E	.3 ± .6

Age: I (Infants), Y (Youths), A (Adults), E(Elders)
+ (Over-representation), - (Under-representation)

Summarizing these results (Table 5-2), this cemetery is highly structured, where individuals were allocated to specific areas based on their age and gender. The observed pattern at CA-SCL-38 indicates a central area reserved mainly for adults, males, and cremations (SC 5). Surrounding this are females, elders, youths and infants (SC 1 and SC 4). In the periphery is the greatest concentration of females and elders (SC 2, SC 3, and SC 7). SC 6 and SC 8 are of a more mixed nature. The lack of a more definite pattern may have been as a result of limitations on the recovery, since these areas coincide with the outer limits of the excavated portion of the site.

With reference to Table 5-3 there are clusters that could be candidates for lineal groups or moieties on the basis of sex, and others where this is unlikely. The sex criterion for this is a sex ratio close to 1. In the first group are SC 1, SC 4, and SC 7. In the second group are SC 3 and SC 5. The rest are ambiguous, either due to small size or a sex ratio neither near 1 nor too far from it.

Table 5-3 Spatial Cluster Distribution by Sex

Cluster	**Whole Sample**	**Male**	**Female**	**Row Total**
1	31 (13%)	11 (11%)	12 (19%)	23 (14%)
2	9 (4%)	2 (2%)	3 (5%)	5 (3%)
3	10 (4%)	2 (2%)	4 (6%)	6 (4%)
4	34 (14%)	12 (12%)	13 (20%)	25 (15%)
5	114 (47%)	56 (57%)	19 (30%)	75 (46%)
6	9 (4%)	3 (3%)	2 (3%)	5 (3%)
7	13 (5%)	4 (4%)	5 (8%)	9 (6%)
8	22 (9%)	8 (8%)	6 (9%)	14 (9%)
Col.Total	242 (99%)	98 (98%)	64 (100%)	162 (99%)
Unknown	2 (1%)	2 (1%)	0 (0%)	2 (1%)
Total	244 (100%)	100 (41%)	64 (26%)	164 (67%)

The same analysis cannot be performed for the age distribution since there is no definitive age data known for the people at that time (Table 5-4).

Table 5-4 Spatial Cluster Distribution by Age

Cluster	Infant	Youth	Adult	Elder	Row Total
1	0 (0%)	7 (23%)	10 (7%)	14 (21%)	31 (13%)
2	0 (0%)	0 (0%)	4 (3%)	5 (8%)	9 (4%)
3	1 (11%)	1 (11%)	4 (3%)	4 (6%)	10 (4%)
4	6 (67%)	1 (3%)	17 (12%)	10 (15%)	34 (14%)
5	1 (11%)	13 (43%)	73 (53%)	27 (41%)	114 (47%)
6	0 (0%)	2 (2%)	5 (4%)	2 (3%)	9 (4%)
7	0 (0%)	2 (7%)	9 (7%)	2 (3%)	13 (5%)
8	1 (11%)	4 (13%)	15 (11%)	2 (3%)	22 (9%)
Col.Total	9 (100)	30 (100%)	137 (100%)	66 (97%)	242 (99%)
Unknown	0 (0%)	0 (0%)	0 (0%)	2 (3%)	2 (1%)
Total	9 (4%)	30 (12%)	137 (56%)	68 (28%)	244 (100%)

5.1.2 Mode of Interment Clustering

A total of 203 individuals (83% of the total sample) were clustered according to their mode of interment (disposal, position, disposition, and orientation). The fifteen cluster solution was selected as indicative of the optimal result (Table 5-5).

Table 5-5 Mode of Interment Cluster Distribution

Cluster	Disposal	Position	Disposition	Orientation	Members
1	I	Unknown	F,D,L,O	N,E,S,W	8 (4%)
2	I	TF	F,O	N,E,S	23 (11%)
3	I	TF	L	N,E,S	20 (10%)
4	I	O	F,L	N,E,S	11 (5%)
5	C	Unknown	D,L,O	N,E,S,W	9 (4%)
6	C	TF	F,L,O	N,E,S,W	7 (3%)
7	C	TF	D,R	E,S,W	6 (3%)
8	I	TF	R	N,E	19 (9%)
9	I	TF	D	N,E	24 (12%)
10	I	TF	R	S,W	21 (10%)
11	I	TF	D	S,W	19 (9%)
12	I	O	D	N,E	9 (4%)
13	I	O	D,R	E,S,W	8 (4%)
14	C	TF	O	N	1 (.5%)
15	I	TF	F,L,O	W	19 (9%)

Disposal: I (inhumation), C (cremation)
Position: TF (tightly flexed), O (other)
Disposition: F (frontal), D (dorsal), L (left), R (right)
Orientation: N (north), E (east), S (south), W (west).

Seven mode of interment clusters (MICs) range in size from 19 to 24 individuals (9-12% of total sample) each (MIC 2-3, MIC 8-11, and MIC 15). In addition, seven other MICs range in size from 6 to 11 individuals (3-5%) each (MIC 1, MIC 4-7, MIC 12-13). The remaining MIC has only one member (MIC 14).

Cross-tabulations were performed to find possible correlations between mode of interment cluster membership and sex and/or age. Although no statistically significant correlations were found between these variables, two significant deviations were found from independence. The sex distribution of MIC 12 and 13 deviated significantly from the population as a whole (P = 0.0112, P = 0.0812 respectively). MIC 12 is characterized by inhumations, slightly flexed, dorsal, and oriented N and E. MIC 13 members are inhumations, slightly flexed, right side, and oriented mainly S. Since both cases evidenced an over-representation of females, it can be hypothesized that these MIC are preferentially female.

On the other hand the deviations for age were not significant; therefore, age does not seem to determine mode of interment.

Additional tests indicate a high correlation between the spatial cluster distribution and the mode of interment of its members (P = 0.01970). In SC 1, occupied largely by females, youths and elders, its members tend to be inhumed, tightly flexed, on the right side and oriented N/E (MIC 8). Those individuals located in SC 4 (largely infants and females), favored inhumations, tightly flexed, dorsal/left, and oriented N/E (MIC 3 and MIC 9). In the central cluster (SC 5), occupied mainly by adults and males, are located 67% and 74% of the members of MIC 10 and MIC 11, respectively (inhumation, tightly flexed, dorsal/right, oriented S/W), and 88% of the members of MIC 5 (cremations).

An over-representation of inhumations, tightly flexed, left, N/E/S (MIC 1 and MIC 3) was noted in SC 6. Similarly, in SC 7 more individuals than expected favored the treatment described in MIC 15 (inhumations, tightly flexed, frontal/left, and oriented W). Lastly, 67% of the individuals with the characteristics of MIC 7 (cremations, tightly flexed, dorsal/right, oriented E/S/W) were located in SC 8.

Additional tests were run to find correlations between the mode of interment and the diversity of artifact types of each individual. No statistically significant dependence was found, thus deviations from the expected values denoted some regularities.

The mean diversity for each MIC can be split into three groups. The MICs with the lowest values (MIC 1 = .9 ± .8, unclustered = .6 ± 1.4) have unknown position or are missing data, the one with the highest value (MIC 13 = 3.6 ± 3.5) are all slightly flexed and extended burials, and the rest fall into an intermediate group (values between 1.3 and 2.3). MIC 2 and MIC 15 have almost half of their members with no artifacts in their graves (44% and 47% respectively). 46% of the members in MIC 4 were associated with one artifact type only. Presence of two artifact types favors those positions in MIC 5, MIC 8, MIC 9, and MIC 10. Mode of interment of individuals containing the greatest diversity of artifacts (7, 8, and 11 types) appears random.

5.1.3 Burial Artifact Clustering

5.1.3.1 Presence Analysis

The sample selected for this analysis constitutes 149 individuals (61% of the total population). Those artifact types represented in less than 5 burials were excluded.

Sixteen artifact types were included in the analysis. These include 1) mortars, 2) pestles, 3) charmstones, 4) stone pipes, 5) manos/abraders, 6) flaked obsidian tools, 7) flaked informal tools, 8) utilitarian bone objects (awls, strigils, pins, serrated tools, bone and antler wedges, gouges, needles, and bipointed objects), 9) bone ornaments (pendants, decorated tubes, and beads), 10) undecorated bone tubes, 11) bone whistles, 12) type A beads, 13) type K beads, 14) type M and type L beads, 15) *Haliotis* and clam shell pendants, and 16) banjo pendants. Incised stone, banana stone and stone beads were excluded since they occur in a single or few graves. Flaked stone debitage is also excluded since is not considered a formal artifact. Manos and stone abraders were grouped into one category, as well as all the technomic bone artifacts into utilitarian bone tools.

Cross-tabulations indicate the presence/absence burial artifact clusters (APC) have a much more significant dependence with the sex of its members (P = 0.01904) than with their age (P = 0.67968). Males are over-represented in APC 2, APC 4, APC 6, APC 7, and APC 11, while females are over-represented in APC 3, APC 10, APC 13, APC 18, and APC 19 (Table 5-6). With respect to age, infants are randomly distributed, youths favor APC 3 and APC 13, adults are more commonly found in APC 2, APC 8, APC 10, APC 11, and APC 13, while elders are over-represented in APC 9, APC 16, and APC 20.

Table 5-6 Burial Artifact Presence Cluster Distribution by Sex

Artifact Cluster	**Whole Sample**	**Male**	**Female**	**Row Total**
1	5 (3%)	3 (4%)	1 (3%)	4 (4%)
2	6 (4%)	5 (7%)	0 (0%)	5 (5%)
3	6 (4%)	0 (0%)	2 (5%)	2 (2%)
4	8 (5%)	6 (8%)	1 (3%)	7 (6%)
5	5 (3%)	2 (3%)	3 (2%)	5 (5%)
6	11 (7%)	6 (8%)	0 (0%)	6 (5%)
7	9 (6%)	9 (12%)	0 (0%)	9 (8%)
8	9 (6%)	4 (5%)	3 (8%)	7 (6%)
9	11 (7%)	7 (10%)	3 (8%)	10 (9%)
10	12 (8%)	4 (6%)	5 (13%)	9 (8%)
11	8 (5%)	5 (7%)	0 (0%)	5 (5%)
12	5 (3%)	3 (4%)	1 (3%)	4 (4%)
13	8 (5%)	2 (3%)	3 (8%)	5 (5%)
14	17 (11%)	6 (8%)	3 (8%)	9 (8%)
15	9 (6%)	5 (7%)	4 (10%)	9 (8%)
16	4 (3%)	3 (1%)	1 (3%)	2 (2%)
17	2 (1%)	1 (1%)	1 (3%)	2 (2%)
18	7 (5%)	1 (1%)	4 (10%)	5 (5%)
19	4 (3%)	0 (0%)	2 (5%)	2 (2%)
20	3 (2%)	1 (1%)	2 (5%)	3 (3%)
Col.Total	149 (100%)	73 (65%)	39 (35%)	112 (100%)

No statistically significant correlation was found between burial artifact presence clusters and spatial clusters, although two APCs are restricted to SC 5 and could be indicative. These are APC 2 (A beads, obsidian), and APC 7 (M beads, A beads, pendants). Both these APCs have male only membership.

A comparison of artifact diversity with the artifact cluster solution resulted in a grading from "rich," through "medium," to "poor." The mean and standard deviation were calculated in order to make the values comparable. The diversity (d) ranking was as follows: "poor" $0 \leq d \leq 1.5$, "medium" 1.5 < d ≤ 3.5, "rich" 3.5 < d. As a result, eight clusters are "poor" (APC 1, APC 6, APC 14, APC 16, APC 17, APC 18, APC 19, and APC 20), eight are "medium" (APC 2, APC 3, APC 4, APC 5, APC 7, APC 12, APC 13, and APC 15), and four are "rich" (APC 8, APC 9, APC 10, and APC 11).

Mode of interment and artifact presence clustering, on the other hand, are independent (P = 0.91571).

Table 5-7 Burial Artifact Presence Clusters

Cluster	Principal Artifacts	Sex Preference	Age Preference	Spatial Location	Diversity
1	obsidian only	none	none	2	poor
2	A bead, obsidian	male only	adult	5 only	medium
3	A bead, pendant	female only	youth	1	medium
4	utilitarian bone	male	none	5	medium
5	util. bone, inf. tool, M bead	none	none	4	medium
6	informal tool	male only	none	6	poor
7	M bead, A bead, pendant	male only	none	5 only	medium
8	util. bone, A bead, pendant	none	adult	5	rich
9	informal tool, pendant	none	elder	random	rich
10	A bead, pendant, mortar, pestle	female	adult	5	rich
11	charmstone, pen-dant	male only	adult	5	rich
12	whistle, A bead	none	none	1	medium
13	informal tool, A bead, pestle	female	youth	random	medium
14	A bead only	none	none	5	poor
15	pestle, A bead	none	adult	random	medium
16	mortar only	none	elder	5	poor
17	bone tube only	none	none	random	poor
18	pendant only	female	none	5	poor
19	M bead only	female only	none	5 only	poor
20	mano/abrader only	none	elder only	4	poor

Table 5-7 illustrates the correlations presented above, denoting the major over-representations for each of the variables with the most common artifact occurrences for each cluster.

Ten of the artifact clusters are over-represented in SC 5 (APC 2, APC 4, APC 7, APC 8, APC 10, APC 11, APC 14, APC 16, APC 18, and APC 19). Of these, three clusters are male only (APC 2, APC 7, and APC 11), and two (APC 2 and APC 11) are over-represented by adults, where the diversity of artifacts range from "medium" to "rich." Four clusters are "poor," containing only one type of artifact (APC 14, APC 16, APC 18, and APC 19). Two of these are over-represented by females (APC 18 and APC 19), and one (APC 16) has a preference for elders. APC 18 and APC 19 are also over-represented in SSC 5B and SSC 5C respectively. APC 8 contains individuals with the greatest diversity of artifact types, and, although it does not show a sex preference, it has an over-representation of adults.

Of the remaining clusters (those not over-represented in SC 5), four are "poor," associated only with one artifact type (APC 1, APC 6, APC 17, and APC 20). APC 20 favors elders and is over-represented in SC 4. APC 6 favors males and is over-represented in SC 6. Two other clusters (APC 3 and APC 13) show female and youth preferences, one (APC 3) is over-represented in SC 1. The rest of the artifact clusters do not concentrate in specific areas of the cemetery, showing a more random distribution. Only two of these (APC 9 and APC 15) show age preferences for elders and adults respectively. APC 9 contains individuals with great artifact variety, the rest show "medium" diversity.

In addition to the artifact presence clustering the presence of each artifact was correlated with the spatial cluster to which the burial belongs. The results are summarized in Table 5-8. Since SC 5 has by far the most over-representations of all the artifacts, the fraction of burials with artifact presence that belong to SC 5 is also given.

Table 5-8 Artifact Spatial Significance

Artifact	**Significance**	**SC 5 Percentage**	**Burials**
Informal Tools	0.42718	43	37
Flaked Obsidian	0.54280	55	18
Mortars	0.64413	60	20
Pestles	0.68380	57	28
Charmstones	0.11124	**92**	13
Stone Pipes	0.63649	71	7
Stone Beads	0.84459	**100**	3
Bone Awls	0.81204	58	12
Serrated Bone	0.92925	56	9
Bone Ornaments	0.47897	60	5
Bone Tubes	0.63649	71	7
Bone Whistles	0.30196	75	16
A Beads	**0.00001**	72	82
M Beads	**0.00140**	**92**	25
K Beads	0.32440	**100**	7
Pendants	**0.00199**	73	56
Banjo Pendants	0.63649	71	7
Whole Abalone	0.82608	75	4

As usual the correlations significant at the 95% level are in **bold**. Also in **bold** are the SC 5 artifact presence percentages that are greater than 90%. These artifacts are candidates for exclusive diagnostic status markers. Note that the correlation is only significant for the type M beads due to the lower number of burials with the other artifacts. A comparative study with other sites could confirm or deny the use of these artifacts as status markers.

In contrast, those artifacts with the lowest fraction of burials in SC 5 are clearly technomic in nature.

In addition interesting patterns show up when the spatial cluster membership for different artifacts are compared, but this is beyond the scope of this thesis.

5.1.3.2 Frequency Analysis

Cluster analysis was performed on the frequency counts of each artifact per burial. Ward's method with Squared Euclidean distance measure was selected. A six-cluster solution was obtained. The sample consisted of 244 cases, including those individuals with no associations. The counts were normalized to a range of 0 to 1.

The clustering solution resulted in one large cluster (n = 174), with few or none associations, and the rest ranging from 7 to 24 individuals, which shows some evidence of differential mortuary treatment.

Artifact frequency cluster (AFC) 1: This cluster is formed of 16 individuals, of which all (except one) were found with obsidian. Half of the cases (n = 8) possessed type A beads, with only one having more than 30% of the maximum number. A few individuals have low numbers of *Haliotis* pendants and mortars. Charmstones occur in three cases in the upper range (> 40% of maximum), including the one with the maximum number. Five individuals have pestles in varying quantities; including the only individual with the maximum number.

AFC 2: This cluster is formed of 24 cases, which mainly possessed shell artifacts. Type A beads, ranging from the lower to the upper frequencies, occur in 75% of its members. Three individuals possess type K beads, two with low frequencies, and the other with the maximum. Almost 50% of the members have type M beads, ranging from the low to the upper frequencies, including the maximum. A few members have banjo pendants in the middle and upper range. More than half of the individuals have *Haliotis* pendants from the lower to the maximum range. A few individuals have low numbers of whistles. One individual has the maximum of informal tools, and almost half have a few bone utilitarian tools.

AFC 3: Composed of 174 individuals with no or very few associations.

AFC 4: This group includes 15 individuals, all associated with mortars, of which 2 members have the maximum. A few individuals have few pestles, type K beads, type M beads, *Haliotis* pendants, banjo pendants, bone pendants and bone utilitarian objects, all in the low range. Type M beads occur in 60% of the members, each having counts in the low and middle ranges. Burials 13 and 50, a double burial, are grouped together in this cluster, both sharing similar artifact types and frequencies.

AFC 5: Consists of 7 individuals, all with stone pipes (one in each grave). Three cases have the maximum of an artifact; one each of bone utilitarian tools, bone whistles, and mortars. One individual has the second highest number of charmstones. Type A (5 cases) and type M beads (3 cases), occur in the lower range.

AFC 6: This cluster is formed of 8 individuals, mainly associated with bone artifacts. All have whistles, in the middle to upper range; one has the maximum of decorated bone, two have bone tubes in the upper range, and one has the second highest number of utilitarian bone tools. In addition, 60% of its members possess type A beads in the lower range, but including the greatest frequency. It is interesting to note that the 7 cluster solution splits off Burial 182 into a single member cluster; this burial is associated with the highest number of three artifacts (type A beads, whistles, and decorated bone).

Artifact frequency clusters are significantly correlated with respect to sex (P = 0.03486). AFC 1, AFC 2, AFC 5, and AFC 6 are over-represented by males (AFC 1 and AFC 2 strongly so), while AFC 3 (which includes those individuals with the least number of artifacts) is greatly over-represented by females. AFC 4 appears equally represented by both genders (Table 5-9). On the other hand, there is no significant correlation with age. However, 8 of 9 infants are in AFC 3 (a slight over-representation); youths are strongly over-represented and adults strongly under-represented in AFC 3. Moreover, adults are over-represented

Table 5-9 Artifact Frequency Cluster Distribution by Sex

Cluster	Whole Sample	Male	Female	Row Total
1	16 (7%)	10 (10%)	3 (5%)	13 (8%)
2	24 (10%)	17 (17%)	3 (5%)	20 (12%)
3	174 (71%)	56 (56%)	50 (78%)	106 (65%)
4	15 (6%)	7 (7%)	6 (9%)	13 (8%)
5	7 (3%)	5 (5%)	1 (4%)	6 (4%)
6	8 (3%)	5 (5%)	1 (2%)	6 (4%)
Col.Total	244 (100%)	100 (100%)	64 (100%)	164 (100%)
Unknown	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Total	244 (100%)	100 (41%)	64 (26%)	164 (67%)

in AFC 1, which has a total absence of infants and youths.

Artifact frequency clusters are also correlated with spatial clustering at a 90% level of confidence ($P = 0.08081$). AFC 1 and AFC 2 are greatly over-represented in SC 5 (63% and 92% of their members respectively are located within this central cluster). Within SC 5, AFC 1 is over-represented in SSC 5E, while AFC 2 has more cases than expected in SSC 5A and no cases in SSC 5E. AFC 3 is heavily over-represented in SC 4 and SC 7, slightly over-represented in SC 1 and SC 3, and greatly under-represented in the central cluster (SC 5). Of the members of AFC 3, those individuals in the central cluster are mainly grouped within SSC 5B and SSC 5F. AFC 5 is slightly over-represented in SC 1 and SC 5. AFC 4 and AFC 6 are more randomly distributed with no specific area of preference (Table 5-10).

The artifact diversity shows an interesting pattern. The large cluster has a very low diversity (0.75 ± 1.09), and the rest are all around four.

The artifact frequency clustering is not significantly correlated with the mode of interment clustering ($P = 0.23976$). However, there are some deviations from complete independence that may be of interest. All 8 members of MIC 1 are within AFC 3. Also, AFC 2 is over-represented in MIC 11; and AFC 3 is over-represented in MIC 15.

Table 5-10 Burial Artifact Frequency Clusters

	Artifacts				
AFC	**All**	**Some**	**Few**	**Sex/Age Preference**	**Spatial Location**
1	obsidian	A bead(L,M)	pendant(L) mortar(L) charmstone(U,*) pestles(L,*)	male,adult	+5
2		A bead(L,M,U) M bead(L,M,*) pendant(L,M,*) bone util.(L)	K bead(L,*) banjo(L,M,*) whistle(L) bone orn.(M) inf. tool(*)	male,adult	+5, -1, -8
3		no/few associations		female infant, youth	+1, +3, +4, +7
4	mortar(L,*)	A bead(L,M)	pestle(L) K bead(L) M bead(L) pendant(L) banjo(L) bone orn.(L) bone util.(L)	none,adult	random
5	pipe	A bead(L)	bone util.(*) whistle(U) mortar(*) M bead(L) K bead(L) pendant(L) charmstone(M)	male,none	+1, +5 only
6	whistle (M,U)	A bead(L,*)	bone orn(*) bone tube(U,*) bone util.(L,U) M bead(L) pendant(L)	male,adult	random

5.1.4 Summary

The results of the four clustering solutions (spatial, mode of interment, burial artifact presence, and burial artifact frequency) and the analysis of significance with respect to age and sex are summarized and compared in Table 5-

11. χ^2 values significant at the 95% level are in **bold**, those significant at the 90% level are in *italics*.

Table 5-11 Cluster Solutions by Age, Sex, and Diversity

Clustering Variable Type	Chi-Square Significance		
	Age	Sex	Diversity
Spatial	**0.00060**	*0.06629*	0.28840
Mode of Interment	0.61265	0.32680	0.21688
Burial Artifact Presence	0.67968	**0.01904**	N/A
Burial Artifact Frequency	0.54163	**0.03486**	N/A

These results indicate that the age, and to a lesser degree the gender, of the individual are strong determinants of the location of burials in the cemetery. Sex strongly influences not only the types of artifacts associated with the dead, but also the frequency of each artifact type. The artifact diversity, despite not showing a statistically significant correlation with the location, nevertheless shows a clear pattern of quasi-normal distributions in each cluster. They can be characterized by the mean diversity and its standard deviation. This has permitted the classification into "poor," "medium," and "rich" clusters.

A summary of the correlation significances between the clustering solutions is presented in Table 5-12. It shows the strong dependence between the artifact frequency and mode of interment when compared to the location within the mound.

Table 5-12 Cluster Solutions Correlations

	Artifact Frequency	Artifact Presence	Mode of Interment
Spatial	*0.08081*	0.41266	**0.01970**
Mode of Interment	0.23976	0.91571	
Artifact Presence	**0.00000**		

It also shows a high correlation between the artifact frequency and the types of artifacts in a burial, although this may be a product of the large variety of assemblages and quantities. There are notable over- and under-representations in the cross-tabulation, which also serves as a method of validation. The variety and significance of these correlations and the concurrence of well delineated sets of components points to a complex web of symbolism in the mortuary ritual. Overall perhaps the most notable is the recurrence of relationships and combinations related to what appears to be the basic organizing principle of the cemetery: its spatial structure.

5.2 Factor Analysis

5.2.1 Artifact Presence

The artifact presence in burials was subjected to factor analysis. The extraction phase resulted in 6 factors with eigenvalues greater than 1, accounting for 55.4% of the total variance (Table 5-13), and these were rotated using the Varimax algorithm. The rotated factors (with those extracted in **bold**) are presented in Table 5-14.

Table 5-13 Percent Variance per Artifact Presence Factor

Factor	Variance
1	16.3
2	9.7
3	8.0
4	7.6
5	7.2
6	6.6

Table 5-14 Factor Loadings for Artifact Presence

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
A Beads	.34183	**.53303**	.24528	.08364	-.04441	.06176
Banjo Pendant	-.15599	-.00079	**.66363**	.00195	.11353	-.05989
Dec. Bone	.48359	.21359	-.06292	**-.64444**	.03135	-.05067
Bone Tubes	**.65829**	-.09209	-.16230	.06225	.08246	-.00941
Bone Util.	**.40547**	.15979	.21969	-.01998	-.12082	-.04370
Charmstones	.29141	.06778	.30708	**.54875**	.14598	.00824
Informal Tool	.02041	.09087	.11791	-.03712	**.77460**	-.04216
Obsidian	.05055	.28755	-.24416	.31934	.09874	**.53217**
K Beads	-.03108	**.49751**	.31427	-.19392	-.44049	-.14858
Mano	-.05323	-.03874	.04257	-.10880	-.04620	**.80677**
M Beads	.32606	.01968	**.60279**	.14889	-.22457	-.07992
Mortars	-.10105	**.69462**	.06368	-.07677	-.02874	.21465
Pendants	.33049	.26680	**.60069**	.07565	.23431	.16391
Pestles	-.04463	**.67692**	-.17115	.18045	.32937	-.22446
Pipes	.31879	.17722	-.09323	**.51984**	-.37427	-.13283
Whistles	**.71835**	-.05807	.15911	.06758	-.00473	.01064

The factor loading patterns (Table 5-15) show that four of the factors (factors 1, 2, 3, and 6) are grouped with high positive loadings, one (factor 4) is bipolar, and one (factor 5) is specific. Some interesting patterns are present. The positive loadings for factor 4 are for ideotechnic artifacts. The particular loadings suggest a difference in the ritualistic meaning between charmstones and pipes on the one hand, and decorated bone on the other. The only specific pattern is associated with informal tools, a technomic artifact, which is found segregated from the other artifacts. The grouping of mortars and pestles in factor 2 is expected, but their grouping with type A and K beads suggest their use in the burial treatment as a sociotechnic artifact, as previously discussed.

Table 5-15 Presence Factor Characteristics

Factor	Pattern	Positive Loading	Negative Load
1	grouped	bone tube, bone util., whistle	
2	grouped	A bead, K bead, mortar, pestle	
3	grouped	banjo, M bead, pendant	
4	bipolar	charmstone, pipe	bone ornaments
5	specific	informal tool	
6	grouped	mano/abrader, obsidian	

Given the paucity of bivariate correlations between artifact presence and age and sex, it is not possible to reliably characterize any of these factors as predominantly male or female, or associated with a particular age.

From these factors the factor scores were calculated for each burial. There is some evidence that the factor scores are age and sex sensitive (Table 5-16).

Table 5-16 Presence Factor Significance with Age and Sex

Factor	**Age**	**Sex**
1	*.0898*	**.0242**
2	.1291	.3879
3	.6116	*.0854*
4	.6858	.2820
5	.7544	.2960
6	.6781	.6634

It was hoped that the factors with significant correlations could be used to determine the sex and age of individuals, but this proved not to be the case due to the high number of outliers in the distributions. These outliers, though, might indicate other differential burial treatment.

The factor scores were then clustered. The nine cluster solution was chosen. The clusters (Table 5-18) do not show any significant correlation with age and sex, but there are some deviations that point to specific treatment of some groups.

Table 5-17 Cluster Age, Sex, and Diversity

Cluster	Size	Males	Females	Diversity
1	22	11	5	2.8 ± 1.5
2	136	41	36	.4 ± .7
3	38	19	12	2.2 ± 1.3
4	6	5	0	4.8 ± 1.3
5	6	4	1	4.5 ± 3.8
6	4	1	2	2.8 ± 3.5
7	21	12	5	2.8 ± 1.8
8	6	5	1	4.0 ± 1.4
9	5	2	2	4.4 ± 2.3

This clearly shows a partitioning of the factor score clusters according to diversity (Table 5-17). Three groups are evident. These groups are those with a very low diversity, a medium diversity, and a group with very high diversities.

Table 5-18 Presence Factor Cluster Mean Scores

Cluster	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
1	-.15 ± .40	1.2 ± 1.4	-.45 ± .93	1.1 ± .8	.51 ± .91	.9[illegible] ± .4[illegible]
2	-.31 ± .23	-.36 ± .39	-.22 ± .28	-.15 ± .07	-.29 ± .16	-.11 ± .1[illegible]
3	.03 ± .64	.26 ± .76	-.08 ± .75	.02 ± .54	1.5 ± .74	-.57 ± .43
4	-.50 ± .69	1.7 ± 1.4	2.1 ± 1.3	-.5 ± 1.3	-1.9 ± .8	-.75 ± .71
5	2.2 ± 2.3	.37 ± .97	-.7 ± 1.4	3.2 ± .9	-1.8 ± .3	-.58 ± .7[illegible]
6	-.41 ± .11	-.3 ± 1.5	.33 ± .17	-.84 ± .29	-.4 ± 1.1	6.1 ± 1.3
7	1.2 ± 1.2	-.49 ± .62	.6 ± 1.2	.15 ± .44	-.39 ± .56	.15 ± .61
8	-.74 ± .91	-.23 ± .71	3.9 ± 1.1	.22 ± .92	1.1 ± 1.1	-.23 ± .42
9	3.3 ± 2.4	1.5 ± 1.8	-.43 ± .52	-4.4 ± .3	.2 ± 1.7	-.35 ± .4[illegible]

Cluster 2 is the largest and has the lowest diversity. It is associated with negative values for all factors (Table 5-18). It is also over-represented in females. In contrast, Cluster 4 has the highest diversity, and is composed strictly of males. It has significantly high negative scores for the two technomic factors (factors 5 and 6), and significantly high positive scores for factors 2 and 3, both sociotechnic/ideotechnic in nature.

There is no significant correlation with spatial clustering, but as before there are some interesting deviations. All the members of Cluster 4 are located in SC 5. In addition 17 of the 21 members of Cluster 7 are located in SC 5. As has been evidenced before, the poorest cluster (2) is under-represented in SC 5.

5.2.2 Artifact Frequency

The same procedure was carried out for the actual number of each artifact per burial. The values were normalized to the 0-1 interval, where for each burial 0 represented no association and 1 represented the maximum association for that artifact among all the burials. Again, the factor extraction step resulted in 6 factors (Table 5-19), accounting for 56.6% of the total variance, but the factor loadings showed significant departures from the loading for the analysis based on presence only.

Table 5-19 Percent Variance per Artifact Frequency Factor

Factor	Variance
1	12.9
2	10.7
3	9.4
4	9.0
5	7.5
6	7.0

Table 5-20 Factor Loadings for Artifact Frequency

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
A Bead	**.67746**	-.04616	.18333	.03468	.14446	.37200
Banjo Pendant	.04328	-.07018	-.05468	-.01884	**.60244**	.00372
Bone Ornament	**.80898**	-.08639	-.00316	-.00235	.02947	-.06706
Bone Tube	.21517	**.64285**	-.14017	.00012	-.08475	-.31920
Bone Util	.00338	**.74871**	-.07847	.20400	.06110	.23346
Charmstone	-.06363	**.66650**	.13920	-.06743	.08291	.08457
Informal Tool	-.04827	.11159	-.07602	**.72641**	.07796	.06743
Obsidian	.04848	.16719	.46430	**.48017**	-.06037	-.15545
K Bead	.00384	.00419	-.04000	.00213	**.61003**	-.03096
Mano/Abrader	-.00480	-.10667	.07531	**.77049**	-.07705	-.05453
M Bead	.05102	.00793	-.10014	.00356	.10432	**.76673**
Mortar	.04803	-.12555	**.65155**	.11739	-.06109	.15051
Pendant	-.02662	.24027	.27462	-.00444	**.70184**	.11346
Pestle	-.04098	.08380	**.79860**	-.11574	.12396	-.11600
Pipe	.06563	.34072	.18436	-.10017	-.26968	**.50655**
Whistle	**.76020**	.21299	-.08065	-.06245	-.08266	-.01289

The factor loading patterns (Table 5-21) are all grouped, with no significant diagnostic negative loadings.

Table 5-21 Frequency Factor Characteristics

Factor	Positive Loadings
1	A bead, bone ornament, whistle
2	bone tube, util. bone, charmstone
3	mortar, pestle
4	informal tool, obsidian, mano/abrader
5	banjo, K bead, pendant
6	M bead, pipe

Despite the differences with the artifact presence analysis, some similarities remain. Mortars and pestles are still grouped together. Factor 4 groups a number of technomic artifacts. Banjo pendants and other pendants are also grouped, but this time with type K beads instead of type M beads.

After the generation of the factor scores, these were again correlated with age and sex (Table 5-22). The scores for factor 6 were significantly (P = 0.0643) correlated with sex, and the scores for factor 4 were correlated at the 90% level (P = 0.0843) with age. Factor 6 showed a higher average rank for males, while factor 4 showed a significantly lower rank for youths and a higher rank for elders.

Table 5-22 Frequency Factor Significance with Age and Sex

Factor	Age	Sex
1	.8008	.3408
2	.1980	.1673
3	.7534	.7709
4	*.0843*	.1541
5	.8404	.1581
6	.9297	*.0643*

The cluster analysis of the artifact frequency factor scores resulted in eight clusters (Table 5-23). Fully three-quarters of the burials are grouped into Cluster 1. The rest are grouped into a medium-sized (Cluster 2) and 6 other small clusters. These latter show a large degree of differentiation, both with respect to sex and diversity.

Table 5-23 Cluster Age, Sex, and Diversity

Cluster	**Size**	**Males**	**Females**	**Diversity**
1	179	61	51	.7 ± 1.0
2	30	16	8	3.3 ± 1.6
3	8	7	0	4.6 ± 1.1
4	9	8	0	3.6 ± 2.2
5	2	1	0	6.0 ± 2.8
6	11	4	4	3.6 ± 1.4
7	4	2	1	6.0 ± 3.5
8	1	1	0	3.0 ± 0.0

Again the clusters fall into three groups according to diversity. The large cluster has a very low diversity value. Two of the small clusters have diversity values of 6. The rest of the clusters have mean diversity values between 3.0 and 4.6.

There is a significant correlation (P = 0.05781) at the 90% level between the clustering and sex. Four of the clusters (Cluster 3, 4, 5, and 8) have no female members. Again, the large cluster is under-represented in males. There is no significant correlation (P = 0.91647) with respect to age.

From the mean factor scores for each cluster (Table 5-24) it can be seen that the pattern is quite different from that of the artifact presence. Most of the clusters have only one diagnostic mean score.

Table 5-24 Frequency Factor Cluster Mean Scores

Cluster	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
1	-.24 ± .12	-.14 ± .34	-.23 ± .36	-.07 ± .46	-.22 ± .12	-.23 ± .15
2	.82 ± 1.1	-.15 ± .40	.04 ± .70	.02 ± .43	.29 ± .62	.47 ± .81
3	.22 ± .94	.12 ± .75	-.10 ± .74	-.05 ± .23	4.4 ± 1.9	.28 ± .97
4	.49 ± .93	.37 ± .92	.8 ± 1.7	-.33 ± .67	-1.1 ± .11	3.5 ± 1.4
5	-.34 ± .65	.58 ± 1.2	-.19 ± 3.2	9.5 ± 2.4	.27 ± 1.5	.43 ± 1.5
6	-.13 ± .31	-.19 ± .64	3.1 ± 1.9	-.24 ± .45	[illegible] ± .91	-.42 ± .61
7	.5 ± 2.1	6.7 ± 1.5	.35 ± 1.5	-.1 ± 1.2	-.14 ± 1.5	-.6 ± [illegible]
8	11 ± [illegible]	-1.3 ± [illegible]	-.25 ± [illegible]	-.13 ± [illegible]	.26 ± [illegible]	-.56 ± [illegible]

Cluster 8 with its single member obviously exists due to its high score for factor 1.

There is no significant overall correlation with the spatial clustering, but again, there is an under-representation of Cluster 1 (the poorest cluster) in SC 5. This is not unexpected, or surprising at this point. Also, there are three clusters (3, 5, and 8) that are entirely contained in SC 5.

5.2.3 Summary

There are large departures between the results of the factor analysis based on presence only and on the actual number of artifacts. Which results are more significant depends on the relative ritual importance of the size of an association versus its mere presence. The truth probably lies somewhere in between. Despite these contradictions, there are some points of coincidence.

The factor loadings for both analyses tend to group technomic artifacts together. In both, mortars and pestles are grouped. Similarly, obsidian and mano/abraders form a set, as do bone tubes and utilitarian bone, and also banjo and other pendants.

The clustering of the factor scores presents notable groupings with respect to diversity, and some sharply delineated spatial structure. Some factor score clusters might represent horizontal distinction due to gender and sex balance, but this is tentative.

In summary, the results from the factor analysis point to structured use of artifact sets in a segment of the population, and that this use coincides with some of the previous analysis.

6. Interpretation

Bringing together the data, the analysis presented above, and the theoretical framework of Chapter 1 should be sufficient to test the three given hypotheses. Multivariate analytical techniques have been used to extract the statistical patterning in the data.

6.1 Hypothesis Verification

- **Hypothesis 1**: If the cemetery was highly structured, then:

    a) The cemetery should present structure in one or more of the following components, and some correlation between them: sex and age, location, body preparation, grave associations.

The sex and age composition is highly deviant from any that could represent the prehistoric population. There is an insufficient number of infants, there is a large number of young males and also elder females, and the sex ratio is highly skewed. In addition, the male and female age distributions are significantly different. These discrepancies may indicate some cultural selective process that determines inclusion in the cemetery based in part on age and sex.

CA-SCL-38 evidences a high degree of spatial organization. It consists of a fairly tight central cluster with two, much looser, concentric partial ring segments. It is similar in spatial pattern to the structure found by T. King at CA-MRN-27, although not in the distribution of their other mortuary variables. The spatial structure is correlated with age and sex. The various loci are associated with fairly narrow population segments. The central cluster stands out as having the most energy and resource intensive burials in the site. The central cluster is strongly associated with males and cremations, while four of the other clusters (two in the middle ring, two in the outer) have a balanced sex ratio. This last could indicate lineal groups, clans, or moieties, and later DNA analysis could verify this patterning. Furthermore, there are preferential areas for youths, elders, and infants in the intermediate and peripheral regions.

In addition, subdivision of the main spatial clusters shows further varying of characteristics. In particular, the central cluster was not monolithically uniform. In the central cluster, the sub-clusters vary widely in their mean artifact diversity (indicator of wealth). There are many artifact sets (given by artifact presence clusters) restricted to only two spatial clusters or sub-clusters, and in particular, there are four such sets restricted entirely (or almost so) to the central cluster. There is also a correlation between the artifact frequency sets and the spatial clustering.

The Yukisma site was a cemetery of preferential, although not exclusive, burial, at least through some of its period of use. The lack of sufficient infants to support the known high levels of population is one indicator. Another is the well defined spatial organization of the cemetery. The many and varied correlations between mode of interment, artifact sets, and age and sex on the one hand, and the burial location on the other, imply that social position (both vertical and horizontal) was a strong determinant of where the individual would be interred.

- **Hypothesis 2**: If there is evidence for rank, power, and authority in the society, then:
    - a) Number of types of artifacts should be non-randomly distributed.
    - b) The distribution of number of types of artifacts should be a decreasing function.
    - c) There should be distinctive artifact and/or body treatment clustering.
    - d) There should be authority symbols differentiated from status symbols.

The number of types of artifacts (diversity) for each burial is not randomly distributed. If the diversity of artifacts found with an individual indicate the power/status of the individual in life, a number of individuals have great power/status. Notably, the two with the highest diversity are females, one elder, one adult. Overall however, the diversity is significantly higher for males. The sex ratio is close to 1:1 for all human populations. For those burials of very low diversity (0-2 types) the sex ratio is much closer to 1:1 than for the rest of the burial sample, where males outnumber females. This difference points to preferential attribution of power/status upon males, but with notable exceptions.

Consistently through all the artifact clustering solutions there is a large cluster characterized by low diversity (few artifact associations) and low factor scores, from which the other clusters stand apart. This cluster is higher in females than the site population at large.

The number of types of artifacts (diversity) is not only non-random, but has a distinctive Poisson-like distribution. By far the largest group has no artifact associations, and as the diversity increases, the number of burials decreases. Individually, the same is true for most (if not all) of each of the artifacts. As a consequence, it is reasonable to assume that most (again, if not all) of the artifacts have some social meaning, and imply limited access.

Related to the above patterns is the fact that there is a correlation between the artifact diversity and the mode of interment. The mode of interment cluster with the highest diversity is a high energy cluster, with almost all members interred semi-flexed (more labor-intensive burials). Another mode of interment component that shows preferential tendencies is the body position. If a semi-flexed burial is considered more energy intensive than a tightly flexed burial (due to labor expenditure for a bigger grave), then this result is similar to that found by T. King (1976) at Buchanan Reservoir. King found that the extended burials were associated with more diverse artifact assemblages, and were interred in specific parts of the site. On the other hand, Luby (1991) found the opposite pattern at CA-ALA-328, a Bay Shore mound site, in its Component III basal cemetery (ca. 380 B.C.). Luby found that "loosely flexed" individuals had lesser quantities of burial associations.

At CA-SCL-38, particular artifacts (type K beads, trapezoidal pendants, clam shell pendants, and stone beads) are exclusive to males. There are no such artifact exclusive to females, or a specific age group. There are, however, some other interesting restrictions. A number of artifacts (charmstones, pipes, banjo pendants, and circular *Haliotis* pendants), when possessed by females, are restricted to the elder category. In a similar vein, there are artifacts (obsidian points, pipes, type K beads, banjo pendants, circular *Haliotis* pendants, whistles, and serrated bone tools) that are not associated with youths or infants. This different pattern would constitute a diagnostic age association in O'Shea's methodology.

Some areas are correlated with possible status markers. There are some very high preferences for certain artifact association sets to be restricted to one or two spatial clusters. Other areas are correlated with age and sex. There are predominantly adult male regions, as well as those dominated by females, and non-adult age groups as well. Moreover, some artifact clusters present fairly low diversities, and are not preferentially located within the high status area (central cluster).

The factor analysis for both artifact presence and artifact frequency shows a reasonable segregation between the artifact classes. They do, however, also point to the possible ritualization of the use of otherwise technomic artifacts. The grouping of mortars and pestles with shell beads is one example, and that of utilitarian bone artifacts with bone tubes and whistles another. When the burial domain is entered, these artifacts seem to acquire highly symbolic significance (cf. Leventhal 1993).

A group (see p. 236) composed of 4 individuals, all female or of indeterminate sex, are interred in the central cluster (SSC 5C). They are of all ages and have 1-2 type M beads and no other associations. If type M beads are status markers, then it is possible that these individuals, while not wealthy, had some measure of status.

The grouping of type L and type M beads vs. diversity is interesting. Individuals with the highest quantities of these beads do not posses high artifact diversities. This result is in contrast to that for the type K beads, for which the individuals with the highest quantity have fairly high diversity values. The marked difference between these two main groups suggests that type L and M beads were a differential class of marker, indicating status rather than wealth. The presence of type L and type M beads suggests the possibility of a class in the society with high status but not necessarily great wealth. This could shed light on the distribution of diversity with age. The peak diversity in males was for adults, and tended to decrease with age. The fact that some elders retained large numbers of beads could indicate that they had reduced wealth but preserved some measure of status.

The two female burials with the highest overall diversity (Burials 93, and 63) have quite similar assemblages. One male with a diversity of 7 (Burial 97) also has a similar assemblage. All three burials belong to the same artifact presence cluster. The assemblages in question are mainly composed of sociotechnic and ideotechnic artifacts. The older of the two females is the only female with pipes. The younger male, however, has larger numbers of beads associated. All these characteristics point to a highly ritualistic treatment of the burial assemblage, with females only attaining some "male" position/status (indicated by the artifact presence factor 4) through greater age.

In contrast, there is little independent evidence for authority, which is marked by symbols of authority. It is difficult to establish these symbols from the mortuary data alone. There are, however, some possible candidates. If one accepts that the seat of authority was the central cluster, then an artifact that was restricted to it could be a candidate. There are four such artifacts (charmstones, stone beads, type K beads, and type M beads). Stone beads have already been characterized as markers of status through ethnographic accounts (C. King 1976, Goldschmidt 1976).

In addition, more authority symbol candidates fall out of the artifact frequency analysis. These are the ones that are most restrictive in terms of representation, or are restricted to one or a few classes of individuals. The factor score clusterings show a reduced number of individuals with unusually high scores, again indicating highly differential mechanisms at work.

The numerous and complex relationships between the artifact assemblages, artifact diversity, particular artifacts, and age and sex likely point to a rich system of status, power, and authority differentiation. Tighter chronological control could lead to the segregation of some of these effects. It remains to be seen if some of these patterns can be reproduced by the application of the current methodology to other sites.

- **Hypothesis 3**: The social structure was hierarchical rather than egalitarian.
  - a) The components should exhibit few correlations with age and sex.
  - b) Children should not be distinguished from some adults in location.
  - c) Sex distinctions in associations should be low.
  - d) Location should be independent of age and sex, but correlated with markers of rank and/or wealth.

e) Mortuary association clusters should be distinct.

f) Burials with high status should be spatially clustered.

g) There should be some infants and/or children with markers of status.

There is ample evidence for non-egalitarian patterns of societal organization during the period of most intense utilization (Middle and Late Periods) at this site. These include the lack of correlation between age and sex and the other mortuary variables. The few artifacts that do evidence a significant correlation with age or sex may be markers of status or authority.

In the contingency tables for mode of interment and age and sex the results were equivocal (Table 4-13). In the compacted categories there is one correlation with age significant at the 95% level, and two at the 90% level. With respect to sex, however, there is only one at the 90% level.

In the correlations between artifact possessions and age and sex (Table 4-44), it is clear that there is a low number of significant correlations, even at the 90% level.

Infants are fairly highly segregated (only one in the central cluster), but sub-adults (infants and youths) in general are more widely distributed, including in the high status area.

Some areas are age and sex dependent, notably the central cluster, but there are more peripheral clusters where the sex ratio is balanced and there are no deviations in age from the population as a whole. There are, on the other hand, a multitude of artifact and mode of interment correlations and restrictions with respect to spatial location.

The artifact associations show a high degree of differentiation, both in terms of the association and of the factor score clusterings. Some highly differentiated associations group tightly. There are also strong correlations between individual artifacts, or artifact sets, and diversity.

In particular, there is a strong correlation between high status, in its many possible manifestations, and inclusion in the central cluster. This cluster is characterized by the highest of diversities, high energy burials, high status artifact sets, and some of the highest individual factor scores.

Infants and youths as a whole exhibit the lowest diversities. There are, however, notable exceptions. Burials 178, 137, and 156 are all less than 4 years in age, but have artifact diversity of 3 or more, greater than 78% of the population. They represent a strong indication of status/wealth ascription.

From the foregoing, despite some indications to the contrary, it can be stated that there is ample evidence for non-egalitarian social structures already in place by the Middle Period. Such a pattern is in broad agreement with the results found at several similar Central and Southern California burial sites. Given the present results, similar results at other sites would point to the patterns of regional hierarchical structure advanced by Brown.

There are several possible causes for the rise of such non-egalitarian systems in California, including the occurrence of periodic droughts in the region, which would lead to heightened competition for scarce resources; or a pattern of inter-tribal aggression (Carneiro 1970, T. King 1976, L. King 1982, Moratto 1984, Walker 1989, Walker, Lambert and DeNiro 1989, and others). There are signs of such interpersonal aggression, both here and at CA-ALA-329 (Jurmain 1991, Jurmain and Bellifemine 1997), although not sufficient to account for the high proportion of young males at the site.

6.2 Summary

More tests may be necessary for each artifact type. In particular, the multivariate approach can be supplemented with narrow tests that focus on a single artifact and correlate it with specific conditions. One possibility is to look for those artifacts that do not occur with females, are associated with a high diversity value, and perhaps are restricted to one area. Although these tests will tend to concentrate on the artifacts with the least representation in the burial sample (that have been ignored for statistical reasons), they still rest on the results from the previous multivariate analyses (diversity, spatial clustering, etc.).

It remains for the future researcher to explore several questions that have surfaced. What is the nature of the several groups of exceptional individuals in the site? According to Goldstein and Saxe, the most likely explanation for the central cluster is corporate group control of a limited resource. What are the resources controlled by the group using the central cluster? What are the temporal effects on mortuary practices? How do environmental/economic factors influence mortuary behavior?

The chronology of each grave was not dealt with in depth due to the inconsistent nature of the dating techniques. Not all the burials had organic materials or artifacts that were susceptible to dating, and/or were temporally sensitive. In addition, the depth data could not be used due to the extensively modified nature of the site. Moreover, there was no apparent spatial structure to those burials that were dated. Such a distribution could imply that the manner of use of the site was fairly constant through time, despite the extended period of site utilization. The structural integrity of the site would be consistent with ethnohistoric accounts of poles used as grave markers (Leventhal 1993). On the other hand, lack of chronological control could obscure some of the significant points of the data.

It was gratifying to discover that the patterns found in the multivariate analysis were of a consistent nature. There were many points of convergence of the different methodologies in the realm of the spatial, artifact and corporeal treatment. The methods proved both complementary in showing different facets of the behavior, and coincident in the fashion that the results converge. It is also clear that only after several different types of analysis do some of these patterns emerge. Two of the major defining components are artifact diversity and spatial location, and these should be the initial points of attack.

It was apparent in the course of the analysis that the multivariate and univariate approaches are complementary. The multivariate results point to fruitful avenues of exploration in the uni- and bivariate domain. In turn, this will lead back to a refinement of the multivariate investigation.

It is evident that there is a need for similar treatment of mortuary populations throughout California. Such a perspective will hopefully lead to understanding of the complex patterns of social structure and evolution. Since these patterns of social interaction take place in the larger mesh of inter-tribal relationships, it is imperative to understand the latter to make sense of the former. It is only through this treatment that full advantage can be taken of the present work and that of predecessors in the field.

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Appendix A: Cross-Tabulations

Cross-tabulations of Artifact Presence/Absence and Frequency

by Age and Sex

Artifacts

PRESENCE Flaked Informal Tools by AGEGROUP Age Group

AGEGROUP — Page 1 of 1

PRESENCE	Count / Exp Val / Row Pct / Col Pct	Infant 0	Youth 1	Adult 2	Elder 3	Row Total
0 Absence	Count	8	26	117	58	209
	Exp Val	7.7	25.7	117.3	58.2	85.7%
	Row Pct	3.8%	12.4%	56.0%	27.8%	
	Col Pct	88.9%	86.7%	85.4%	85.3%	
1 Presence	Count	1	4	20	10	35
	Exp Val	1.3	4.3	19.7	9.8	14.3%
	Row Pct	2.9%	11.4%	57.1%	28.6%	
	Col Pct	11.1%	13.3%	14.6%	14.7%	
Column Total		9	30	137	68	244
		3.7%	12.3%	56.1%	27.9%	100.0%

PRESENCE Flaked Informal Tools by SEX Sex

SEX — Page 1 of 1

PRESENCE	Count / Exp Val / Row Pct / Col Pct	Male 1	Female 2	Row Total
0 Absence	Count	82	56	138
	Exp Val	84.1	53.9	84.1%
	Row Pct	59.4%	40.6%	
	Col Pct	82.0%	87.5%	
1 Presence	Count	18	8	26
	Exp Val	15.9	10.1	15.9%
	Row Pct	69.2%	30.8%	
	Col Pct	18.0%	12.5%	
Column Total		100	64	164
		61.0%	39.0%	100.0%

AMOUNT Flaked Informal Tools by AGEGROUP Age Group

AGEGROUP — Page 1 of 1

AMOUNT	Count / Exp Val / Row Pct / Col Pct	Infant 0	Youth 1	Adult 2	Elder 3	Row Total
1 Few	Count	1	4	17	9	31
	Exp Val	.9	3.5	17.7	8.9	88.6%
	Row Pct	3.2%	12.9%	54.8%	29.0%	
	Col Pct	100.0%	100.0%	85.0%	90.0%	
2 Some	Count	0	0	1	1	2
	Exp Val	.1	.2	1.1	.6	5.7%
	Row Pct	.0%	.0%	50.0%	50.0%	
	Col Pct	.0%	.0%	5.0%	10.0%	
3 Many	Count	0	0	2	0	2
	Exp Val	.1	.2	1.1	.6	5.7%
	Row Pct	.0%	.0%	100.0%	.0%	
	Col Pct	.0%	.0%	10.0%	.0%	
Column Total		1	4	20	10	35
		2.9%	11.4%	57.1%	28.6%	100.0%

AMOUNT Flaked Informal Tools by SEX Sex

SEX — Page 1 of 1

AMOUNT	Count / Exp Val / Row Pct / Col Pct	Male 1	Female 2	Row Total
1 Few	Count	16	7	23
	Exp Val	15.9	7.1	88.5%
	Row Pct	69.6%	30.4%	
	Col Pct	88.9%	87.5%	
2 Some	Count	1	1	2
	Exp Val	1.4	.6	7.7%
	Row Pct	50.0%	50.0%	
	Col Pct	5.6%	12.5%	
3 Many	Count	1	0	1
	Exp Val	.7	.3	[illegible]
	Row Pct	100.0%	.0%	
	Col Pct	5.6%	.0%	
Column Total		18	8	26
		69.2%	30.8%	[illegible]

PRESENCE Obsidian Tools by AGEGROUP Age Group

AGEGROUP — Page 1 of 1

PRESENCE	Count / Exp Val / Row Pct / Col Pct	Infant 0	Youth 1	Adult 2	Elder 3	Row Total
0 Absence	Count	9	30	125	62	226
	Exp Val	8.3	27.8	126.9	63.0	92.6%
	Row Pct	4.0%	13.3%	55.3%	27.4%	
	Col Pct	100.0%	100.0%	91.2%	91.2%	
1 Presence	Count	0	0	12	6	18
	Exp Val	.7	2.2	10.1	5.0	7.4%
	Row Pct	.0%	.0%	66.7%	33.3%	
	Col Pct	.0%	.0%	8.8%	8.8%	
Column Total		9	30	137	68	244
		3.7%	12.3%	56.1%	27.9%	100.0%

PRESENCE Obsidian Tools by SEX Sex

SEX — Page 1 of 1

PRESENCE	Count / Exp Val / Row Pct / Col Pct	Male 1	Female 2	Row Total
0 Absence	Count	89	61	150
	Exp Val	91.5	58.5	91.5%
	Row Pct	59.3%	40.7%	
	Col Pct	89.0%	95.3%	
1 Presence	Count	11	3	14
	Exp Val	8.5	5.5	8.5%
	Row Pct	78.6%	21.4%	
	Col Pct	11.0%	4.7%	
Column Total		100	64	164
		61.0%	39.0%	100.0%

PRESENCE Mortars by AGEGROUP Age Group

AGEGROUP Page 1 of 1

PRESENCE	Count / Exp Val / Row Pct / Col Pct	Infant 0	Youth 1	Adult 2	Elder 3	Row Total
Absence	0	9	29	124	62	224
		8.3	27.5	125.8	62.4	91.8%
		4.0%	12.9%	55.4%	27.7%	
		100.0%	96.7%	90.5%	91.2%	
Presence	1	0	1	13	6	20
		.7	2.5	11.2	5.6	8.2%
		.0%	5.0%	65.0%	30.0%	
		.0%	3.3%	9.5%	8.8%	
Column Total		9	30	137	68	244
		3.7%	12.3%	56.1%	27.9%	100.0%

PRESENCE Mortars by SEX Sex

SEX Page 1 of 1

PRESENCE	Count / Exp Val / Row Pct / Col Pct	Male 1	Female 2	Row Total
Absence	0	91	56	147
		89.6	57.4	89.6%
		61.9%	38.1%	
		91.0%	87.5%	
Presence	1	9	8	17
		10.4	6.6	10.4%
		52.9%	47.1%	
		9.0%	12.5%	
Column Total		100	64	164
		61.0%	39.0%	100.0%

PRESENCE Pestles by AGEGROUP Age Group

AGEGROUP Page 1 of 1

PRESENCE	Count / Exp Val / Row Pct / Col Pct	Infant 0	Youth 1	Adult 2	Elder 3	Row Total
Absence	0	9	26	118	63	216
		8.0	26.6	121.3	60.2	88.5%
		4.2%	12.0%	54.6%	29.2%	
		100.0%	86.7%	86.1%	92.6%	
Presence	1	0	4	19	5	28
		1.0	3.4	15.7	7.8	11.5%
		.0%	14.3%	67.9%	17.9%	
		.0%	13.3%	13.9%	7.4%	
Column Total		9	30	137	68	244
		3.7%	12.3%	56.1%	27.9%	100.0%

PRESENCE Pestles by SEX Sex

SEX Page 1 of 1

PRESENCE	Count / Exp Val / Row Pct / Col Pct	Male 1	Female 2	Row Total
Absence	0	88	53	141
		86.0	55.0	86.0%
		62.4%	37.6%	
		88.0%	82.8%	
Presence	1	12	11	23
		14.0	9.0	14.0%
		52.2%	47.8%	
		12.0%	17.2%	
Column Total		100	64	164
		61.0%	39.0%	100.0%

AMOUNT Pestles by AGEGROUP Age Group

AGEGROUP Page 1 of 1

AMOUNT	Count / Exp Val / Row Pct / Col Pct	Youth 1	Adult 2	Elder 3	Row Total
Few	1	2	16	4	22
		3.1	14.9	3.9	78.6%
		9.1%	72.7%	18.2%	
		50.0%	84.2%	80.0%	
Some	2	2	3	0	5
		.7	3.4	.9	17.9%
		40.0%	60.0%	.0%	
		50.0%	15.8%	.0%	
Many	3	0	0	1	1
		.1	.7	.2	3.6%
		.0%	.0%	100.0%	
		.0%	.0%	20.0%	
Column Total		4	19	5	28
		14.3%	67.9%	17.9%	100.0%

AMOUNT Pestles by SEX Sex

SEX Page 1 of 1

AMOUNT	Count / Exp Val / Row Pct / Col Pct	Male 1	Female 2	Row Total
Few	1	9	10	19
		9.9	9.1	82.6%
		47.4%	52.6%	
		75.0%	90.9%	
Some	2	2	1	3
		1.6	1.4	13.0%
		66.7%	33.3%	
		16.7%	9.1%	
Many	3	1	0	1
		.5	.5	4.3%
		100.0%	.0%	
		8.3%	.0%	
Column Total		12	11	23
		52.2%	47.8%	100.0%

PRESENCE Charmstones by AGEGROUP Age Group

Count Exp Val Row Pct Col Pct	AGEGROUP Infant 0	Youth 1	Adult 2	Page 1 of 1 Elder 3	Row Total
PRESENCE Absence 0	9 8.5 3.9% 100.0%	29 28.4 12.6% 96.7%	126 129.7 54.5% 92.0%	67 64.4 29.0% 98.5%	231 94.7%
Presence 1	0 .5 .0% .0%	1 1.6 7.7% 3.3%	11 7.3 84.6% 8.0%	1 3.6 7.7% 1.5%	13 5.3%
Column Total	9 3.7%	30 12.3%	137 56.1%	68 27.9%	244 100.0%

PRESENCE Charmstones by SEX Sex

Count Exp Val Row Pct Col Pct	SEX Male 1	Page 1 of 1 Female 2	Row Total
PRESENCE Absence 0	91 93.9 59.1% 91.0%	63 60.1 40.9% 98.4%	154 93.9%
Presence 1	9 6.1 90.0% 9.0%	1 3.9 10.0% 1.6%	10 6.1%
Column Total	100 61.0%	64 39.0%	164 100.0%

AMOUNT Charmstones by AGEGROUP Age Group

Count Exp Val Row Pct Col Pct	AGEGROUP Youth 1	Adult 2	Page 1 of 1 Elder 3	Row Total
AMOUNT Few 1	1 .5 16.7% 100.0%	5 5.1 83.3% 45.5%	0 .5 .0% .0%	6 46.2%
Some 2	0 .3 .0% .0%	4 3.4 100.0% 36.4%	0 .3 .0% .0%	4 30.8%
Many 3	0 .2 .0% .0%	2 2.5 66.7% 18.2%	1 .2 33.3% 100.0%	3 23.1%
Column Total	1 7.7%	11 84.6%	1 7.7%	13 100.0%

AMOUNT Charmstones by SEX Sex

Count Exp Val Row Pct Col Pct	SEX Male 1	Page 1 of 1 Female 2	Row Total
AMOUNT Few 1	5 4.5 100.0% 55.6%	0 .5 .0% .0%	5 50.0%
Some 2	2 1.8 100.0% 22.2%	0 .2 .0% .0%	2 20.0%
Many 3	2 2.7 66.7% 22.2%	1 .3 33.3% 100.0%	3 30.0%
Column Total	9 90.0%	1 10.0%	10 100.0%

PRESENCE stone pipes by AGEGROUP Age Group

Count Exp Val Row Pct Col Pct	AGEGROUP Infant 0	Youth 1	Adult 2	Page 1 of 1 Elder 3	Row Total
PRESENCE Absence 0	9 8.7 3.8% 100.0%	30 29.1 12.7% 100.0%	132 133.1 55.7% 96.4%	66 66.0 27.8% 97.1%	237 97.1%
Presence 1	0 .3 .0% .0%	0 .9 .0% .0%	5 3.9 71.4% 3.6%	2 2.0 28.6% 2.9%	7 2.9%
Column Total	9 3.7%	30 12.3%	137 56.1%	68 27.9%	244 100.0%

PRESENCE stone pipes by AGEGROUP Age Group

Count Exp Val Row Pct Col Pct	AGEGROUP Youth 1	Adult 2	Page 1 of 1 Elder 3	Row Total
PRESENCE Absence 0	1 1.0 .6% 100.0%	94 95.4 59.5% 94.9%	63 61.7 39.9% 98.4%	158 96.3%
Presence 1	0 .0 .0% .0%	5 3.6 83.3% 5.1%	1 2.3 16.7% 1.6%	6 3.7%
Column Total	1 .6%	99 60.4%	64 39.0%	164 100.0%

PRESENCE Spire Lopped by AGEGROUP Age Group

AGEGROUP — Page 1 of

PRESENCE	Count Exp Val Row Pct Col Pct	Infant 0	Youth 1	Adult 2	Elder 3	Row Total
Absence	0	6 6.0 3.7% 66.7%	22 19.9 13.6% 73.3%	82 91.0 50.6% 59.9%	52 45.1 32.1% 76.5%	162 66.4%
Presence	1	3 3.0 3.7% 33.3%	8 10.1 9.8% 26.7%	55 46.0 67.1% 40.1%	16 22.9 19.5% 23.5%	82 33.6%
	Column Total	9 3.7%	30 12.3%	137 56.1%	68 27.9%	244 100.0%

PRESENCE Spire Lopped by SEX

SEX — Page 1 of 1

PRESENCE	Count Exp Val Row Pct Col Pct	Male 1	Female 2	Row Total
Absence	0	60 64.6 56.6% 60.0%	46 41.4 43.4% 71.9%	106 64.6%
Presence	1	40 35.4 69.0% 40.0%	18 22.6 31.0% 28.1%	58 35.4%
	Column Total	100 61.0%	64 39.0%	164 100.0%

AMOUNT Spire Lopped by AGEGROUP Age Group

AGEGROUP — Page 1 of 1

AMOUNT	Count Exp Val Row Pct Col Pct	Infant 0	Youth 1	Adult 2	Elder 3	Row Total
Few	1	2 2.0 3.6% 66.7%	6 5.5 10.7% 75.0%	38 37.6 67.9% 69.1%	10 10.9 17.9% 62.5%	56 68.3%
Some	2	1 .6 5.9% 33.3%	2 1.7 11.8% 25.0%	9 11.4 52.9% 16.4%	5 3.3 29.4% 31.3%	17 20.7%
Many	3	0 .3 .0% .0%	0 .3 .0% .0%	8 6.0 88.9% 14.5%	1 1.8 11.1% 6.3%	9 11.0%
	Column Total	3 3.7%	8 9.8%	55 67.1%	16 19.5%	82 100.0%

AMOUNT Spire Lopped by SEX

SEX — Page 1 of 1

AMOUNT	Count Exp Val Row Pct Col Pct	Male 1	Female 2	Row Total
Few	1	22 24.8 61.1% 55.0%	14 11.2 38.9% 77.8%	36 62.1%
Some	2	10 9.0 76.9% 25.0%	3 4.0 23.1% 16.7%	13 22.4%
Many	3	8 6.2 88.9% 20.0%	1 2.8 11.1% 5.6%	9 15.5%
	Column Total	40 69.0%	18 31.0%	58 100.0%

PRESENCE M Beads by AGEGROUP Age Group

AGEGROUP — Page 1 of 1

PRESENCE	Count Exp Val Row Pct Col Pct	Infant 0	Youth 1	Adult 2	Elder 3	Row Total
Absence	0	9 8.1 4.1% 100.0%	28 26.9 12.8% 93.3%	122 123.0 55.7% 89.1%	60 61.0 27.4% 88.2%	219 89.8%
Presence	1	0 .9 .0% .0%	2 3.1 8.0% 6.7%	15 14.0 60.0% 10.9%	8 7.0 32.0% 11.8%	25 10.2%
	Column Total	9 3.7%	30 12.3%	137 56.1%	68 27.9%	244 100.0%

PRESENCE M Beads by SEX Sex

SEX — Page 1 of 1

PRESENCE	Count Exp Val Row Pct Col Pct	Male 1	Female 2	Row Total
Absence	0	83 86.6 58.5% 83.0%	59 55.4 41.5% 92.2%	142 86.6%
Presence	1	17 13.4 77.3% 17.0%	5 8.6 22.7% 7.8%	22 13.4%
	Column Total	100 61.0%	64 39.0%	164 100.0%

AMOUNT M Beads by AGEGROUP Age Group

AMOUNT	Count Exp Val Row Pct Col Pct	AGEGROUP Youth 1	Adult 2	Elder 3	Row Total
Few	1	1 .9 9.1% 50.0%	7 6.6 63.6% 46.7%	3 3.5 27.3% 37.5%	11 44.0%
Some	2	1 1.0 8.3% 50.0%	8 7.2 66.7% 53.3%	3 3.8 25.0% 37.5%	12 48.0%
Many	3	0 .2 .0% .0%	0 1.2 .0% .0%	2 .6 100.0% 25.0%	2 8.0%
	Column Total	2 8.0%	15 60.0%	8 32.0%	25 100.0%

Page 1 of 1

AMOUNT M Beads by SEX Sex

AMOUNT	Count Exp Val Row Pct Col Pct	SEX Male 1	Female 2	Row Total
Few	1	5 7.0 55.6% 29.4%	4 2.0 44.4% 80.0%	9 40.9%
Some	2	10 8.5 90.9% 58.8%	1 2.5 9.1% 20.0%	11 50.0%
Many	3	2 1.5 100.0% 11.8%	0 .5 .0% .0%	2 9.1%
	Column Total	17 77.3%	5 22.7%	22 100.0%

Page 1 of 1

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PRESENCE Bone Tubes by AGEGROUP Age Group

PRESENCE	Count Exp Val Row Pct Col Pct	AGEGROUP Infant 0	Youth 1	Adult 2	Elder 3	Row Total
Absence	0	9 8.7 3.8% 100.0%	29 29.0 12.3% 96.7%	133 132.5 56.4% 97.1%	65 65.8 27.5% 95.6%	236 96.7%
Presence	1	0 .3 .0% .0%	1 1.0 12.5% 3.3%	4 4.5 50.0% 2.9%	3 2.2 37.5% 4.4%	8 3.3%
	Column Total	9 3.7%	30 12.3%	137 56.1%	68 27.9%	244 100.0%

Page 1 of 1

PRESENCE Bone Tubes by SEX Sex

PRESENCE	Count Exp Val Row Pct Col Pct	SEX Male 1	Female 2	Row Total
Absence	0	97 96.3 61.4% 97.0%	61 61.7 38.6% 95.3%	158 96.3%
Presence	1	3 3.7 50.0% 3.0%	3 2.3 50.0% 4.7%	6 3.7%
	Column Total	100 61.0%	64 39.0%	164 100.0%

Page 1 of 1

AMOUNT Bone Tubes by AGEGROUP Age Group

AMOUNT	Count Exp Val Row Pct Col Pct	AGEGROUP Youth 1	Adult 2	Elder 3	Row Total
Few	1	1 .3 50.0% 100.0%	1 1.0 50.0% 25.0%	0 .8 .0% .0%	2 25.0%
Some	2	0 .5 .0% .0%	2 2.0 50.0% 50.0%	2 1.5 50.0% 66.7%	4 50.0%
Many	3	0 .3 .0% .0%	1 1.0 50.0% 25.0%	1 .8 50.0% 33.3%	2 25.0%
	Column Total	1 12.5%	4 50.0%	3 37.5%	8 100.0%

Page 1 of 1

AMOUNT Bone Tubes by SEX Sex

AMOUNT	Count Exp Val Row Pct Col Pct	SEX Male 1	Female 2	Row Total
Few	1	1 .5 100.0% 33.3%	0 .5 .0% .0%	1 16.7%
Some	2	1 2.0 25.0% 33.3%	3 2.0 75.0% 100.0%	4 66.7%
Many	3	1 .5 100.0% 33.3%	0 .5 .0% .0%	1 16.7%
	Column Total	3 50.0%	3 50.0%	6 100.0%

Page 1 of 1

PRESENCE K Beads by AGEGROUP Age Group

Page 1 of 1

PRESENCE		AGEGROUP	Infant 0	Youth 1	Adult 2	Elder 3	Row Total
Absence	0	Count	9	30	131	67	237
		Exp Val	8.7	29.1	133.1	66.0	97.1%
		Row Pct	3.8%	12.7%	55.3%	28.3%	
		Col Pct	100.0%	100.0%	95.6%	98.5%	
Presence	1	Count	0	0	6	1	7
		Exp Val	.3	.9	3.9	2.0	2.9%
		Row Pct	.0%	.0%	85.7%	14.3%	
		Col Pct	.0%	.0%	4.4%	1.5%	
		Column Total	9	30	137	68	244
			3.7%	12.3%	56.1%	27.9%	100.0%

PRESENCE K Beads by SEX Sex

Page 1 of 1

PRESENCE		SEX	Male 1	Female 2	Row Total
Absence	0	Count	94	64	158
		Exp Val	96.3	61.7	96.3%
		Row Pct	59.5%	40.5%	
		Col Pct	94.0%	100.0%	
Presence	1	Count	6	0	6
		Exp Val	3.7	2.3	3.7%
		Row Pct	100.0%	.0%	
		Col Pct	6.0%	.0%	
		Column Total	100	64	164
			61.0%	39.0%	100.0%

AMOUNT K Beads by AGEGROUP Age Group

Page 1 of 1

AMOUNT		AGEGROUP	Adult 2	Elder 3	Row Total
Few	1	Count	3	0	3
		Exp Val	2.6	.4	42.9%
		Row Pct	100.0%	.0%	
		Col Pct	50.0%	.0%	
Some	2	Count	2	1	3
		Exp Val	2.6	.4	42.9%
		Row Pct	66.7%	33.3%	
		Col Pct	33.3%	100.0%	
Many	3	Count	1	0	1
		Exp Val	.9	.1	14.3%
		Row Pct	100.0%	.0%	
		Col Pct	16.7%	.0%	
		Column Total	6	1	7
			85.7%	14.3%	100.0%

AMOUNT K Beads by SEX Sex

Page 1 of 1

AMOUNT		SEX	Male 1	Row Total
Few	1	Count	3	3
		Exp Val	3.0	50.0%
		Row Pct	100.0%	
		Col Pct	50.0%	
Some	2	Count	2	2
		Exp Val	2.0	33.3%
		Row Pct	100.0%	
		Col Pct	33.3%	
Many	3	Count	1	1
		Exp Val	1.0	16.7%
		Row Pct	100.0%	
		Col Pct	16.7%	
		Column Total	6	6
			100.0%	100.0%

PRESENCE Pendants by AGEGROUP Age Group

Page 1 of 1

PRESENCE		AGEGROUP	Infant 0	Youth 1	Adult 2	Elder 3	Row Total
Absence	0	Count	8	25	108	59	200
		Exp Val	7.4	24.6	112.3	55.7	82.0%
		Row Pct	4.0%	12.5%	54.0%	29.5%	
		Col Pct	88.9%	83.3%	78.8%	86.8%	
Presence	1	Count	1	5	29	9	44
		Exp Val	1.6	5.4	24.7	12.3	18.0%
		Row Pct	2.3%	11.4%	65.9%	20.5%	
		Col Pct	11.1%	16.7%	21.2%	13.2%	
		Column Total	9	30	137	68	244
			3.7%	12.3%	56.1%	27.9%	100.0%

PRESENCE Pendants by SEX Sex

Page 1 of 1

PRESENCE		SEX	Male 1	Female 2	Row Total
Absence	0	Count	80	51	131
		Exp Val	79.9	51.1	79.9%
		Row Pct	61.1%	38.9%	
		Col Pct	80.0%	79.7%	
Presence	1	Count	20	13	33
		Exp Val	20.1	12.9	20.1%
		Row Pct	60.6%	39.4%	
		Col Pct	20.0%	20.3%	
		Column Total	100	64	164
			61.0%	39.0%	100.0%

AMOUNT Pendants by AGEGROUP Age Group

AGEGROUP — Page 1 of 1

AMOUNT	Count Exp Val Row Pct Col Pct	Infant 0	Youth 1	Adult 2	Elder 3	Row Total
Few	1	0 .7 .0% .0%	3 3.3 10.3% 60.0%	20 19.1 69.0% 69.0%	6 5.9 20.7% 66.7%	29 65.9%
Some	2	1 .3 8.3% 100.0%	2 1.4 16.7% 40.0%	6 7.9 50.0% 20.7%	3 2.5 25.0% 33.3%	12 27.3%
Many	3	0 .1 .0% .0%	0 .3 .0% .0%	3 2.0 100.0% 10.3%	0 .6 .0% .0%	3 6.8%
	Column Total	1 2.3%	5 11.4%	29 65.9%	9 20.5%	44 100.0%

AMOUNT Pendants by SEX Sex

SEX — Page 1 of 1

AMOUNT	Count Exp Val Row Pct Col Pct	Male 1	Female 2	Row Total
Few	1	12 13.3 54.5% 60.0%	10 8.7 45.5% 76.9%	22 66.7%
Some	2	6 5.5 66.7% 30.0%	3 3.5 33.3% 23.1%	9 27.3%
Many	3	2 1.2 100.0% 10.0%	0 .8 .0% .0%	2 6.1%
	Column Total	20 60.6%	13 39.4%	33 100.0%

PRESENCE Banjo Pendants by AGEGROUP Age Group

AGEGROUP — Page 1 of 1

PRESENCE	Count Exp Val Row Pct Col Pct	Infant 0	Youth 1	Adult 2	Elder 3	Row Total
Absence	0	8 7.4 4.0% 88.9%	25 24.6 12.5% 83.3%	108 112.3 54.0% 78.8%	59 55.7 29.5% 86.8%	200 82.0%
Presence	1	1 1.6 2.3% 11.1%	5 5.4 11.4% 16.7%	29 24.7 65.9% 21.2%	9 12.3 20.5% 13.2%	44 18.0%
	Column Total	9 3.7%	30 12.3%	137 56.1%	68 27.9%	244 100.0%

PRESENCE Banjo Pendants by SEX Sex

SEX — Page 1 of 1

PRESENCE	Count Exp Val Row Pct Col Pct	Male 1	Female 2	Row Total
Absence	0	80 79.9 61.1% 80.0%	51 51.1 38.9% 79.7%	131 79.9%
Presence	1	20 20.1 60.6% 20.0%	13 12.9 39.4% 20.3%	33 20.1%
	Column Total	100 61.0%	64 39.0%	164 100.0%

AMOUNT Banjo Pendants by AGEGROUP Age Group

AGEGROUP — Page 1 of 1

AMOUNT	Count Exp Val Row Pct Col Pct	Infant 0	Youth 1	Adult 2	Elder 3	Row Total
Few	1	0 .3 .0% .0%	1 1.4 8.3% 20.0%	8 7.9 66.7% 27.6%	3 2.5 25.0% 33.3%	12 27.3%
Some	2	0 .2 .0% .0%	0 .8 .0% .0%	6 4.6 85.7% 20.7%	1 1.4 14.3% 11.1%	7 15.9%
Many	3	1 .6 4.0% 100.0%	4 2.8 16.0% 80.0%	15 16.5 60.0% 51.7%	5 5.1 20.0% 55.6%	25 56.8%
	Column Total	1 2.3%	5 11.4%	29 65.9%	9 20.5%	44 100.0%

AMOUNT Banjo Pendants by SEX Sex

SEX — Page 1 of 1

AMOUNT	Count Exp Val Row Pct Col Pct	Male 1	Female 2	Row Total
Few	1	3 5.5 33.3% 15.0%	6 3.5 66.7% 46.2%	9 27.3%
Some	2	5 3.6 83.3% 25.0%	1 2.4 16.7% 7.7%	6 18.2%
Many	3	12 10.9 66.7% 60.0%	6 7.1 33.3% 46.2%	18 54.5%
	Column Total	20 60.6%	13 39.4%	33 100.0%

PRESENCE Bone Whistles by AGEGROUP Age Group

AGEGROUP — Page 1 of 1

PRESENCE	Count Exp Val Row Pct Col Pct	Infant 0	Youth 1	Adult 2	Elder 3	Row Total
Absence	0	9 8.4 3.9% 100.0%	30 28.0 13.2% 100.0%	124 128.0 54.4% 90.5%	65 63.5 28.5% 95.6%	228 93.4%
Presence	1	0 .6 .0% .0%	0 2.0 .0% .0%	13 9.0 81.3% 9.5%	3 4.5 18.8% 4.4%	16 6.6%
	Column Total	9 3.7%	30 12.3%	137 56.1%	68 27.9%	244 100.0%

PRESENCE Bone Whistles by SEX Sex

SEX — Page 1 of 1

PRESENCE	Count Exp Val Row Pct Col Pct	Male 1	Female 2	Row Total
Absence	0	90 91.5 60.0% 90.0%	60 58.5 40.0% 93.8%	150 91.5%
Presence	1	10 8.5 71.4% 10.0%	4 5.5 28.6% 6.3%	14 8.5%
	Column Total	100 61.0%	64 39.0%	164 100.0%

AMOUNT Bone Whistles by AGEGROUP Age Group

AGEGROUP — Page 1 of 1

AMOUNT	Count Exp Val Row Pct Col Pct	Adult 2	Elder 3	Row Total
Few	1	6 7.3 66.7% 46.2%	3 1.7 33.3% 100.0%	9 56.3%
Some	2	3 2.4 100.0% 23.1%	0 .6 .0% .0%	3 18.8%
Many	3	4 3.3 100.0% 30.8%	0 .8 .0% .0%	4 25.0%
	Column Total	13 81.3%	3 18.8%	16 100.0%

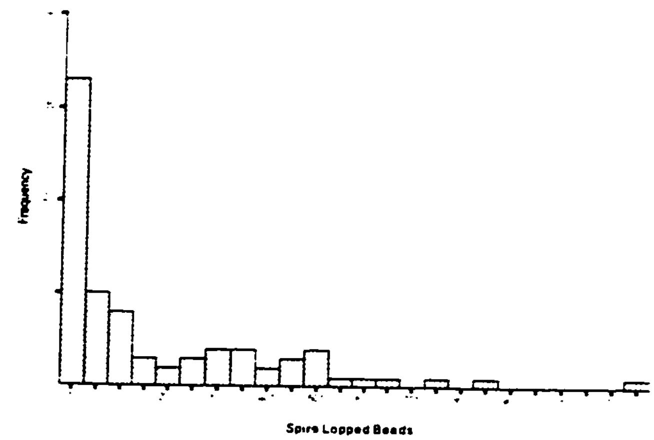
AMOUNT Bone Whistles by SEX Sex

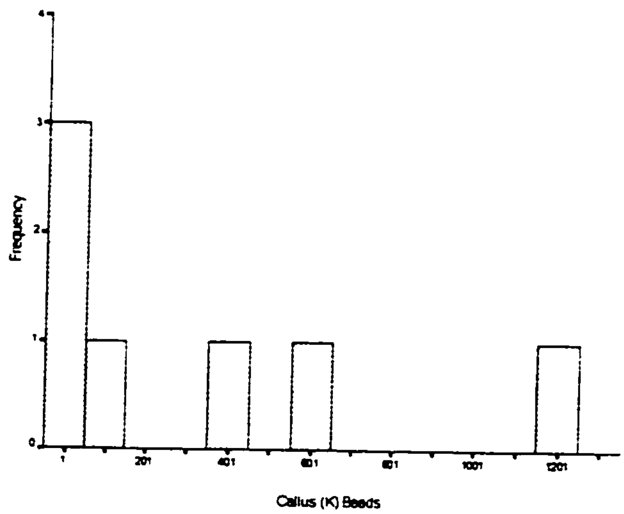
SEX — Page 1 of 1

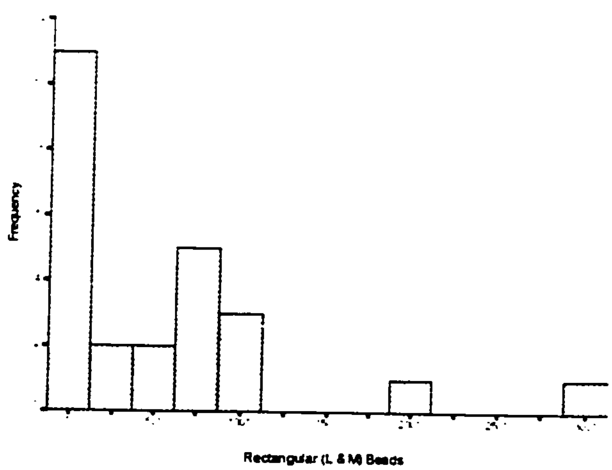
AMOUNT	Count Exp Val Row Pct Col Pct	Male 1	Female 2	Row Total
Few	1	6 6.4 66.7% 60.0%	3 2.6 33.3% 75.0%	9 64.3%
Some	2	1 .7 100.0% 10.0%	0 .3 .0% .0%	1 7.1%
Many	3	3 2.9 75.0% 30.0%	1 1.1 25.0% 25.0%	4 28.6%
	Column Total	10 71.4%	4 28.6%	14 100.0%

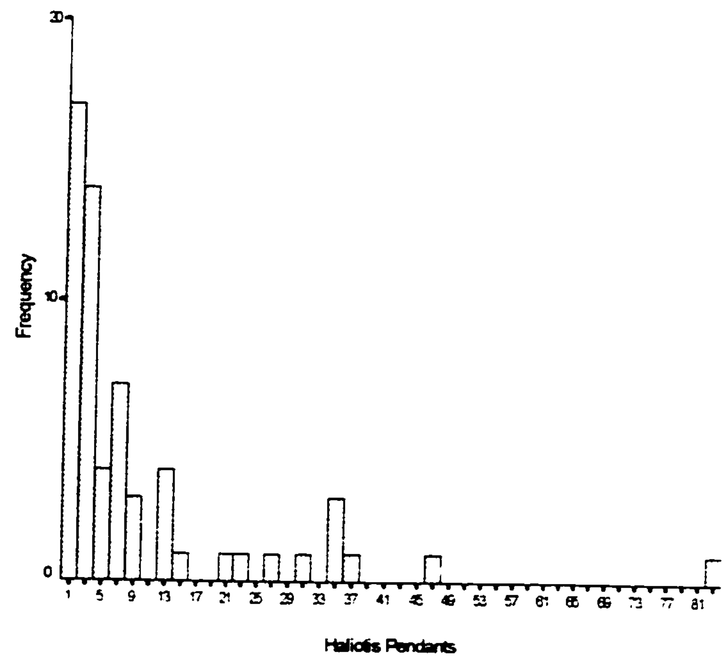
Appendix B: Plots and Graphs

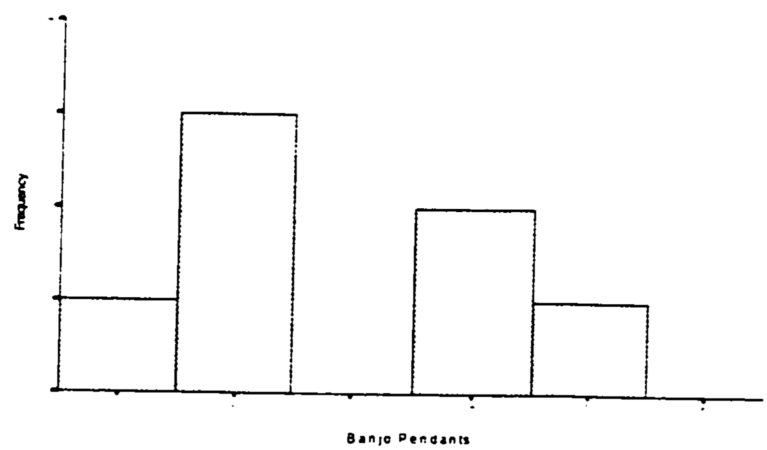
Artifact Frequency Distributions and Cluster Dendrograms

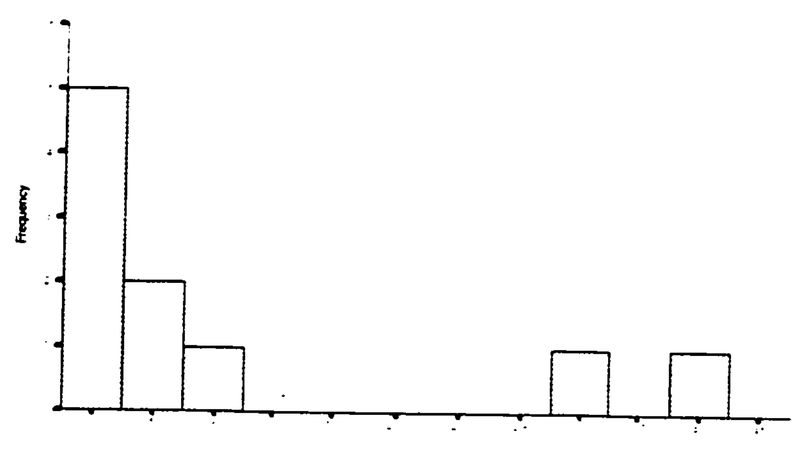

Frequency
Spire Lopped Beads

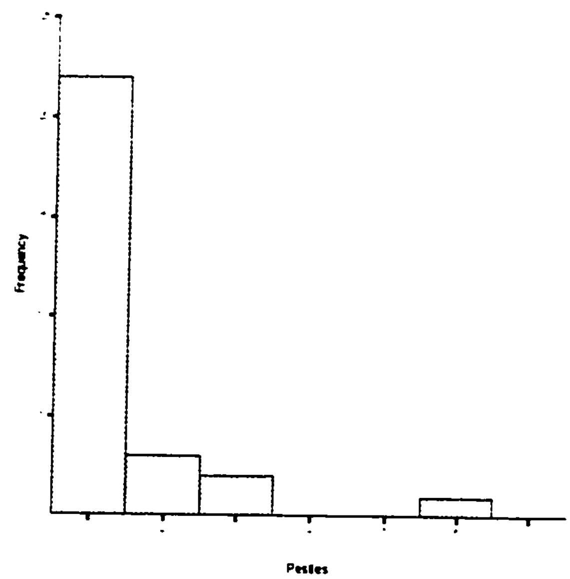

Frequency
4
3
2
1
0
1
201
401
601
801
1001
1201
Callus (K) Beads

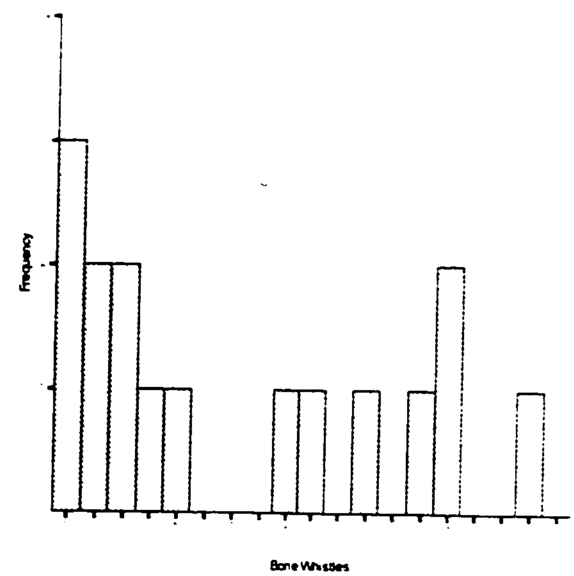

Frequency
Rectangular (L & M) Beads

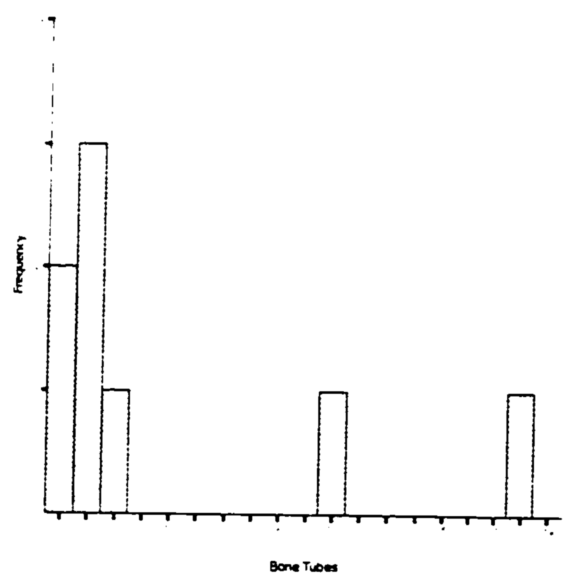

30
10
0
Frequency
1 5 9 13 17 21 25 29 33 37 41 45 49 53 57 61 65 69 73 77 81
Haliotis Pendants

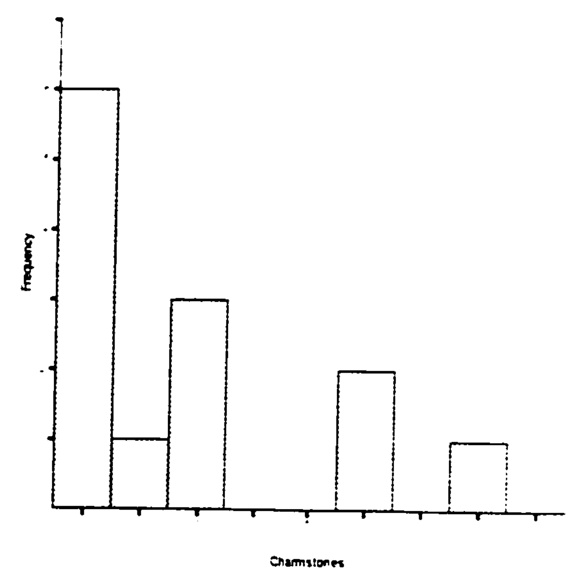

Frequency
Banjo Pendants


Frequency
Circular Haliotis Pendants

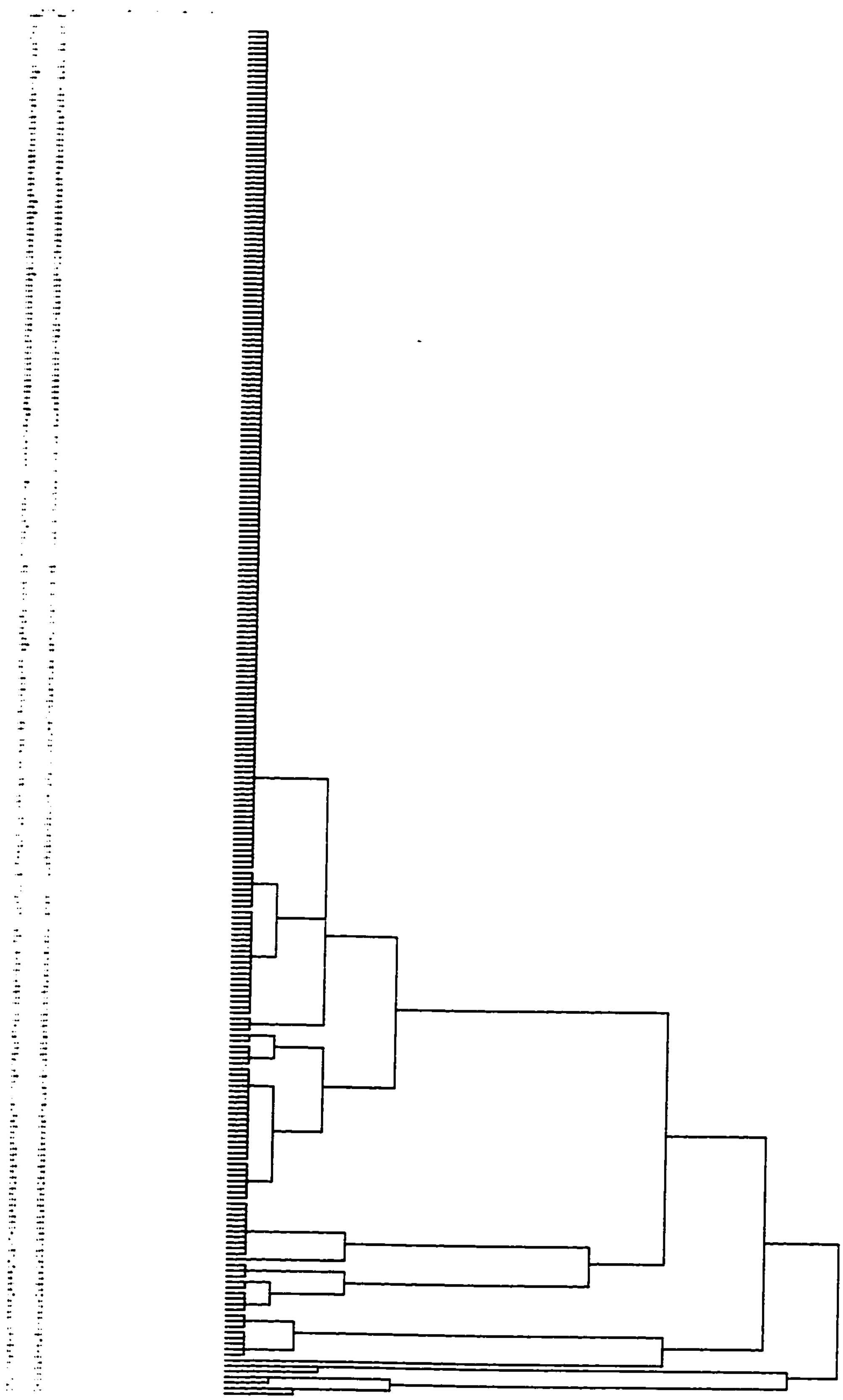

Frequency
Pestles


Frequency
Bone Whistles

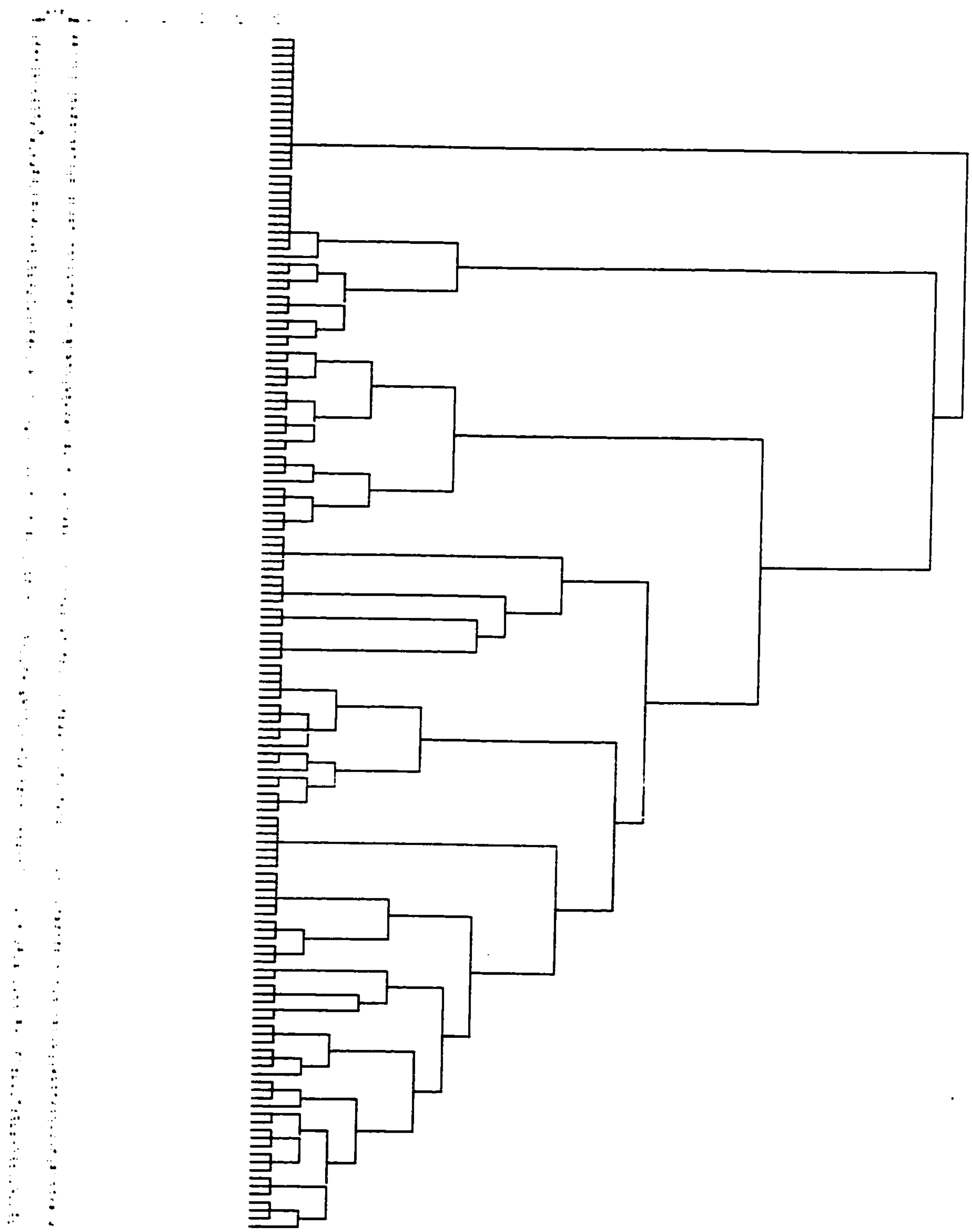

Frequency
Bone Tubes


Frequency
Charmstones

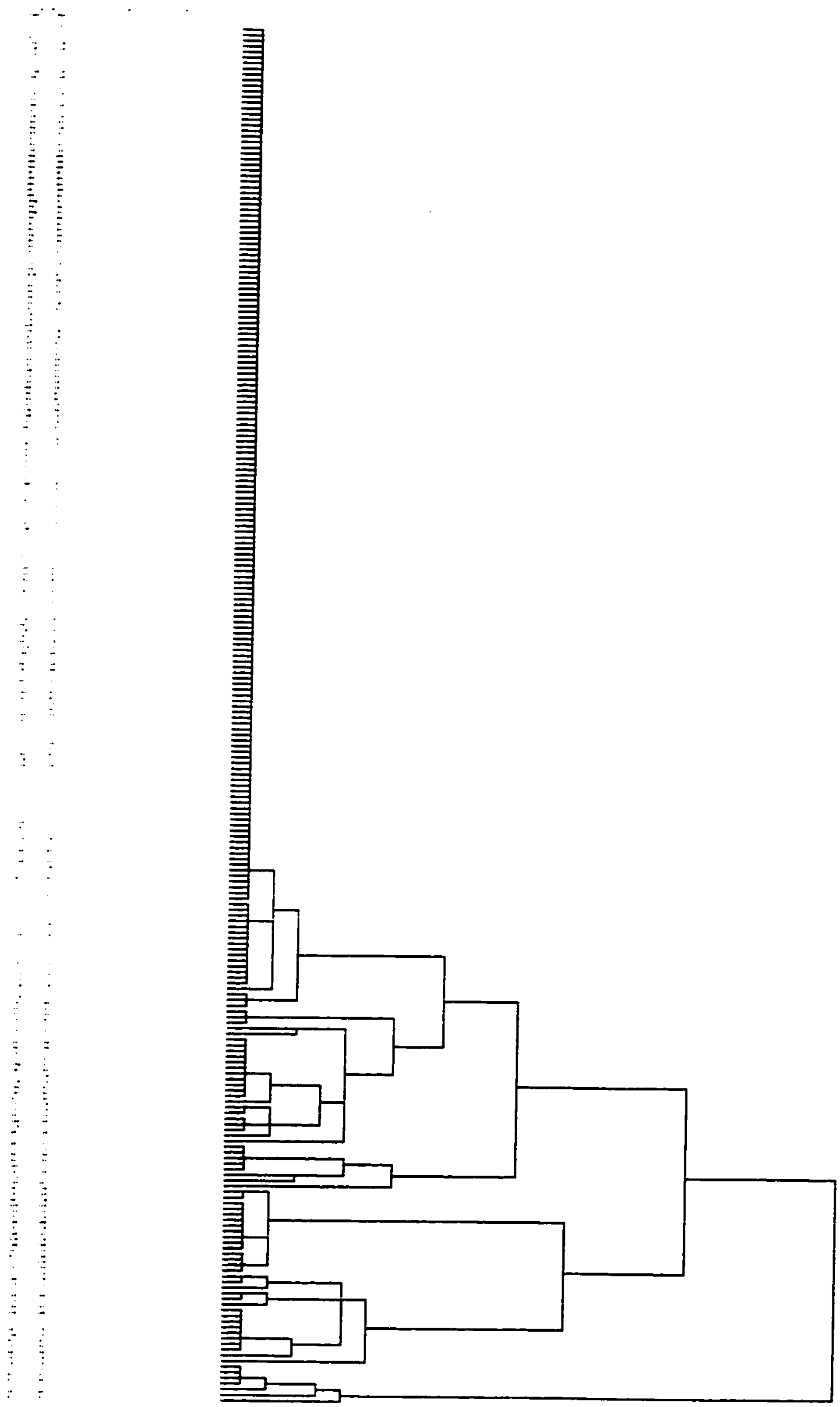
Dendrogram for Spatial Clustering



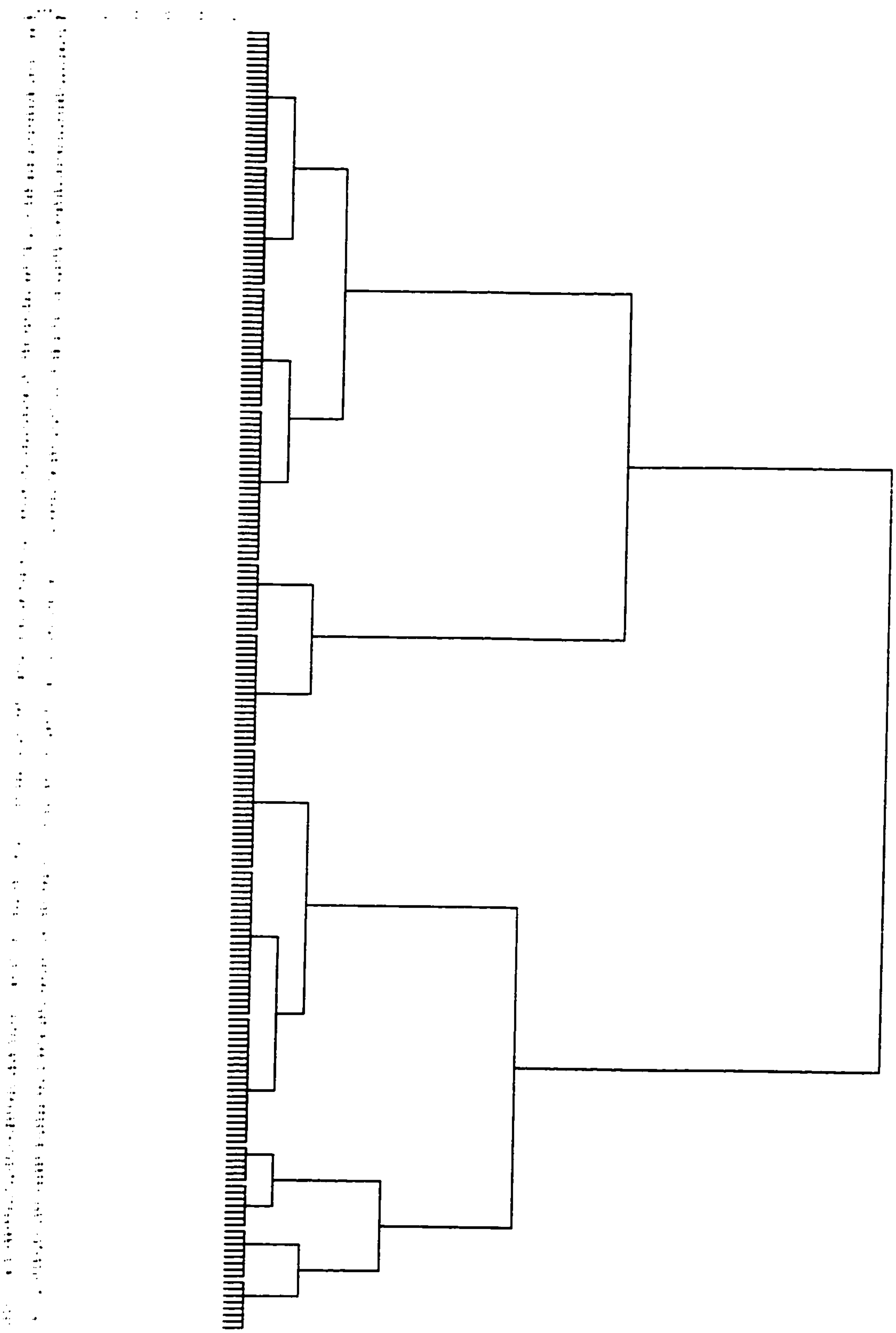
Dendrogam for Artifact Presence/Absence Clustering



Dendrogram for Artifact Frequency Clustering



Dendrogram for Mode of Interment Clustering



Appendix C: Plates and Drawings

Selected Artifact and Burial Illustrations and Photographs, from CA-SCL-38.

(Figures C-1 through C-68)

Artifact Illustrations by Glen Wilson

Artifact Photographs by David Calleri

Burial Photographs by Alan Leventhal

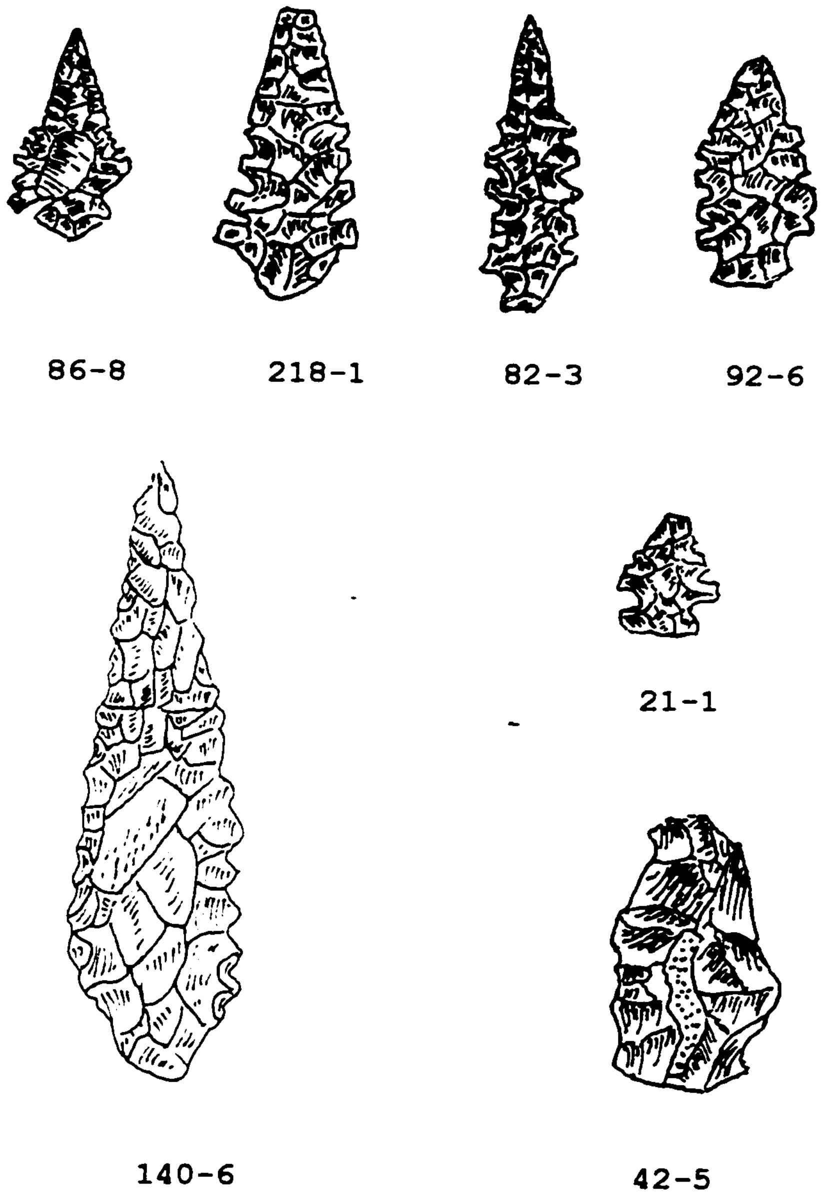
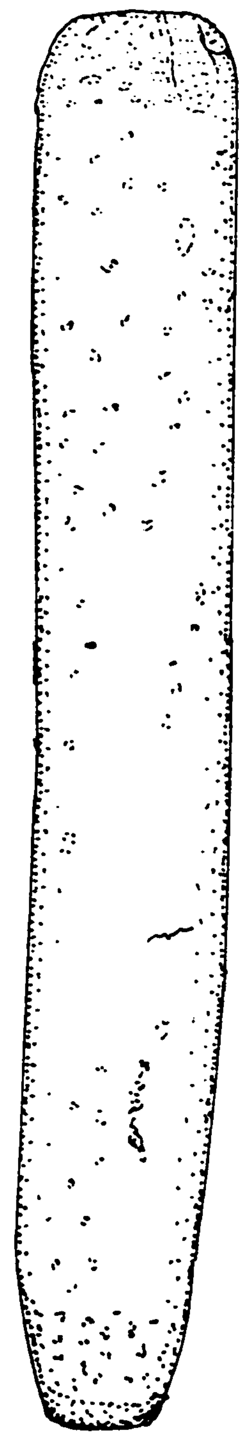


Figure C-1 Obsidian Projectile Points

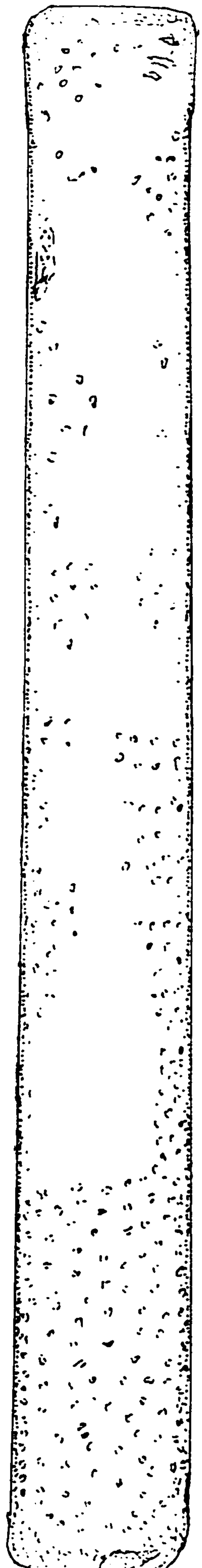
122-1/2



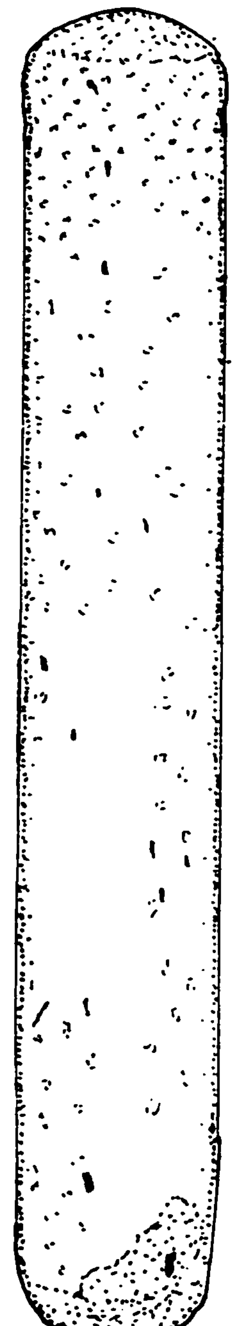
72-18

(1/2 scale)

Figure C-2 Pestles



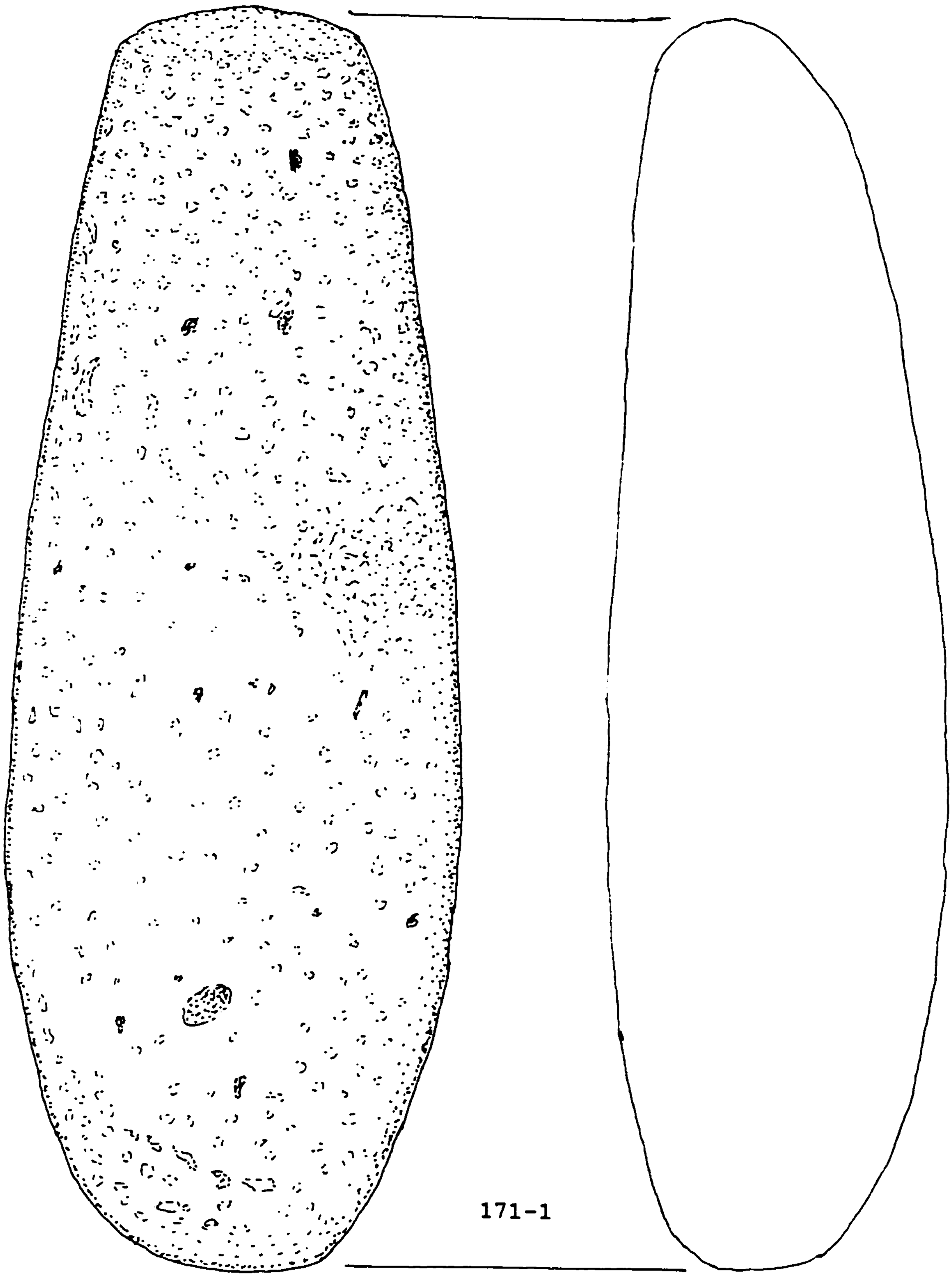
112-4



35-7

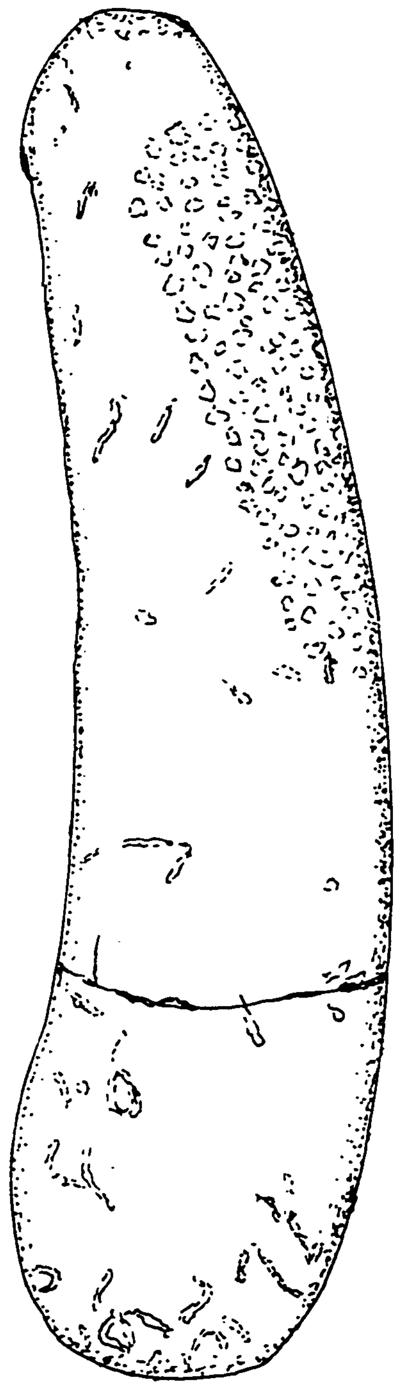
(1/2 scale)

Figure C-3 Pestles



171-1

Figure C-4 Pestle


171-3

(2/3 scale)

Figure C-5 Pestle

350-15

Figure C-6 Knobbed Pestle

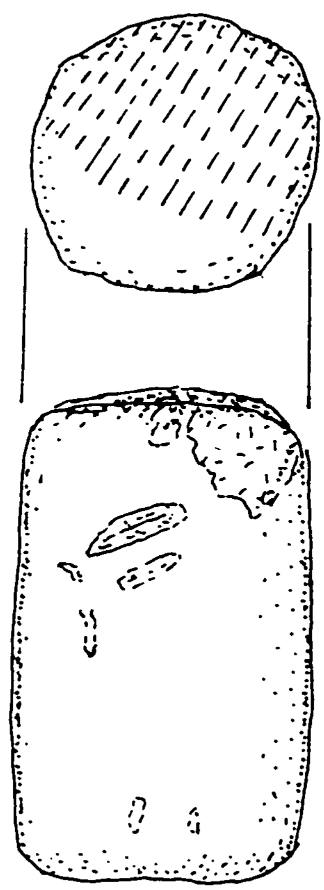
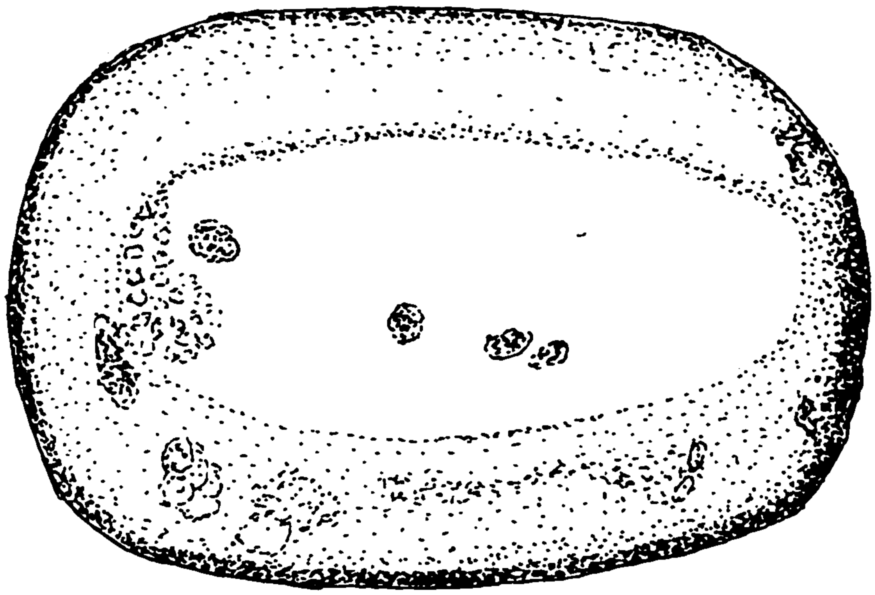


Figure C-7 Small Pestle with Ochre

350-2



107-1

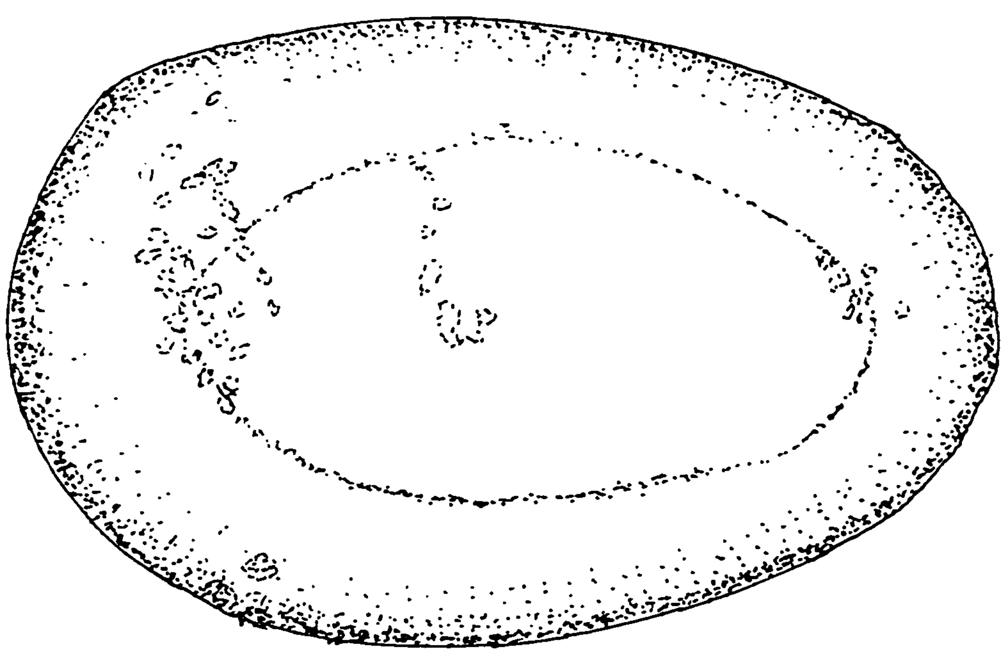
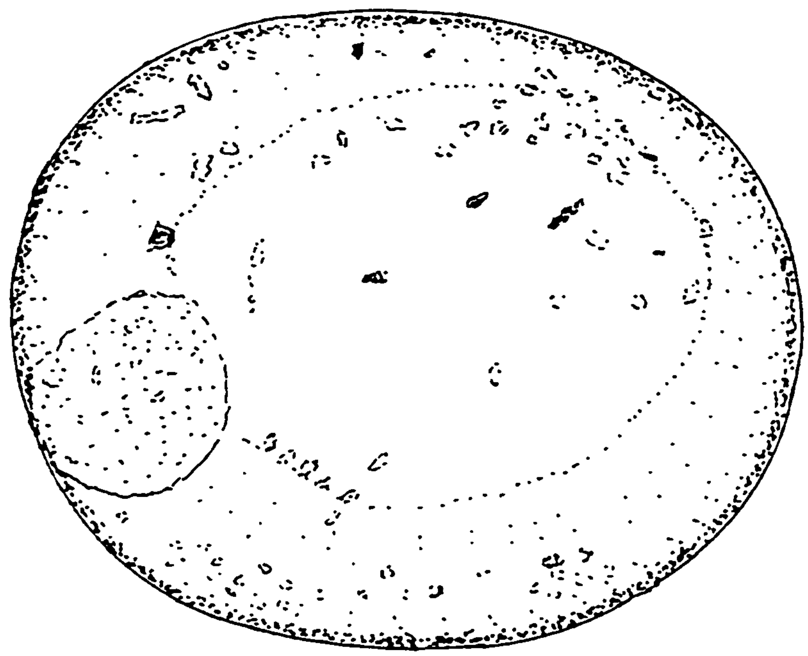
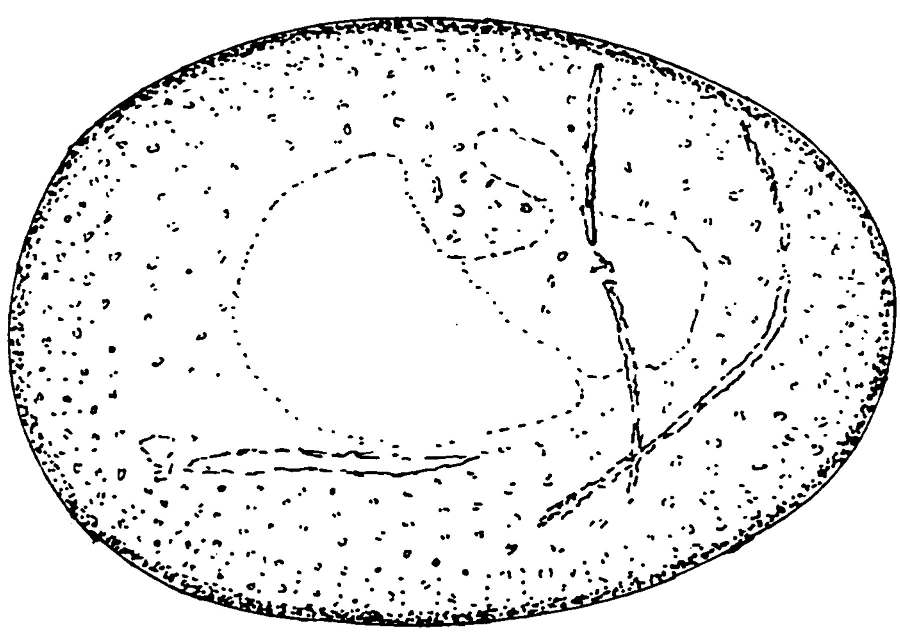


Figure C-8 Manos

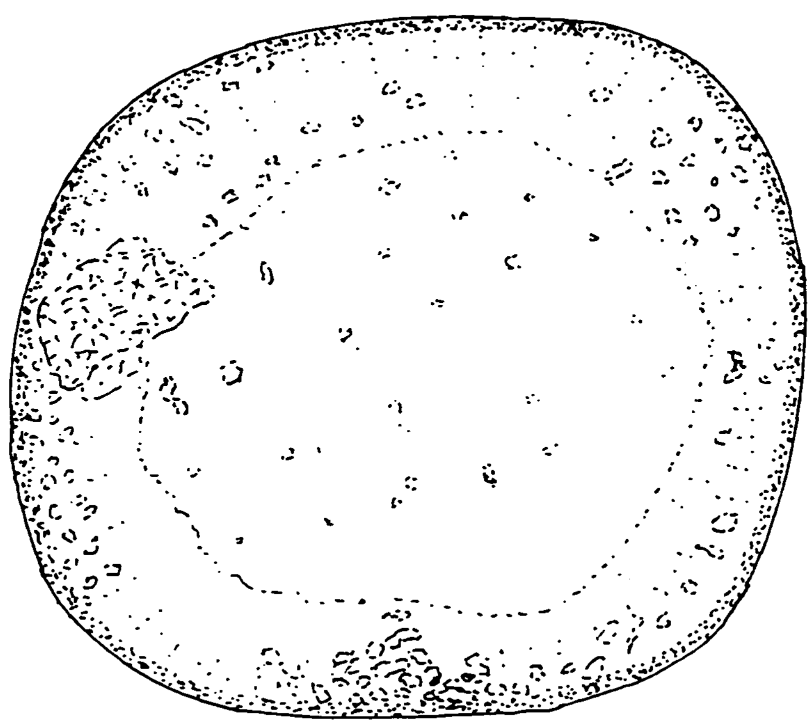


126-4



350-4

Figure C-9 Manos



250-168

Figure C-10 Mano

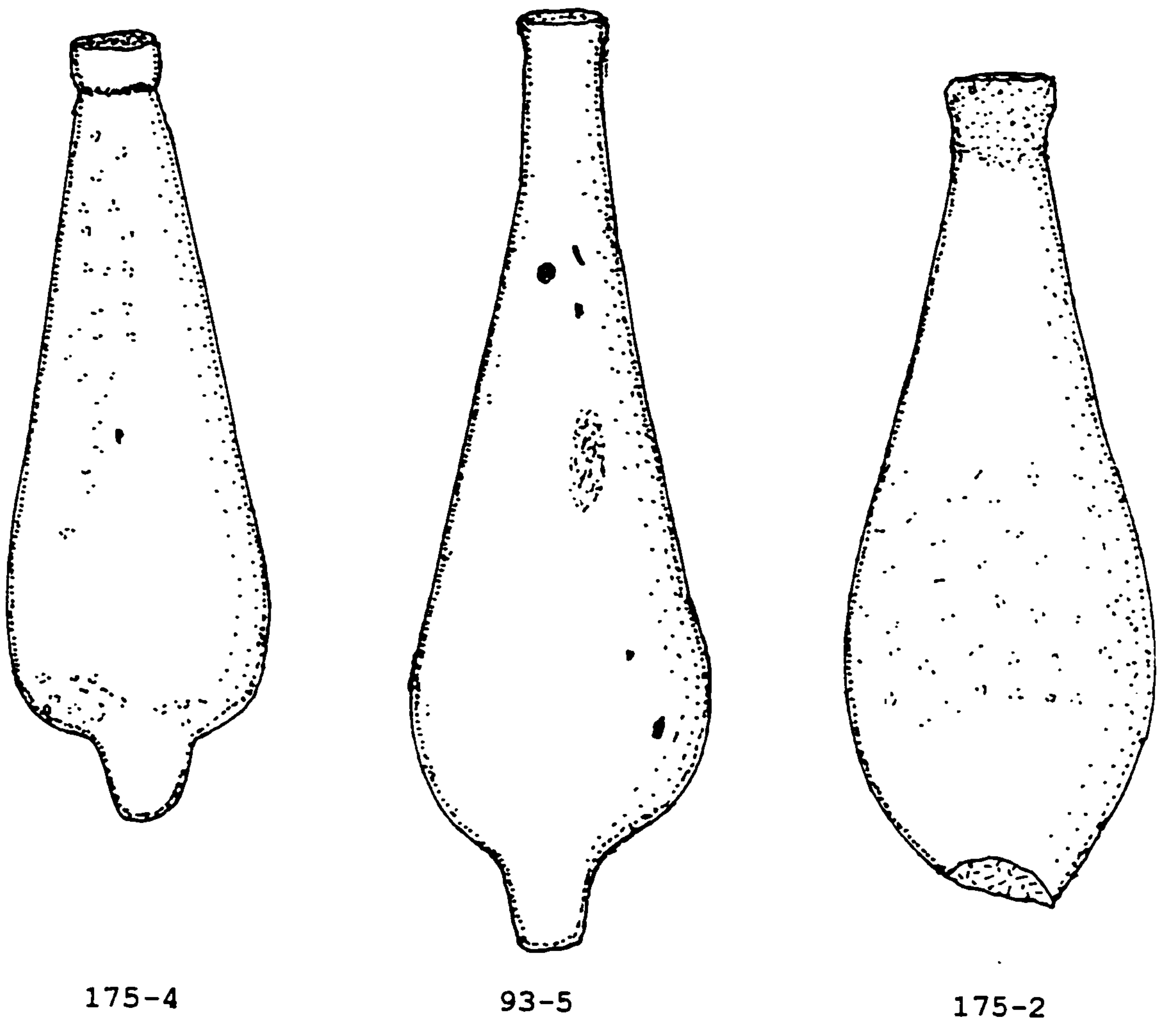
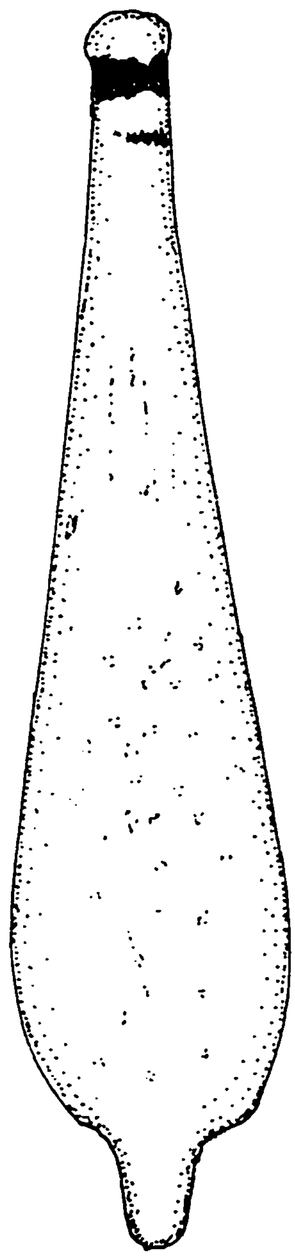
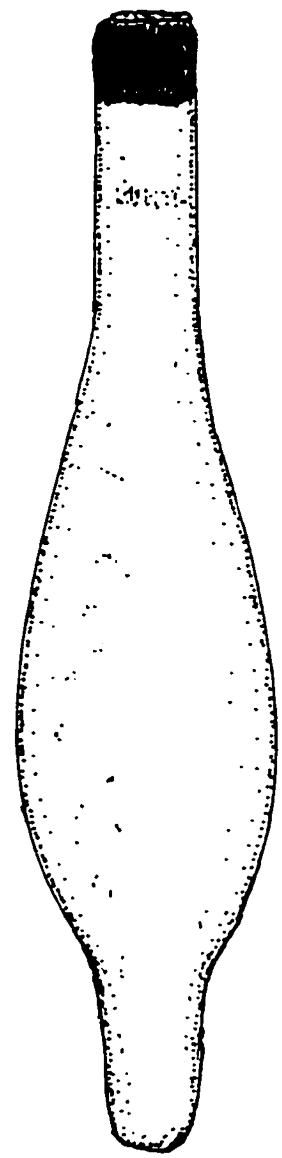


Figure C-11 Charmstones

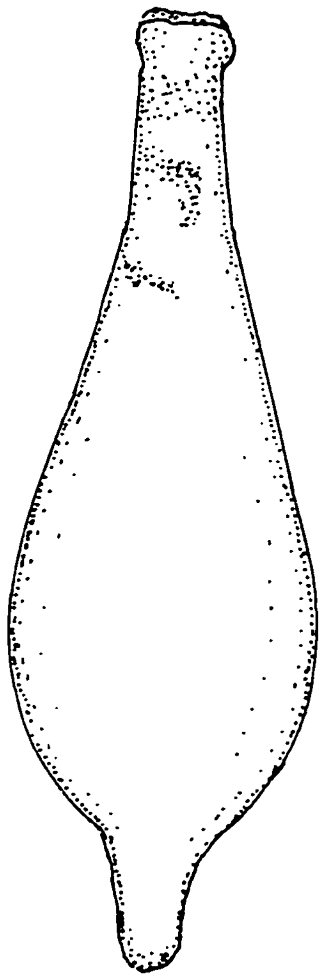


93-4

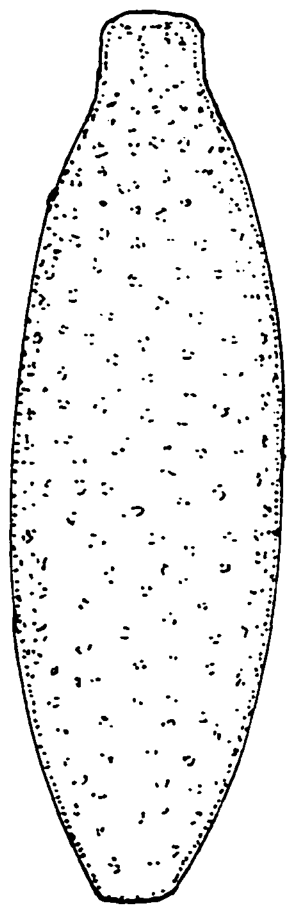


175-7

Figure C-12 Charmstones

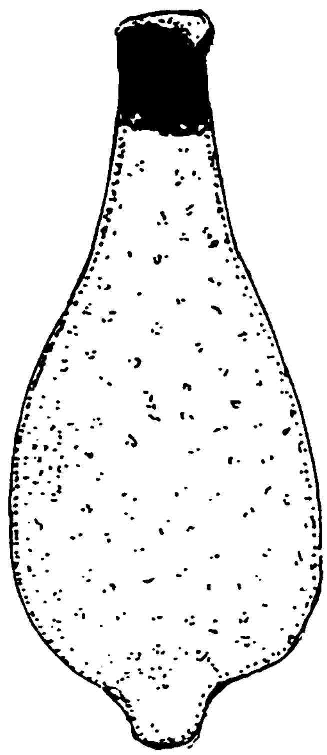


148-1

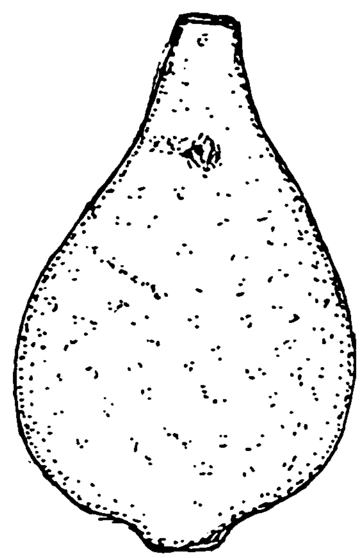


130-10

Figure C-13 Charmstones

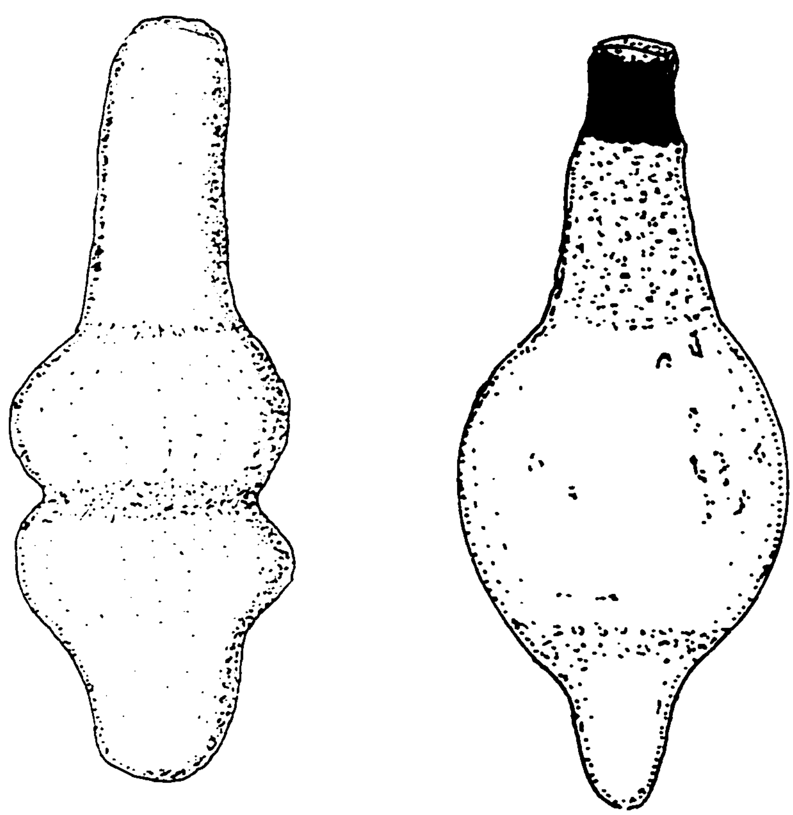


134-3



93-7

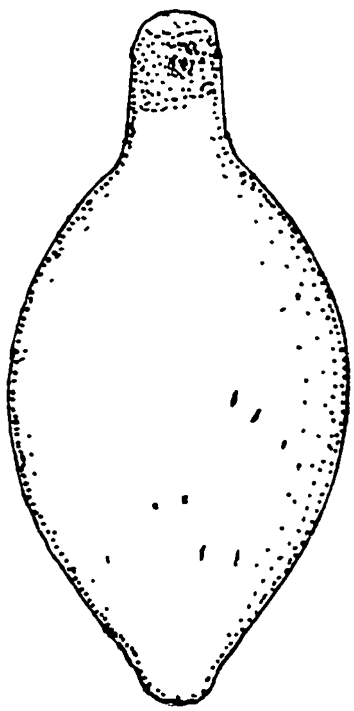
Figure C-14 Charmstones



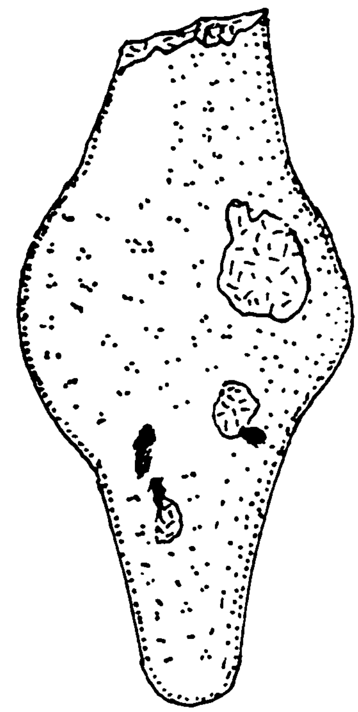
44-4
isolate

140-4

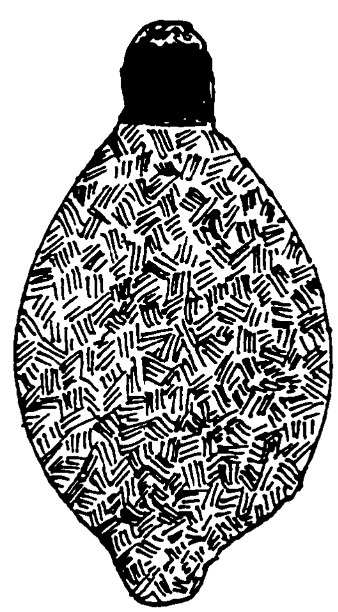
Figure C-15 Charmstones



130-8

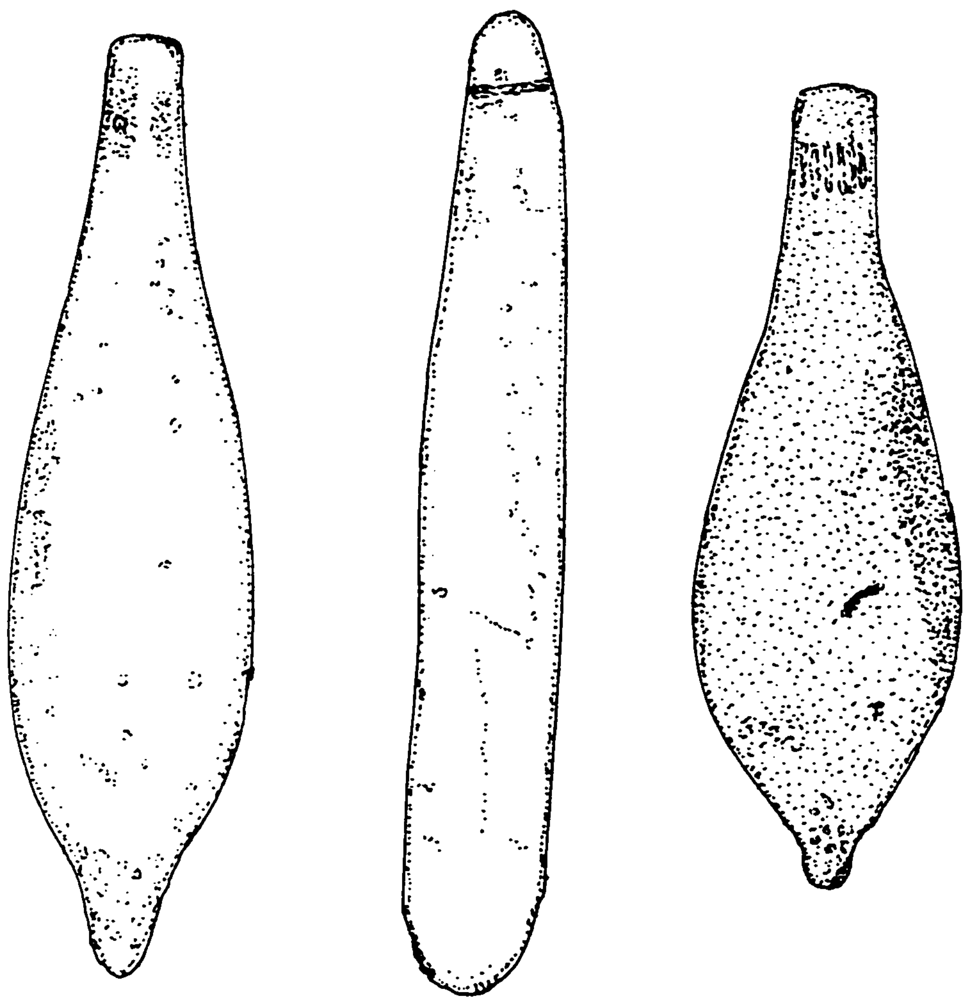


2-4



140-3

Figure C-16 Charmstones



93-6 63-12 91-7

Figure C-17 Charmstones and "Banana" stone

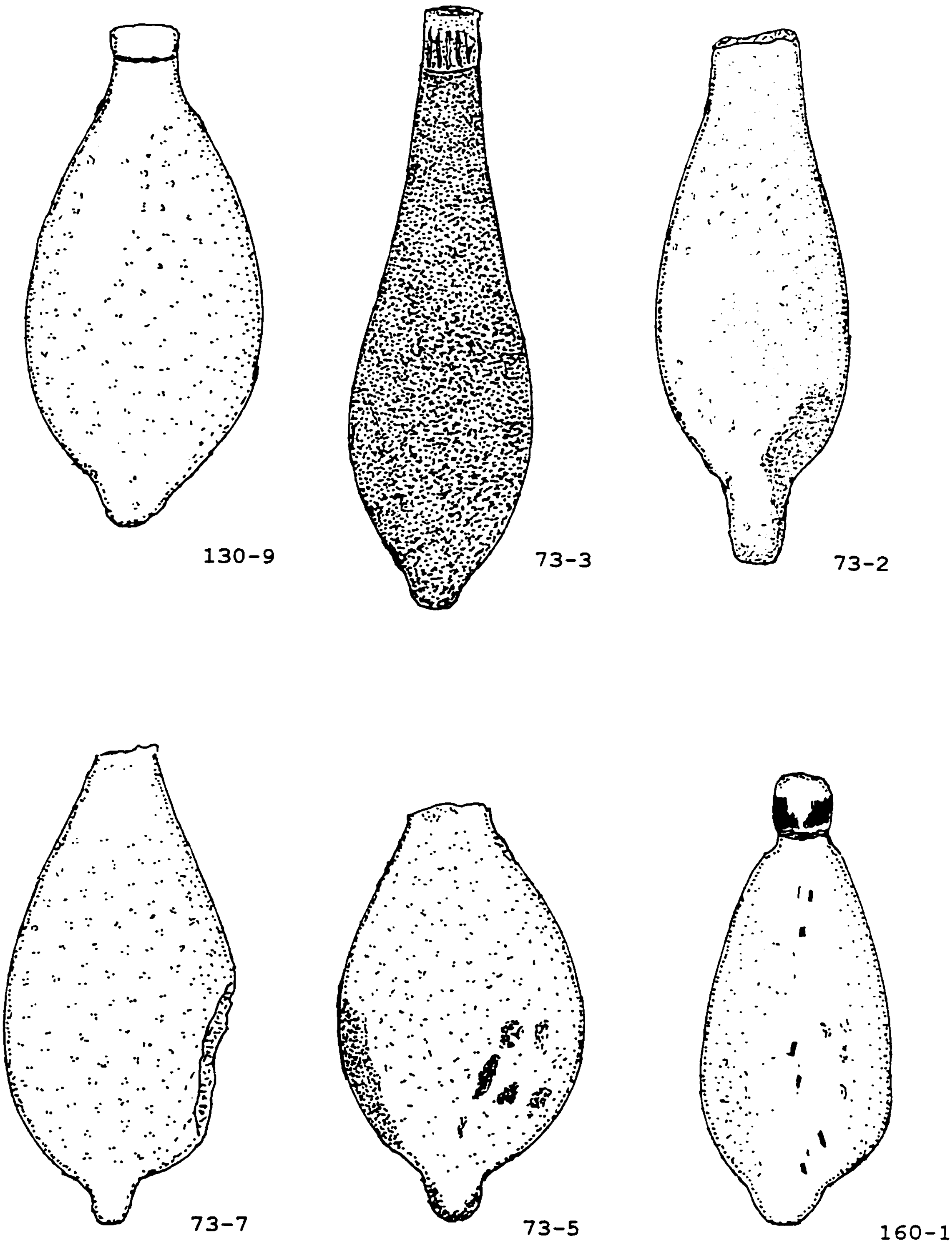


Figure C-18 Charmstones

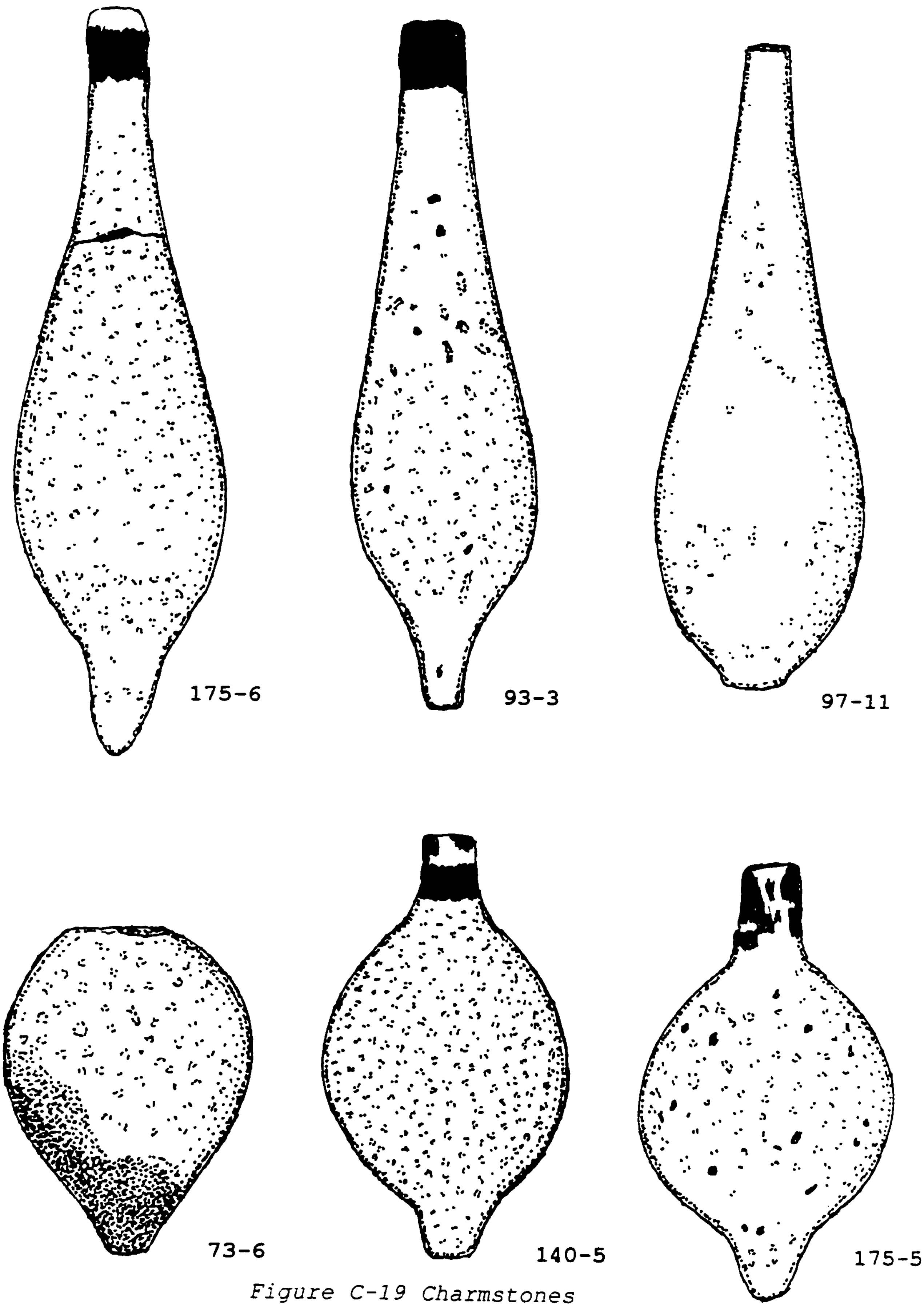


Figure C-19 Charmstones

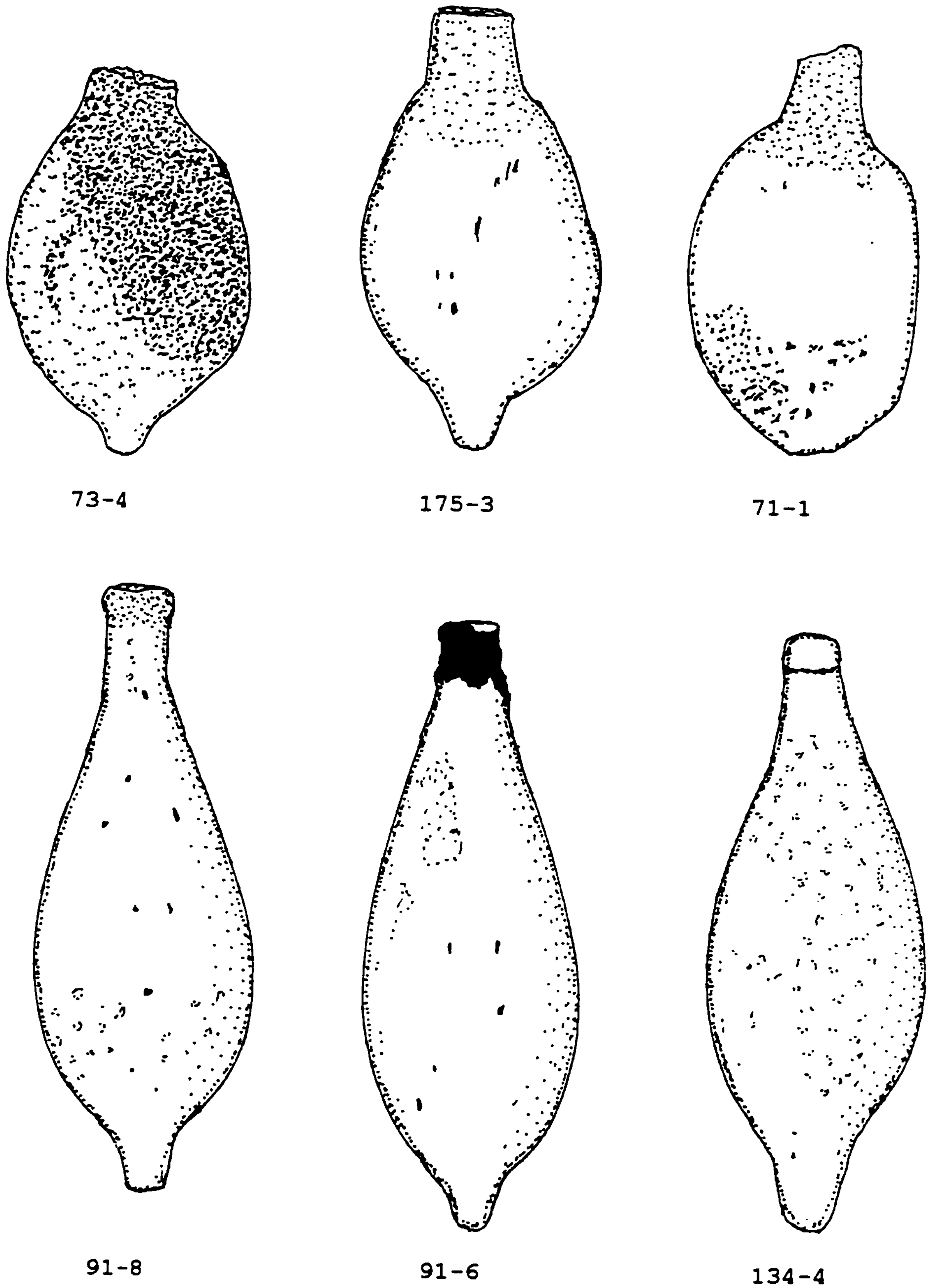


Figure C-20 Charmstones

175-3 175-9 93-2

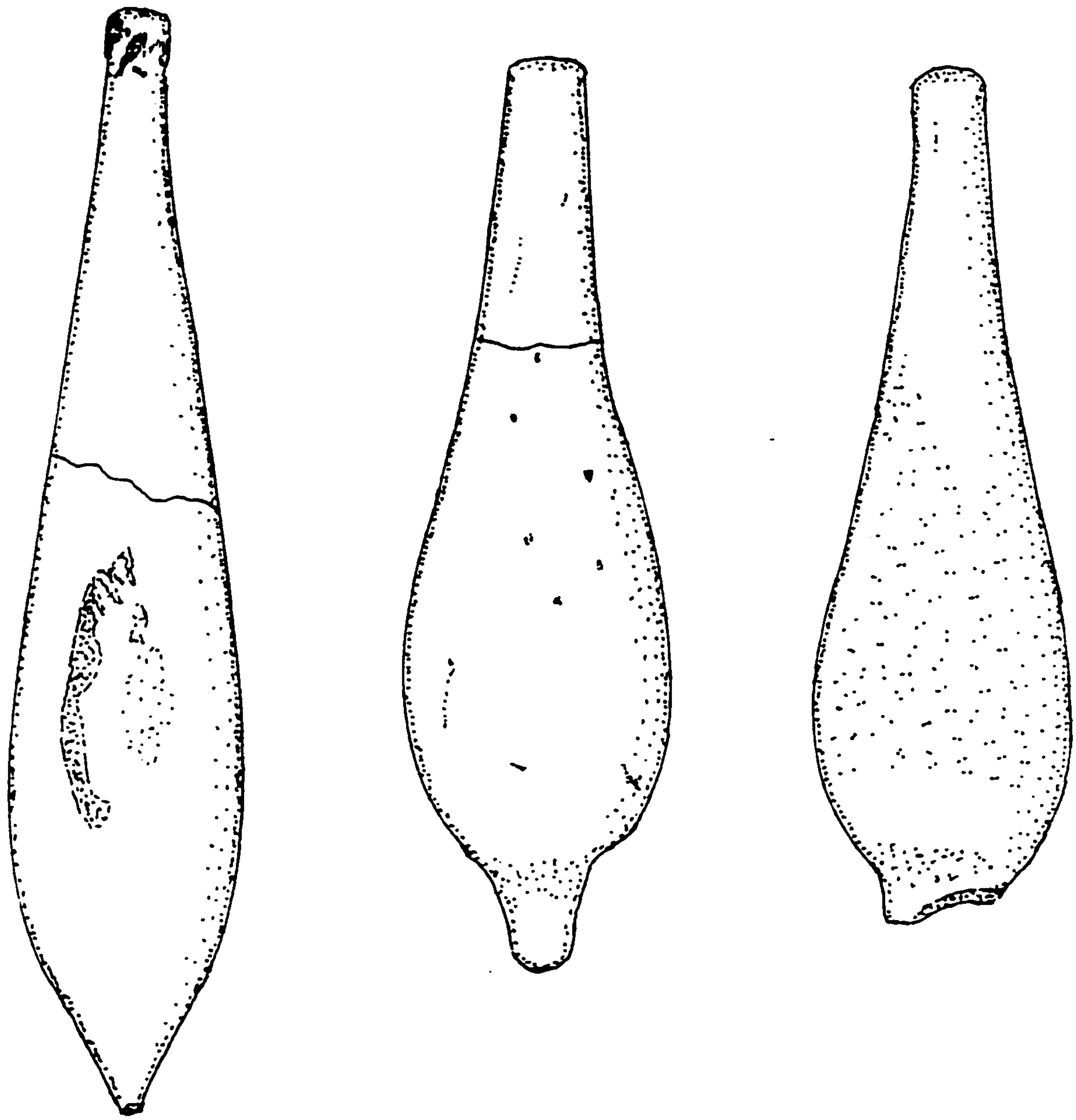
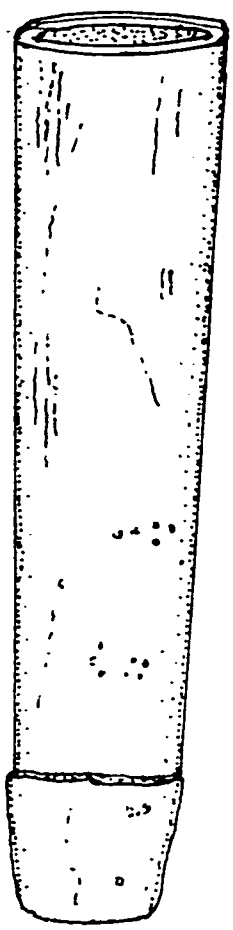
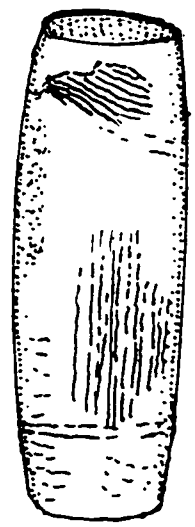


Figure C-21 Charmstones



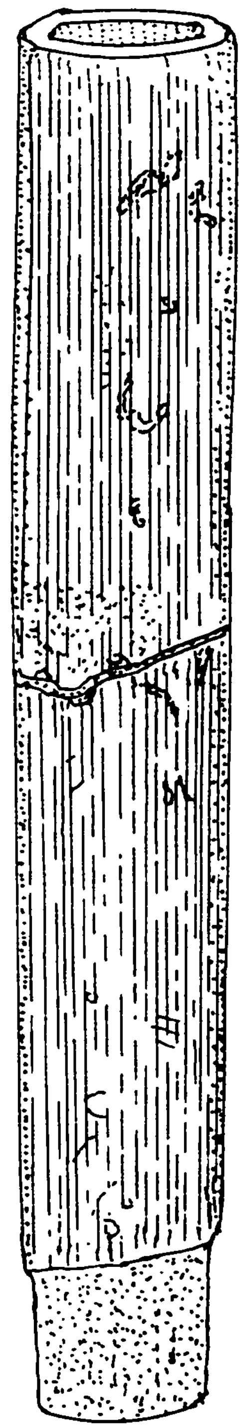
97-10

82-1



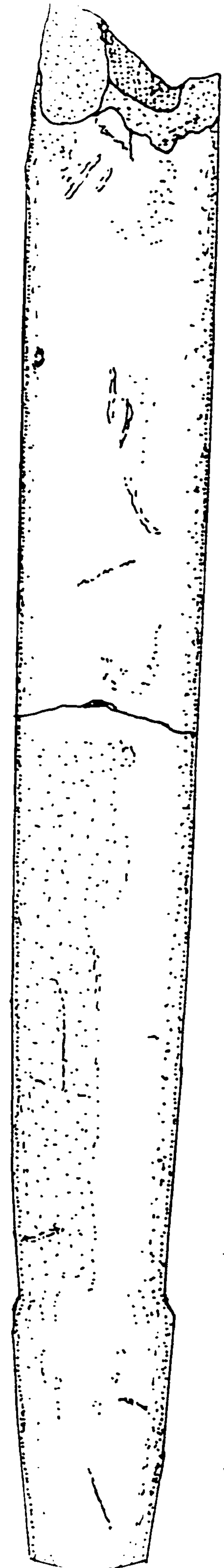
93-17

Figure C-22 Stone Pipes



167-7

Figure C-23 Stone Pipe



33-1

Figure C-24 Stone Pipe

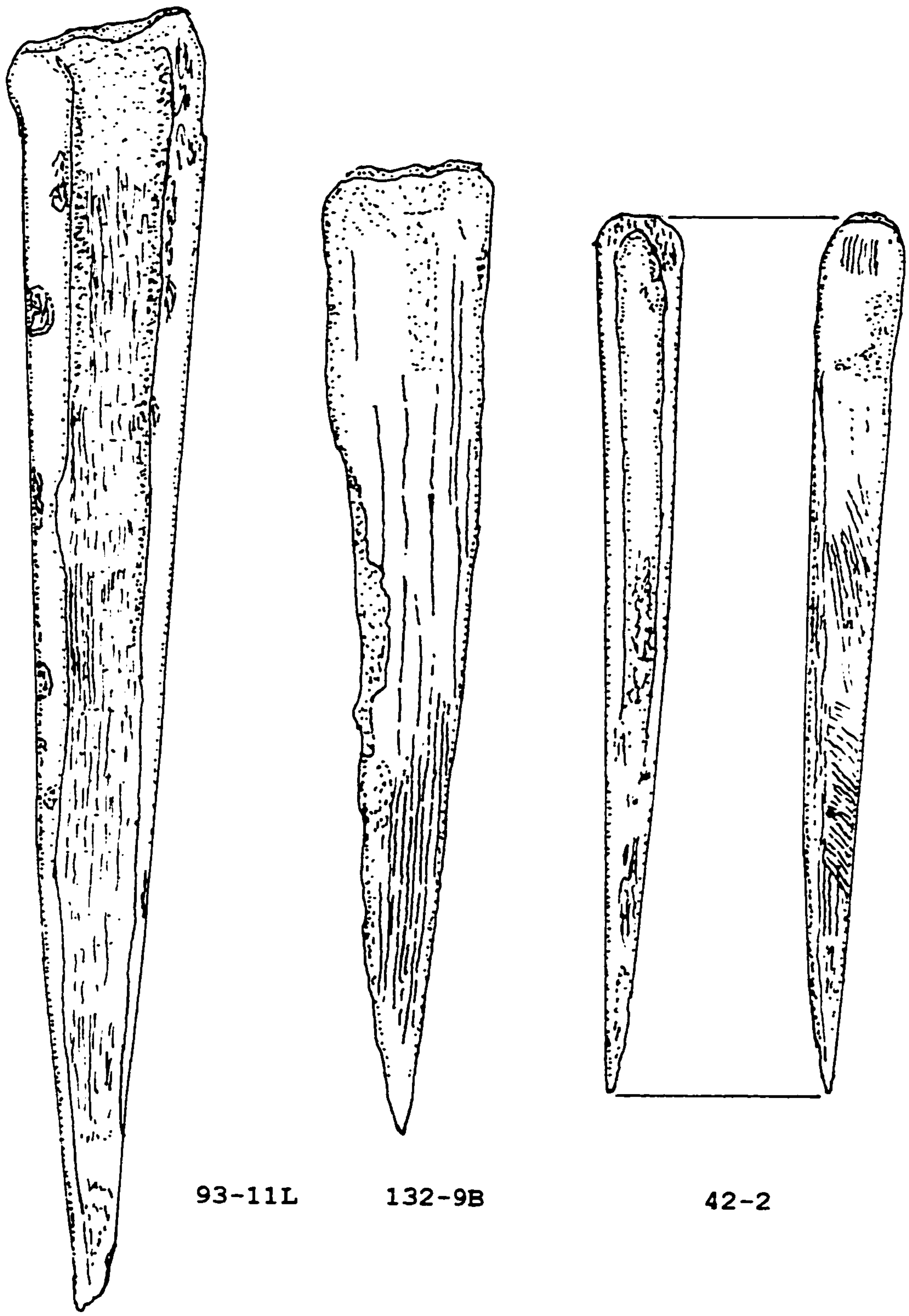
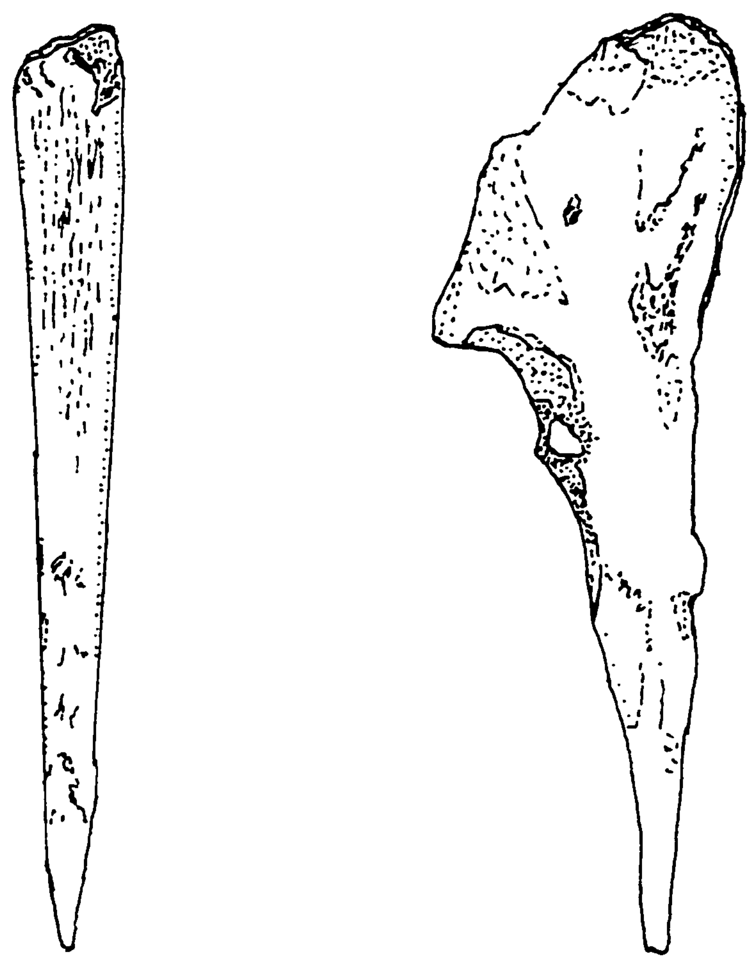


Figure C-25 Bone Awls



250-155

80-1

Figure C-26 Bone Awls

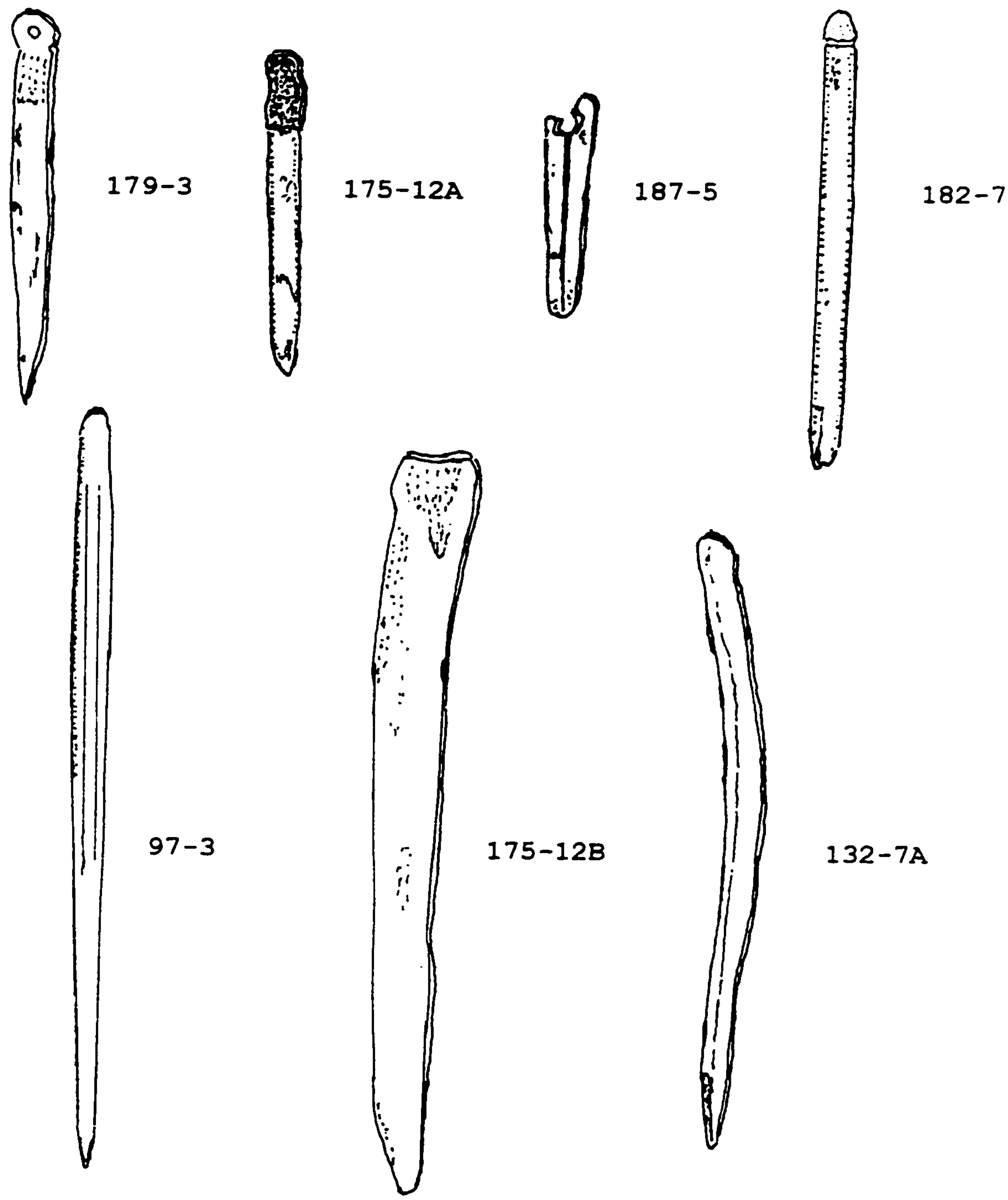


Figure C-27 Bone Utilitarian Tools

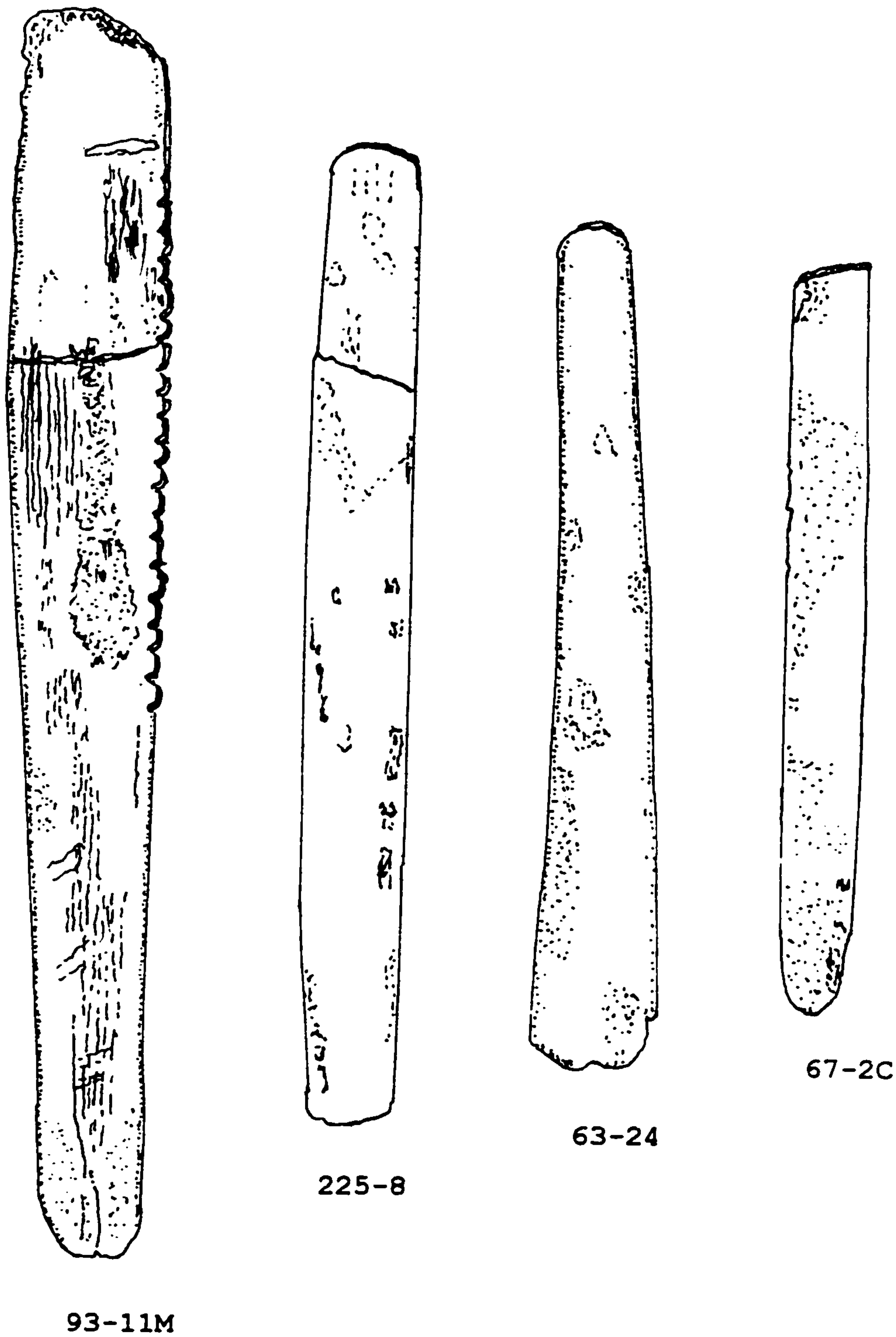
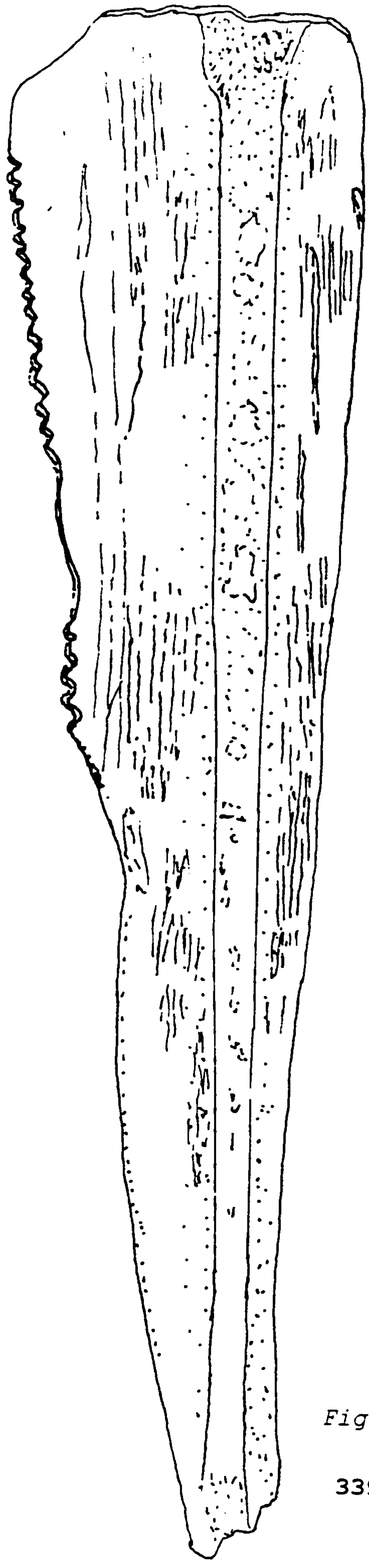
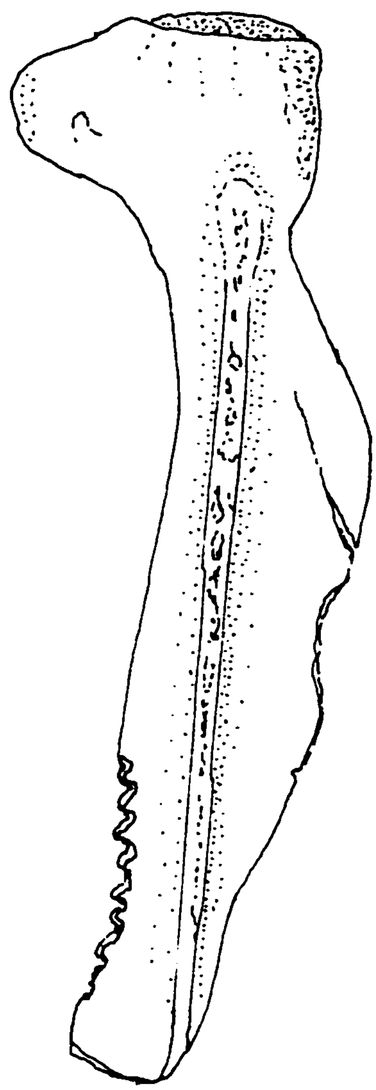


Figure C-28 Bone Utilitarian Tools

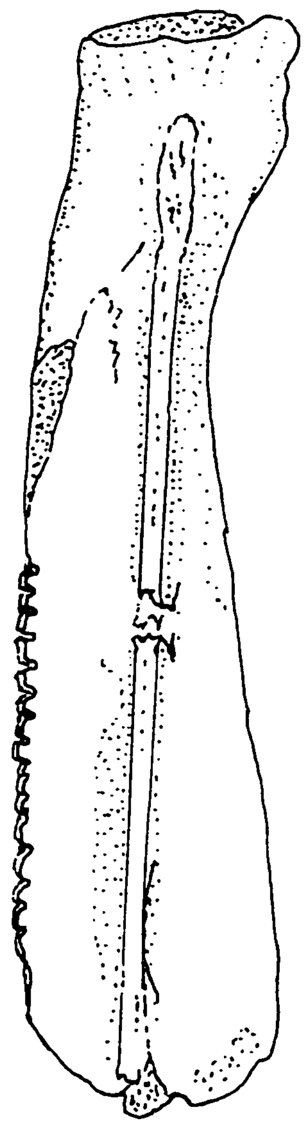


231-4A

Figure C-29 Bone Serrated Elk Scapula

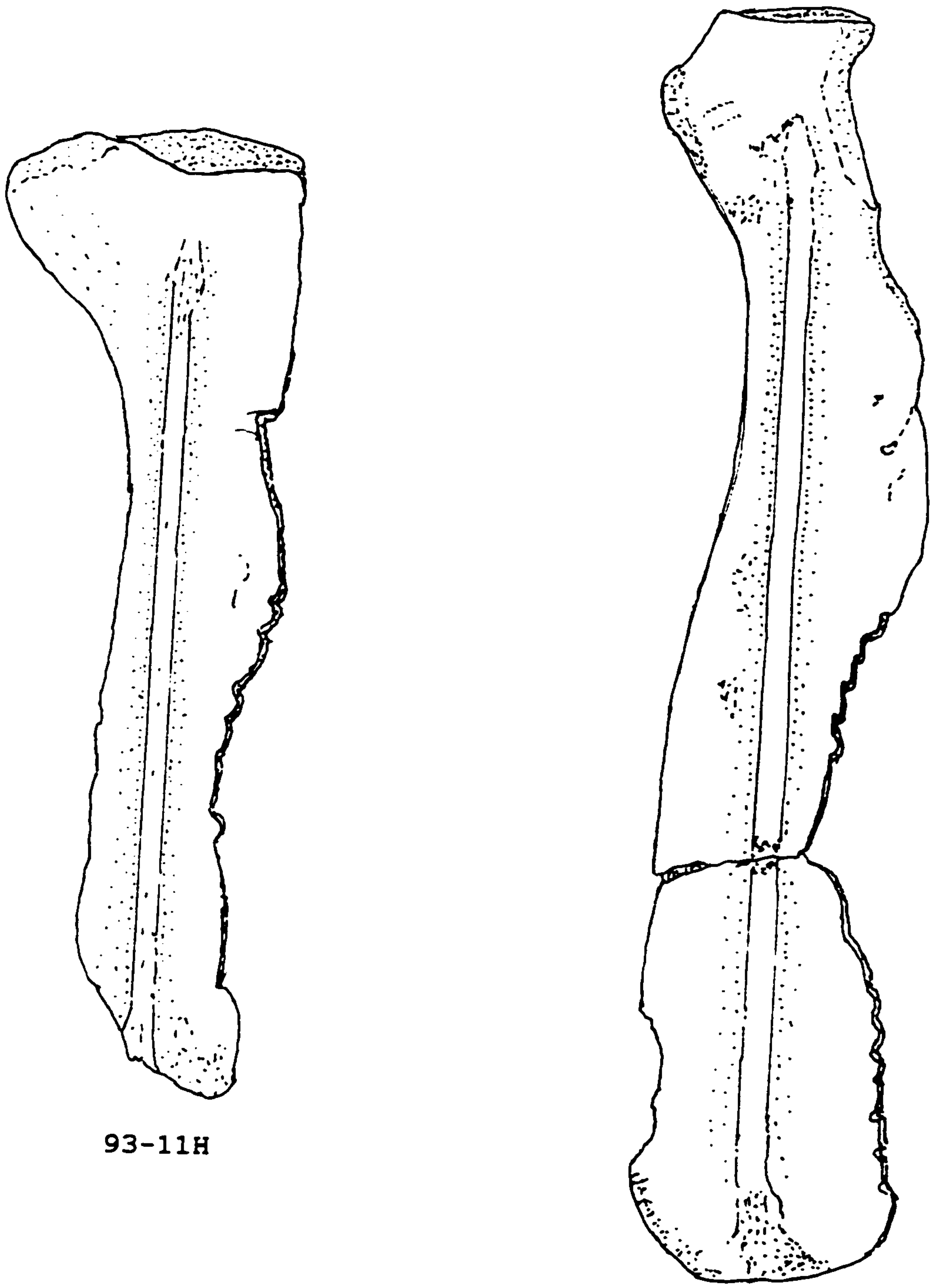


93-11F



93-11K

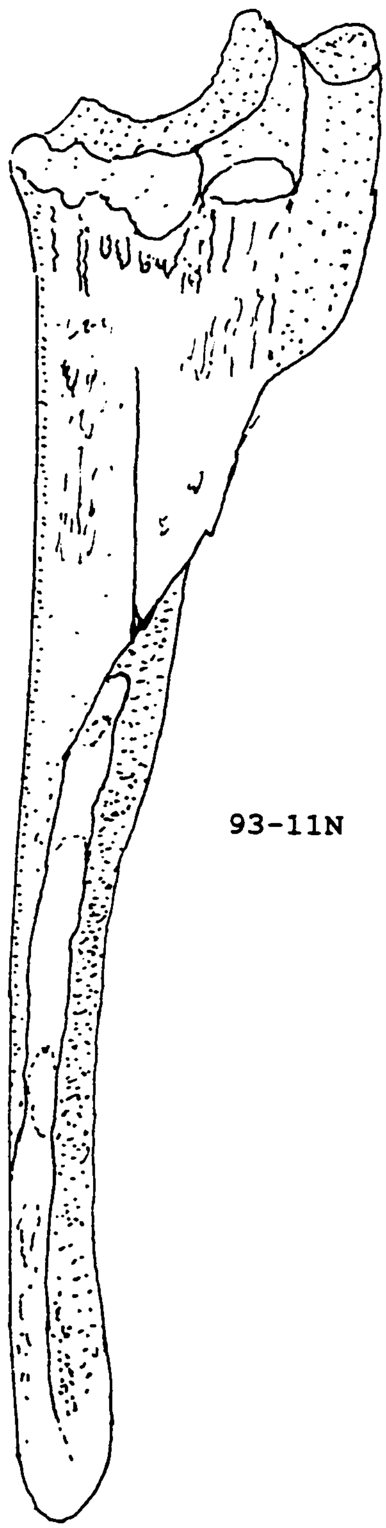
Figure C-30 Bone Serrated Deer Scapulae



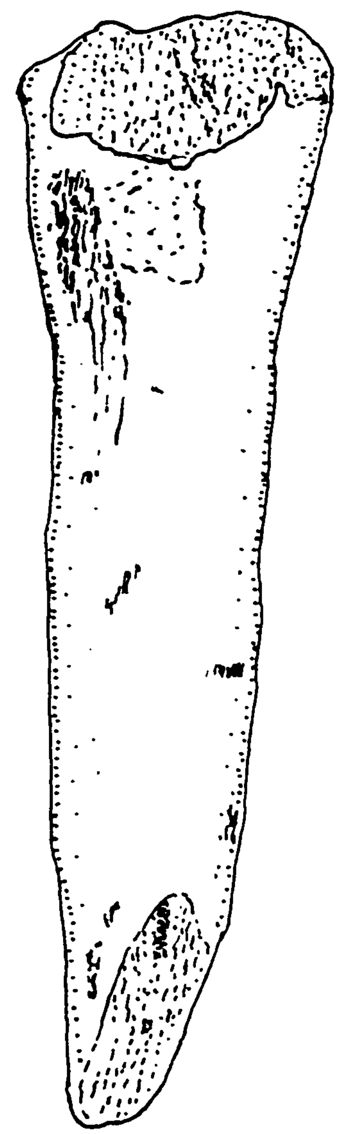
93-11H

163-1A

Figure C-31 Bone Serrated Scapulae

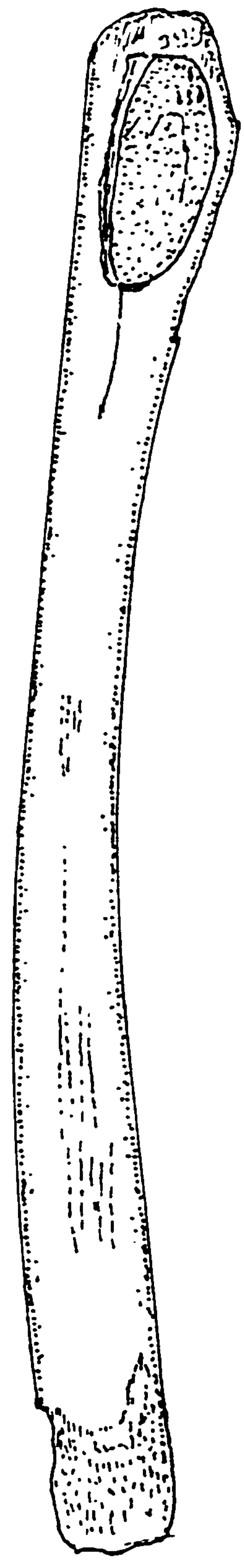


93-11N



53-3

Figure C-32 Antler Wedges



227-1

Figure C-33 Bullroarer

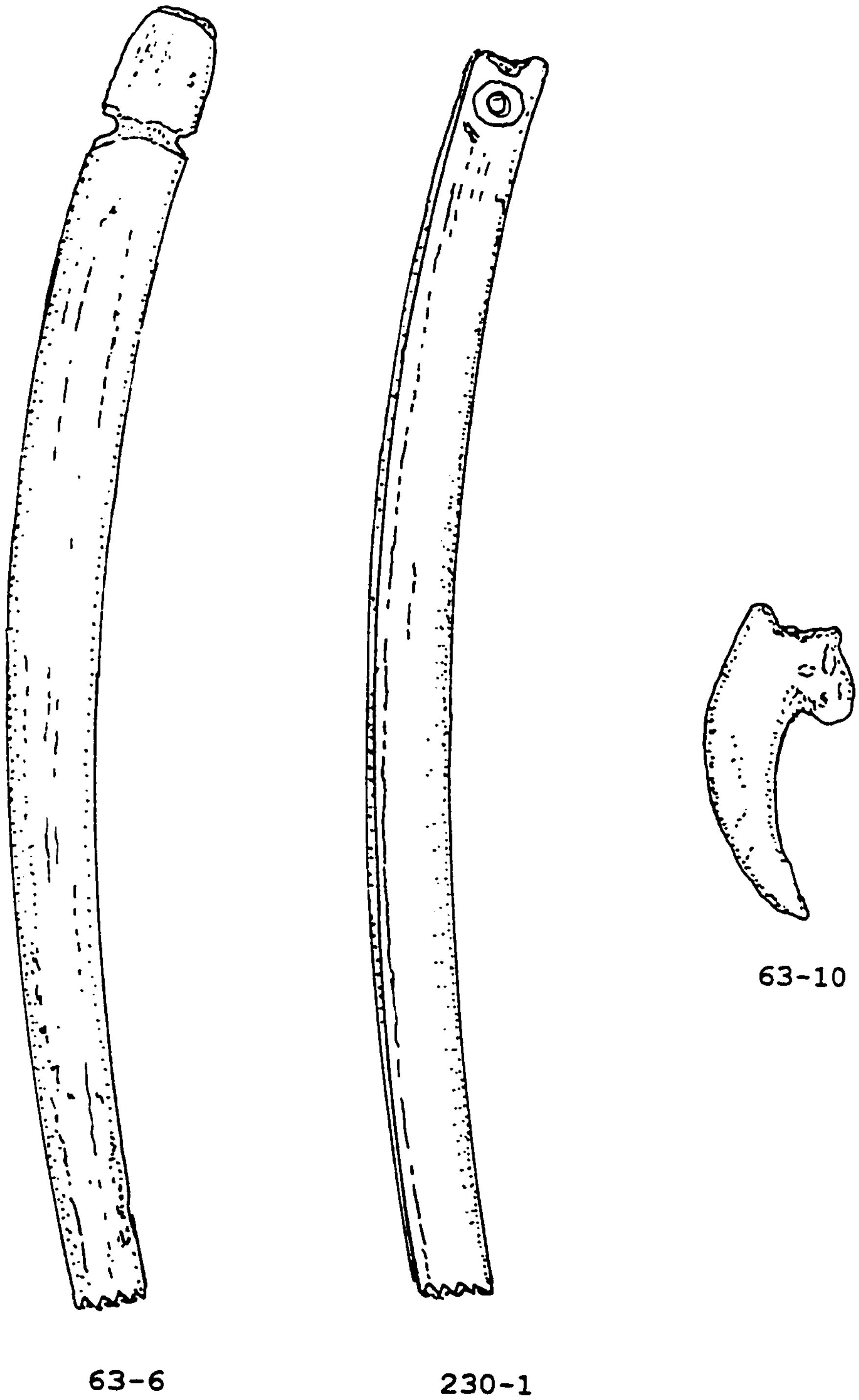


Figure C-34 Bone Pendants and Bird Claw

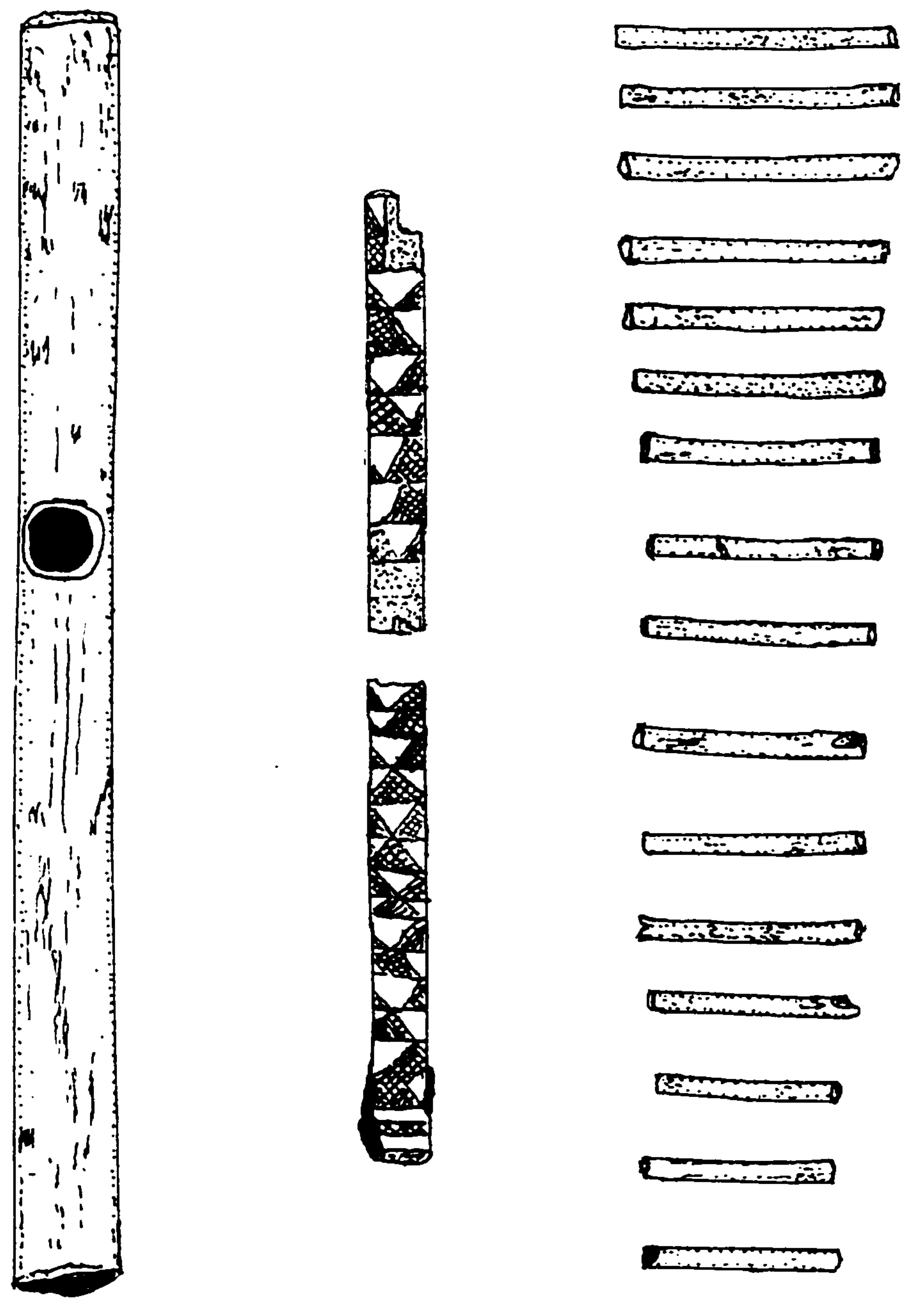
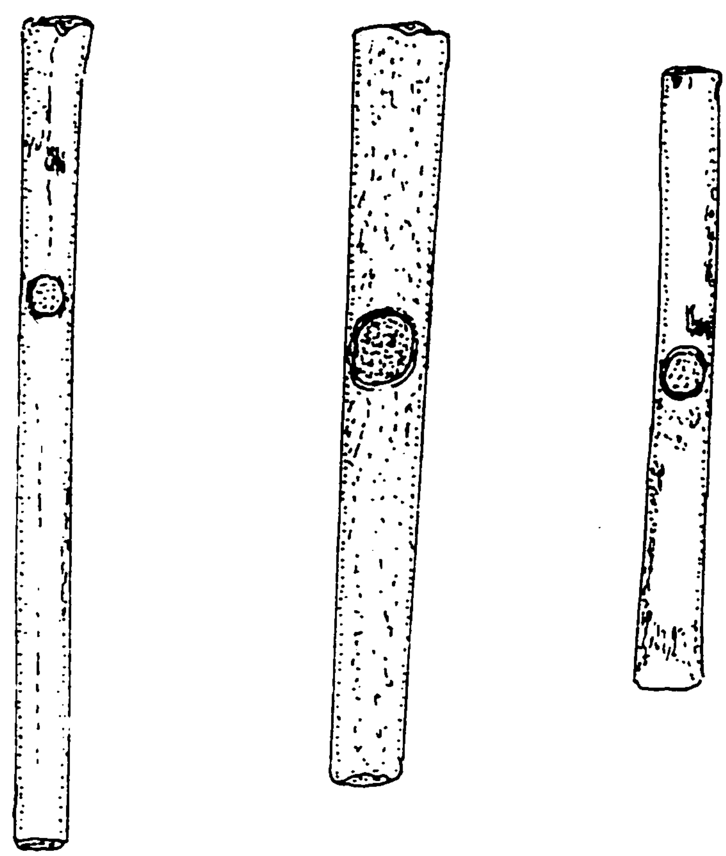
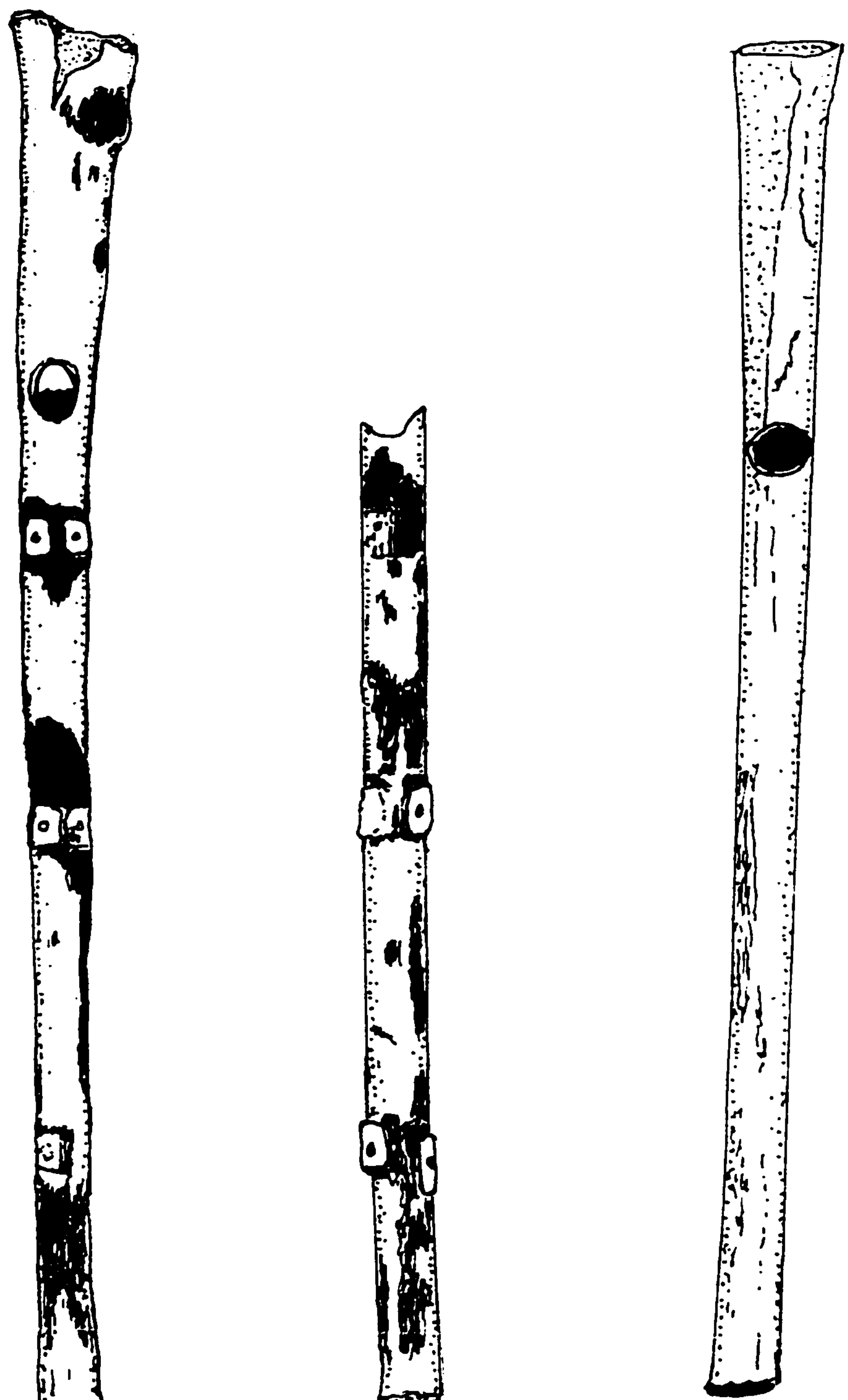


Figure C-35 Bird Bone Tools



63-11 62-6 97-2

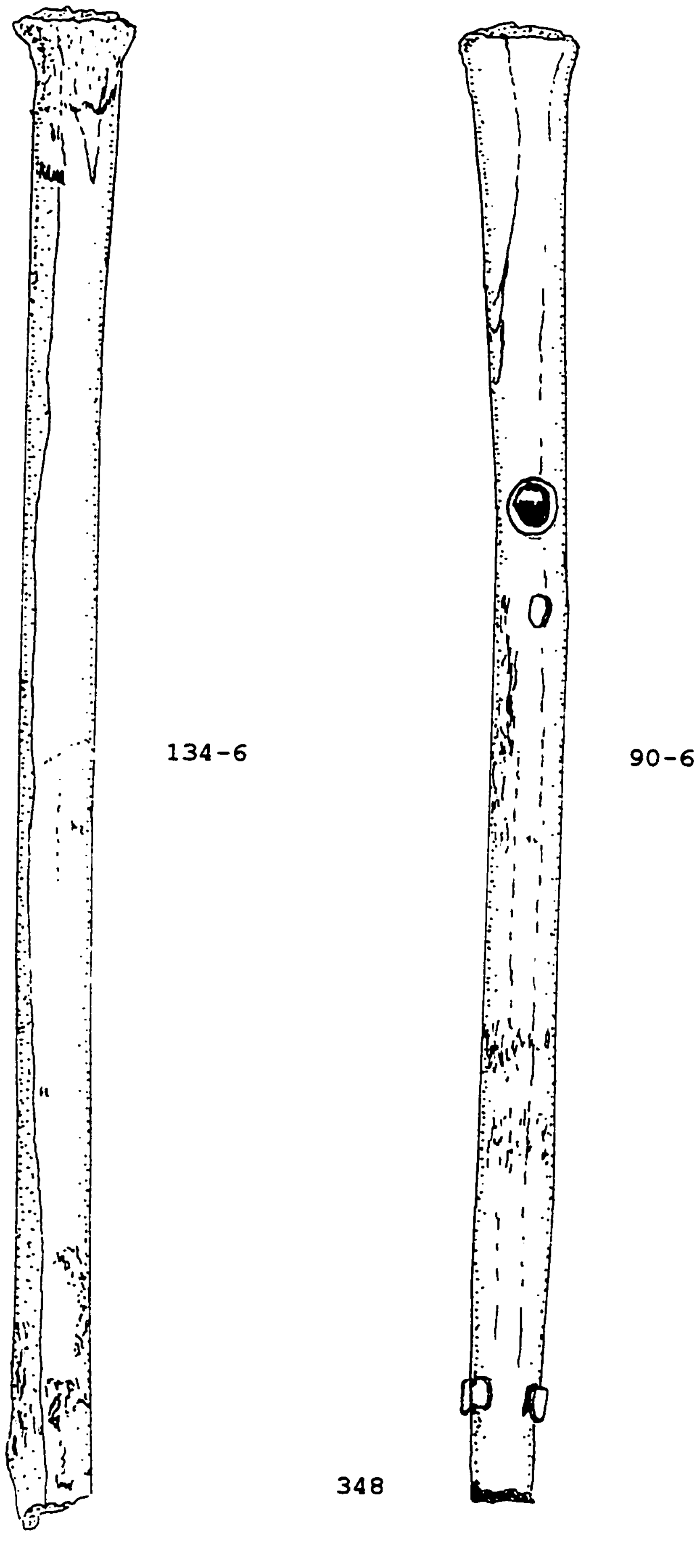
Figure C-36 Bird Bone Whistles



105-1A 105-1B 90-1

Figure C-37 Decorated Bird Bone Whistles

Figure C-38 Tube and Decorated Bird Bone Whistle



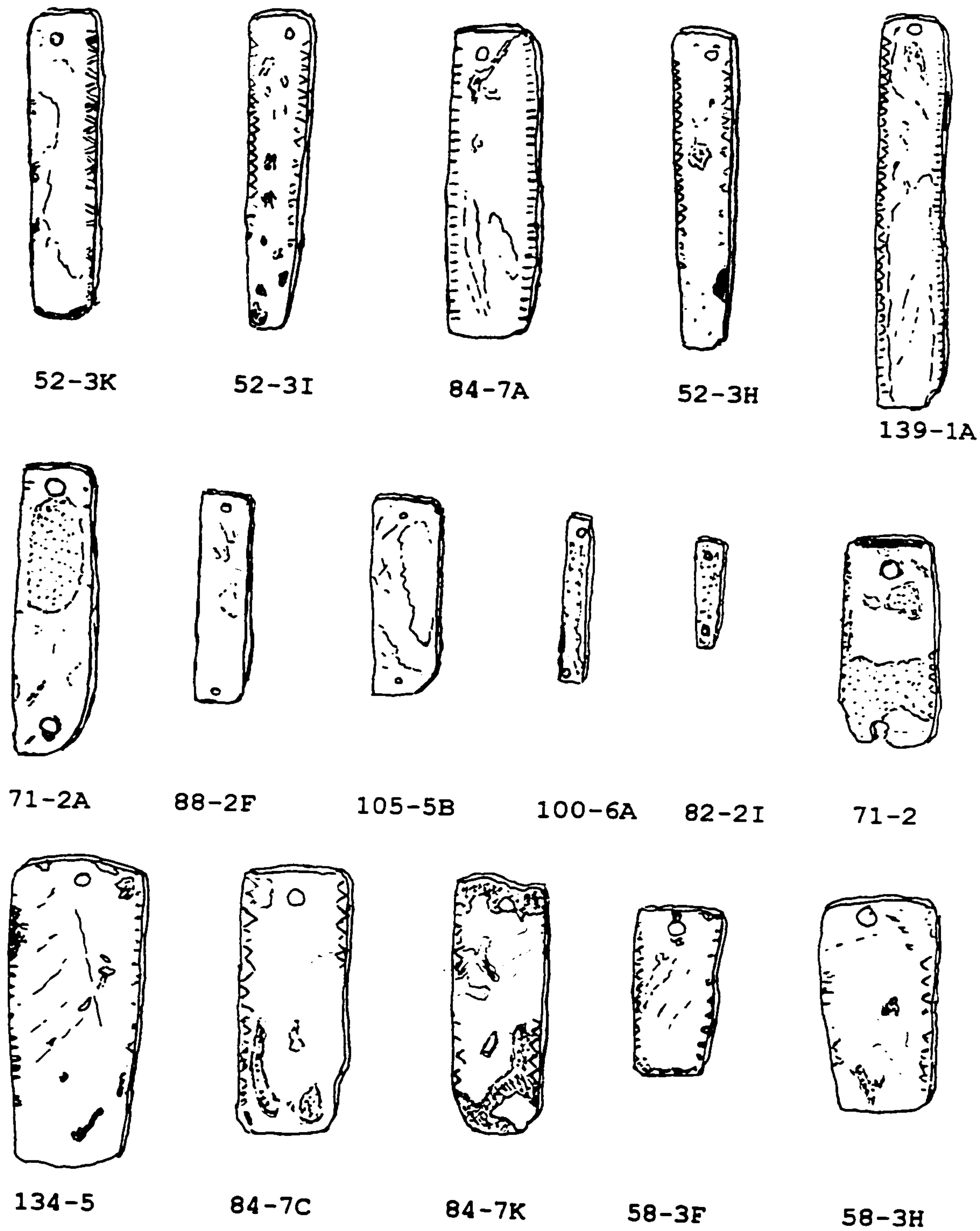


Figure C-39 Incised Rectangular Haliotis Pendants

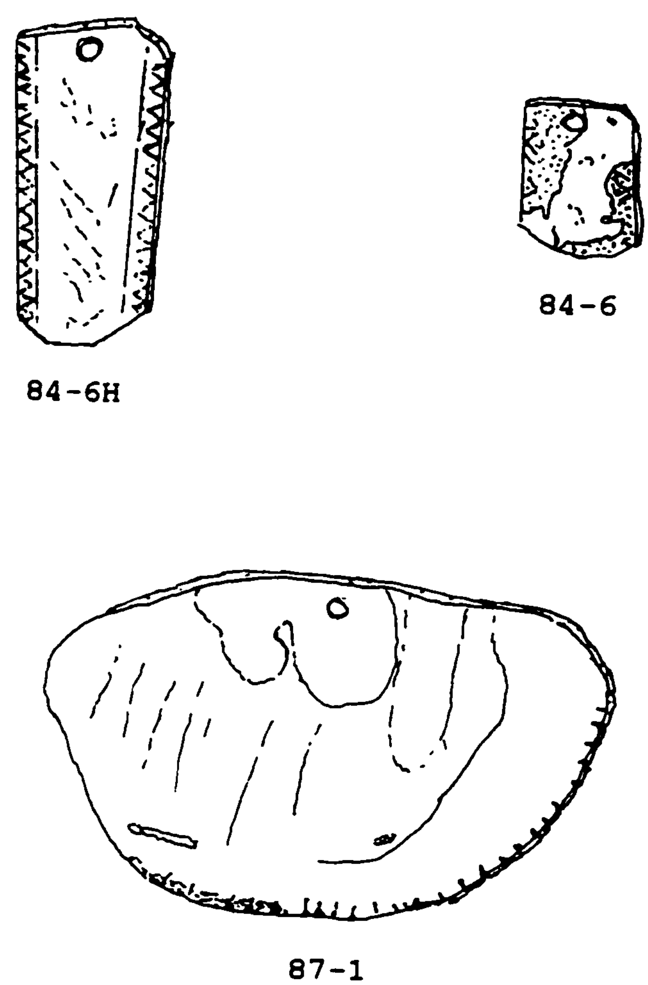
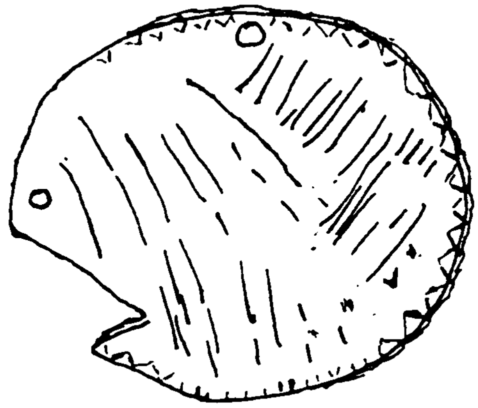
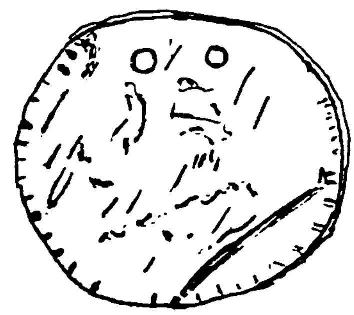


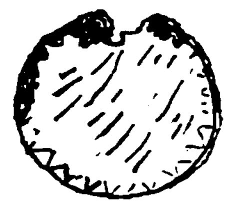
Figure C-40 Incised Rectangular and Semi-Circular Pendants



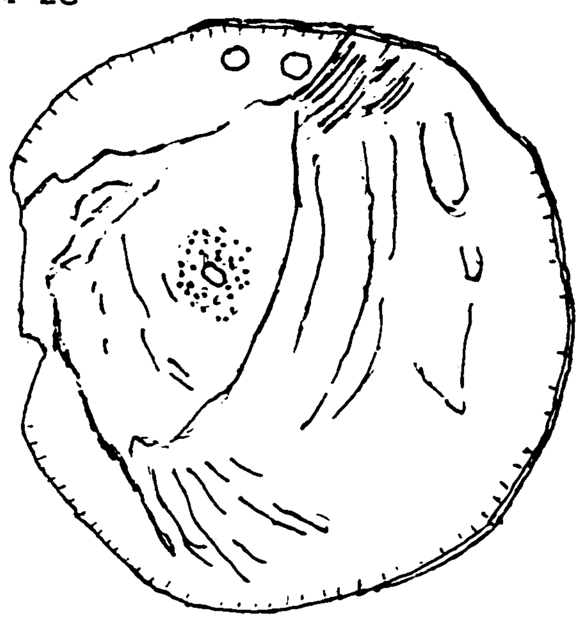
164-2G



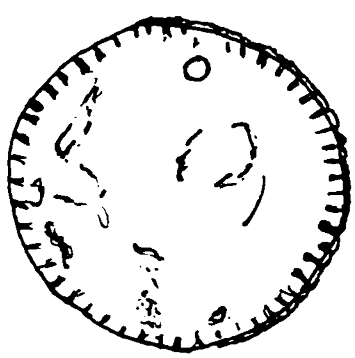
175-17B



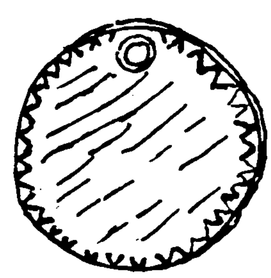
171-15Q



164-2D



171-15X



171-15S

Figure C-41 Incised Round Haliotis Pendants

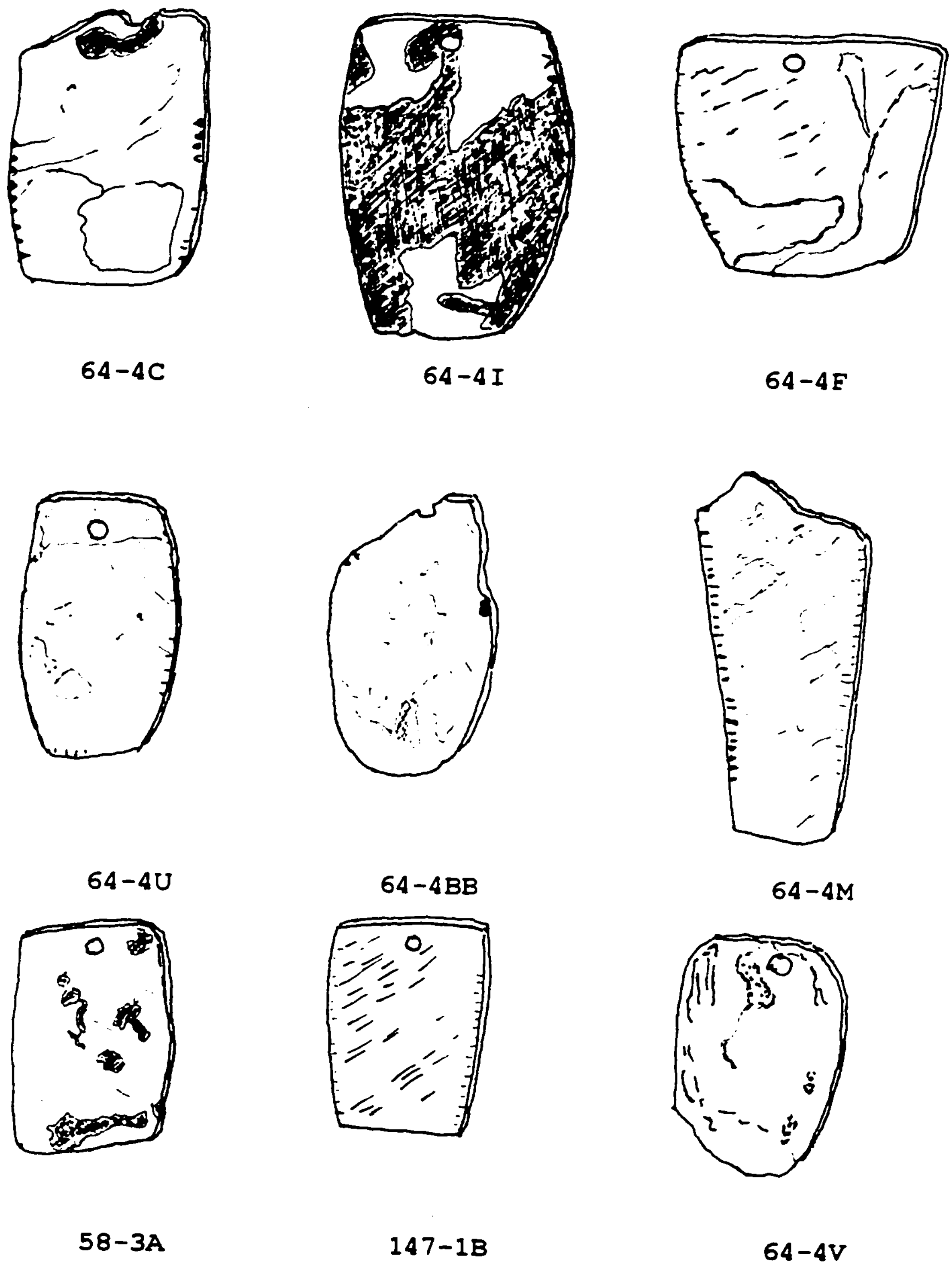


Figure C-42 Haliotis Pendants

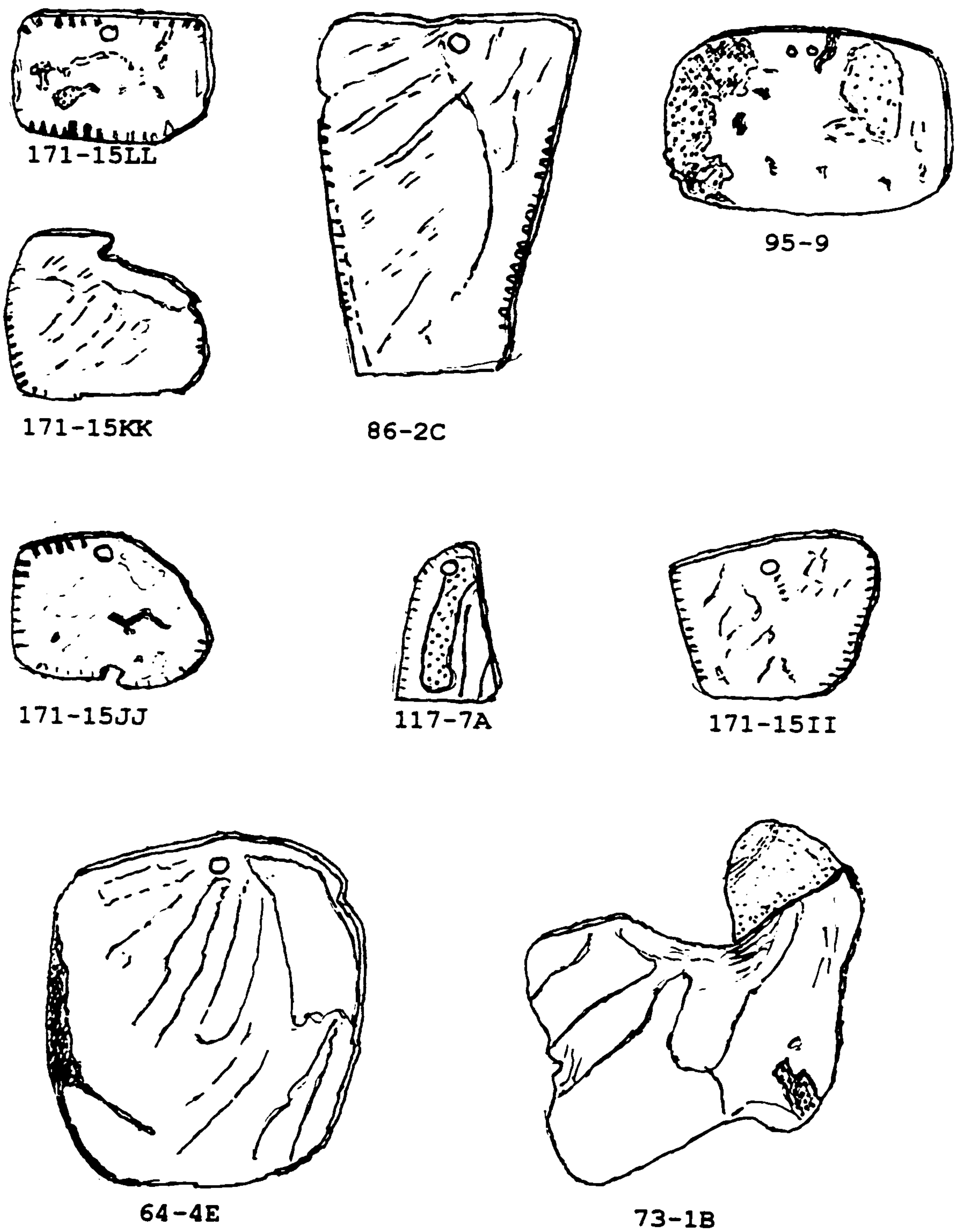


Figure C-43 Haliotis Pendants

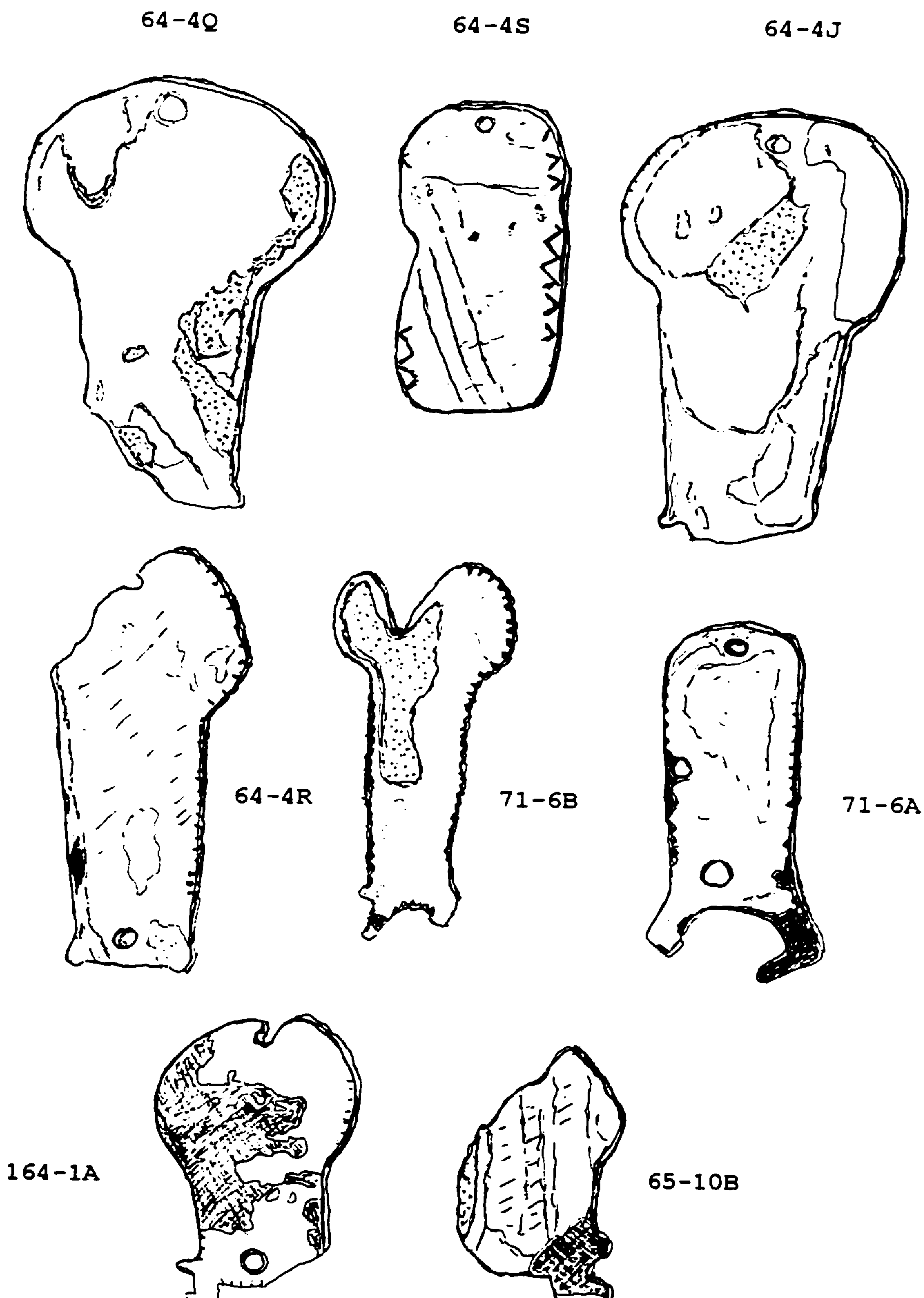


Figure C-44 Haliotis Banjo Pendants

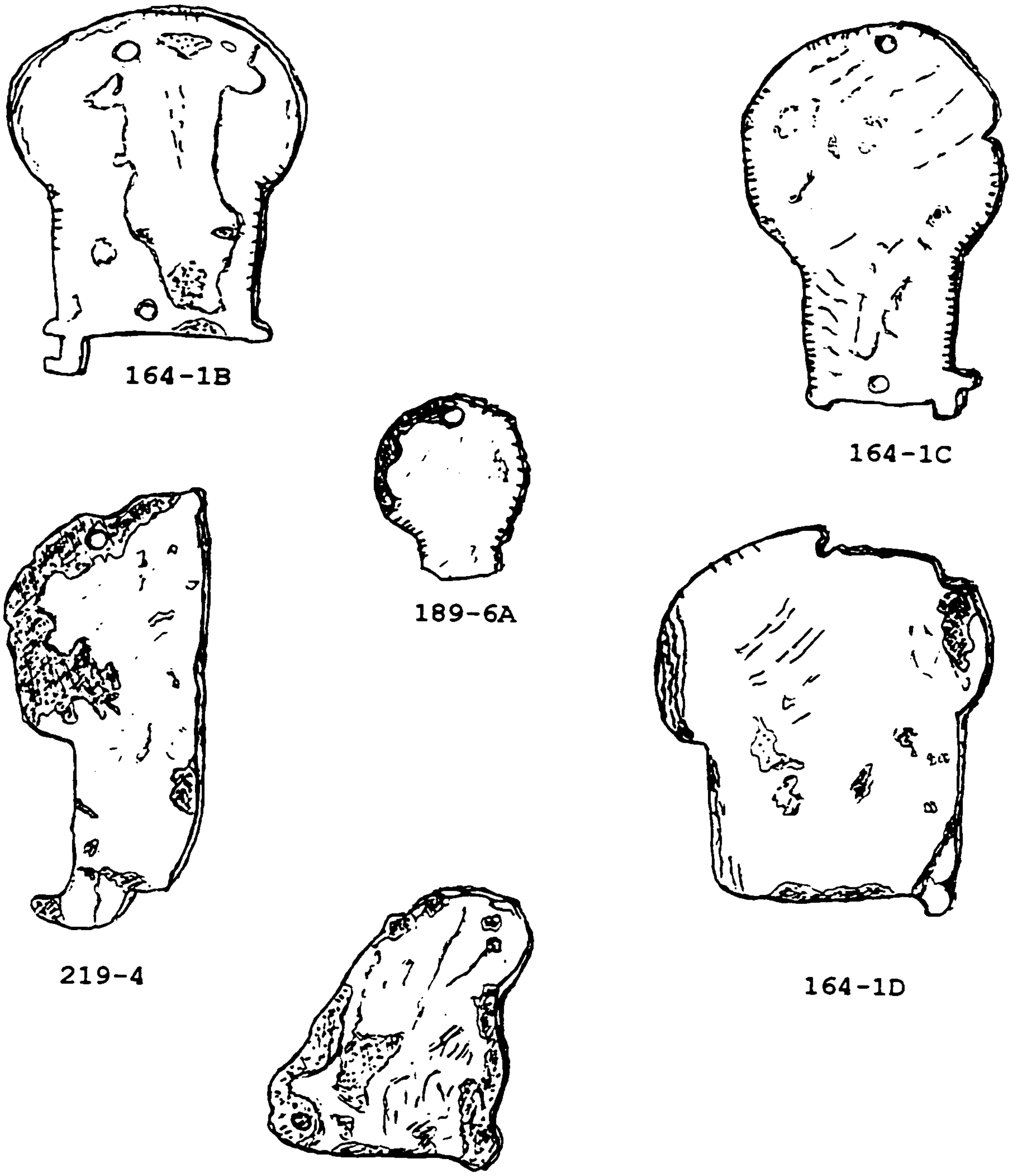


Figure C-45 Haliotis Banjo Pendants

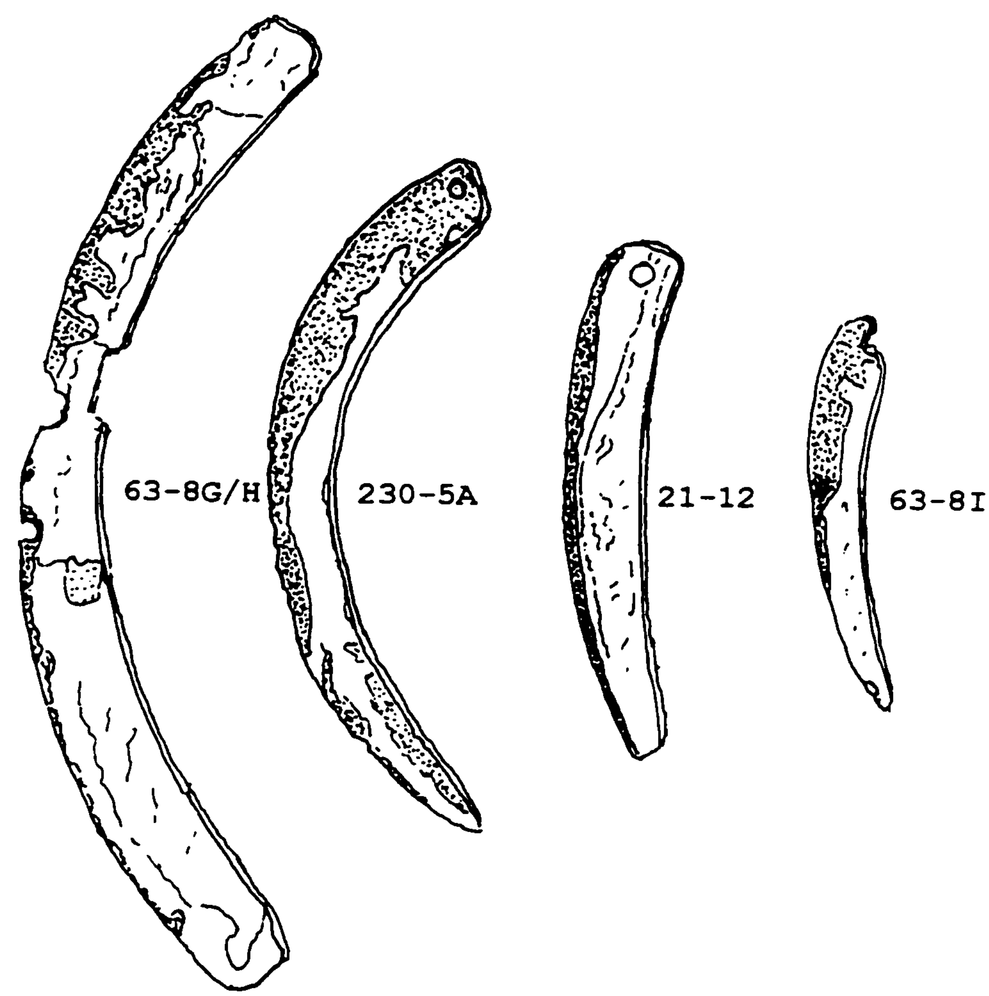
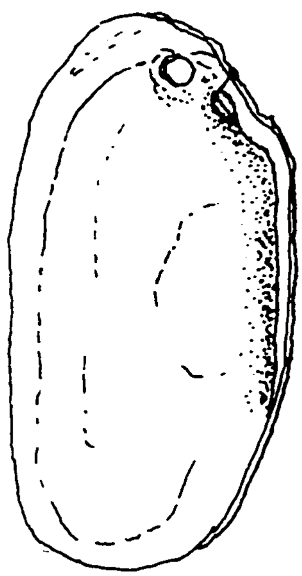
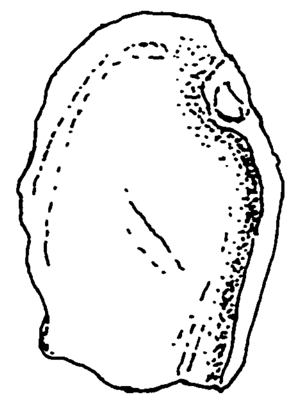


Figure C-46 Haliotis Rim Pendants



168-1A



163-8

73-1A

Figure C-47 Clam Shell Pendants and Haliotis Ornament

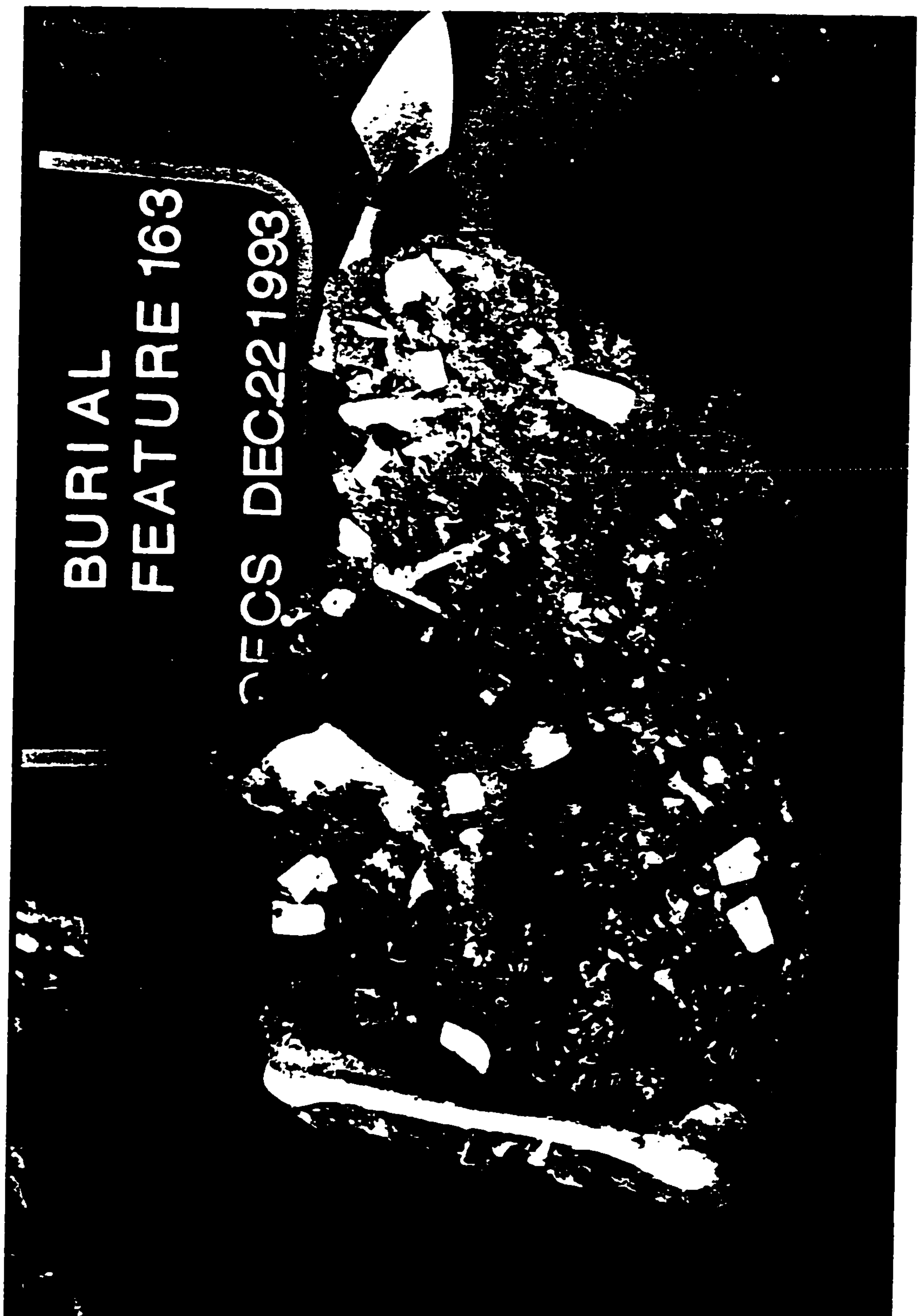


Figure C-48 Cremation

Figure C-49 Redeposited Inhumation

Figure C-50 Tightly Flexed Inhumation

Figure C-51 Burial 88, Tightly Flexed Variant

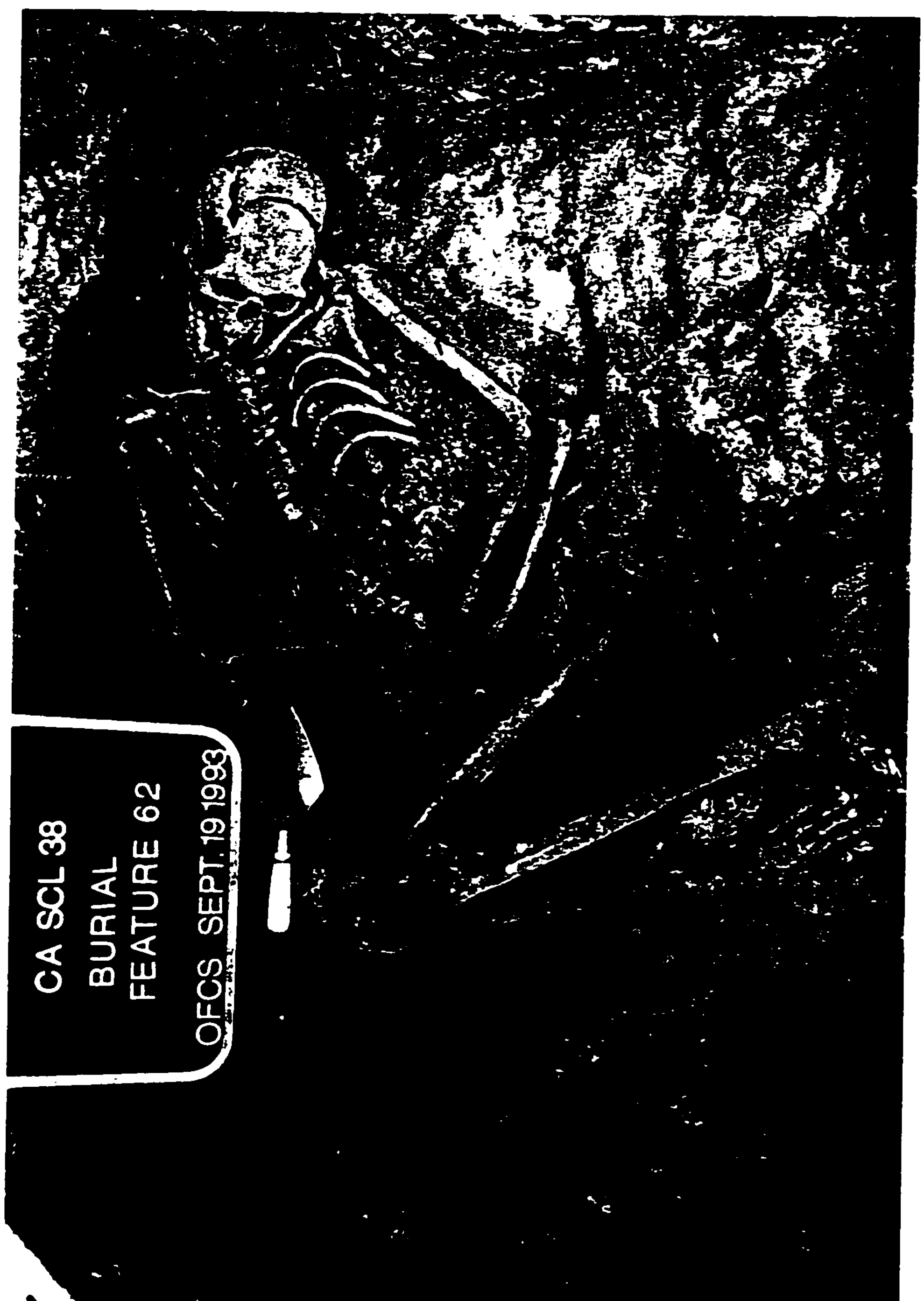


Figure C-52 Semi-Flexed Inhumation

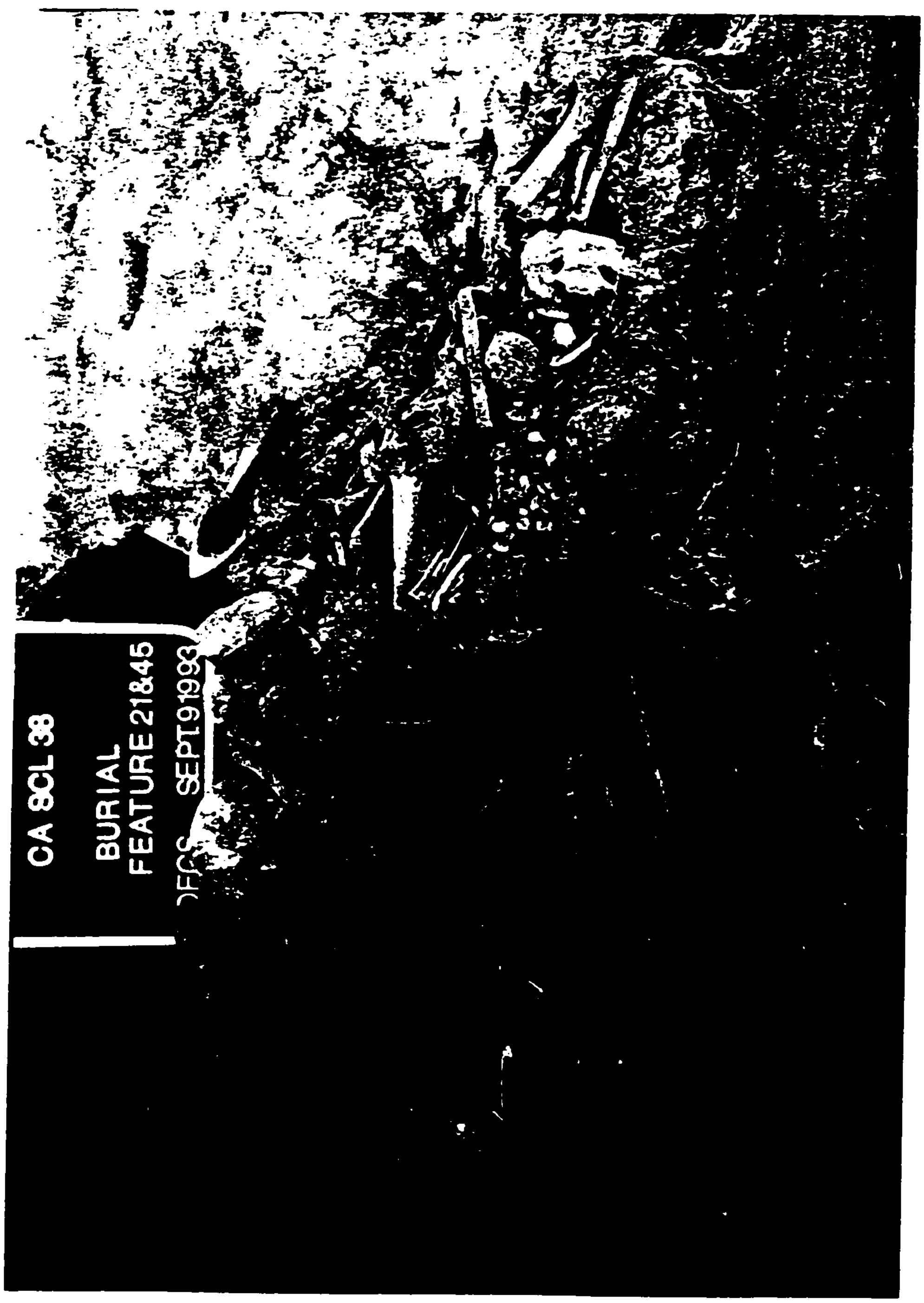


Figure C-53 Burials with Special Treatment

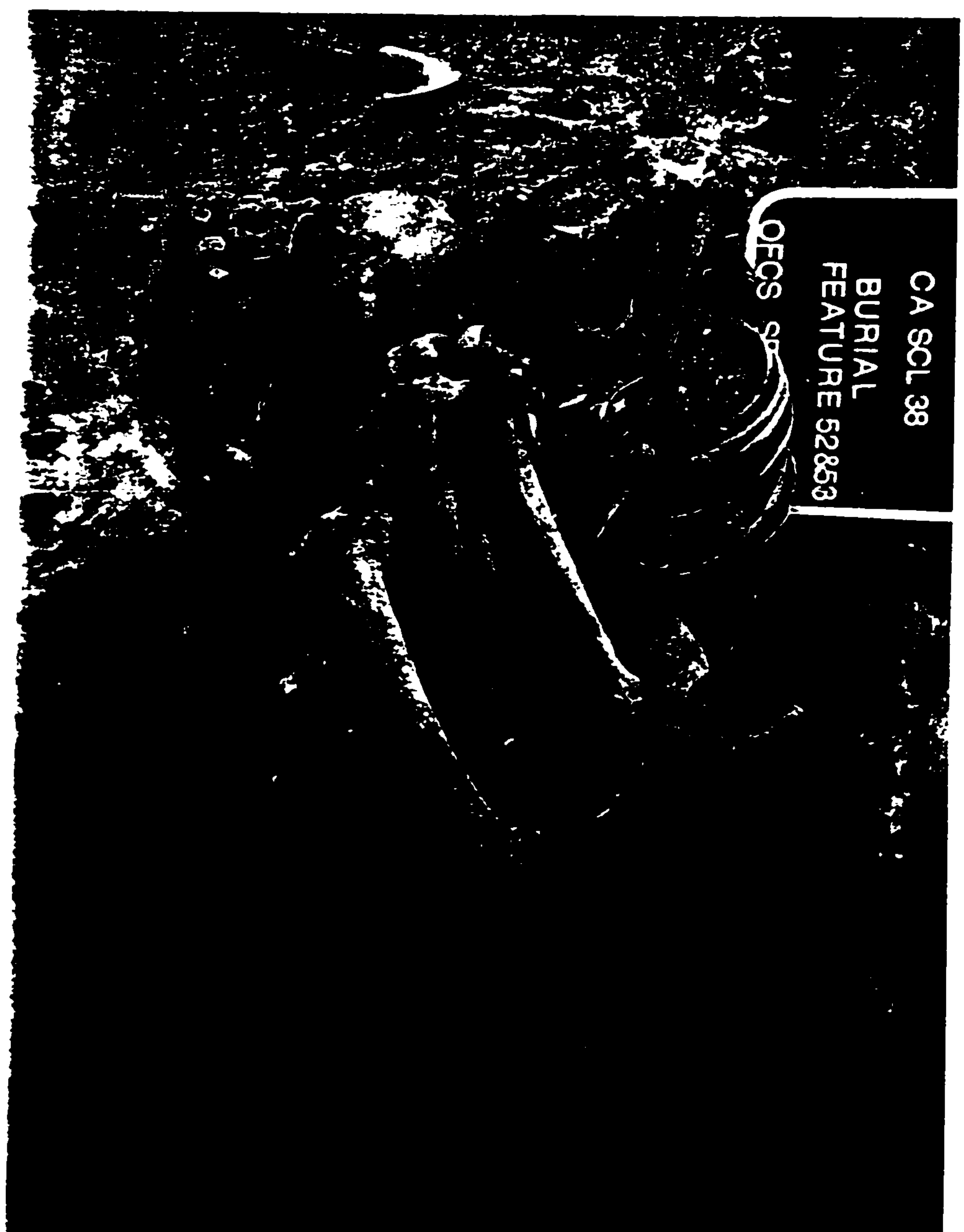


Figure C-54 Double Burial, Adults

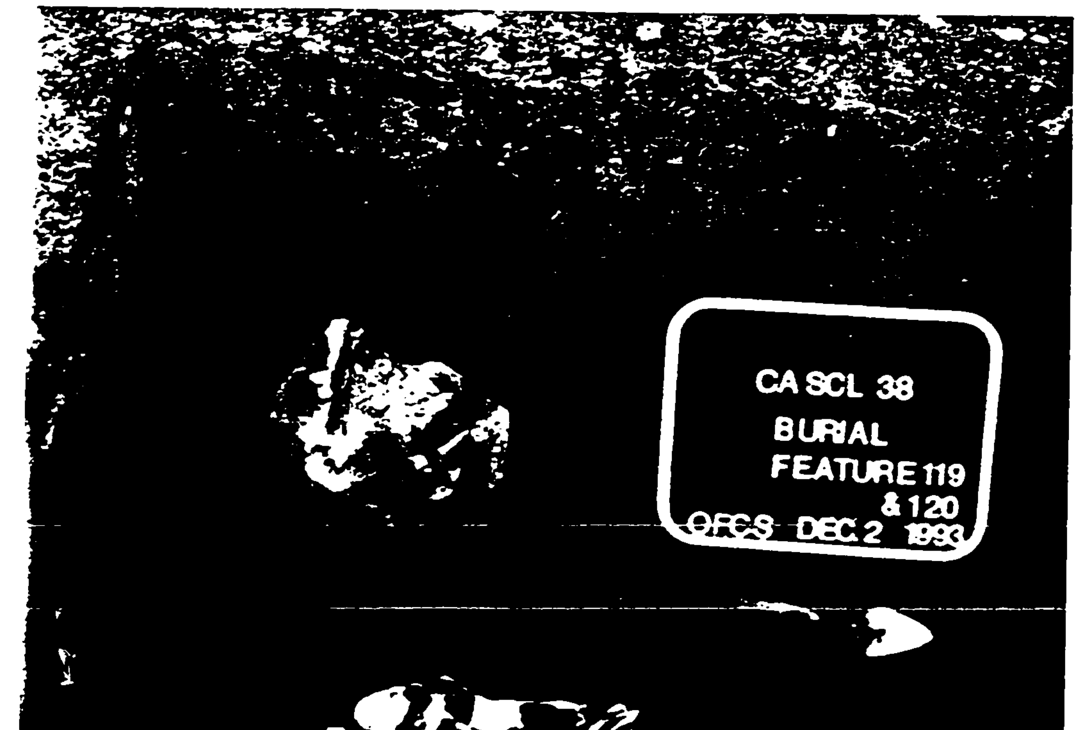


Figure C-55 Double Burial, Adult/Sub-Adult

Figure C-56 Double Burial, Sub-Adults

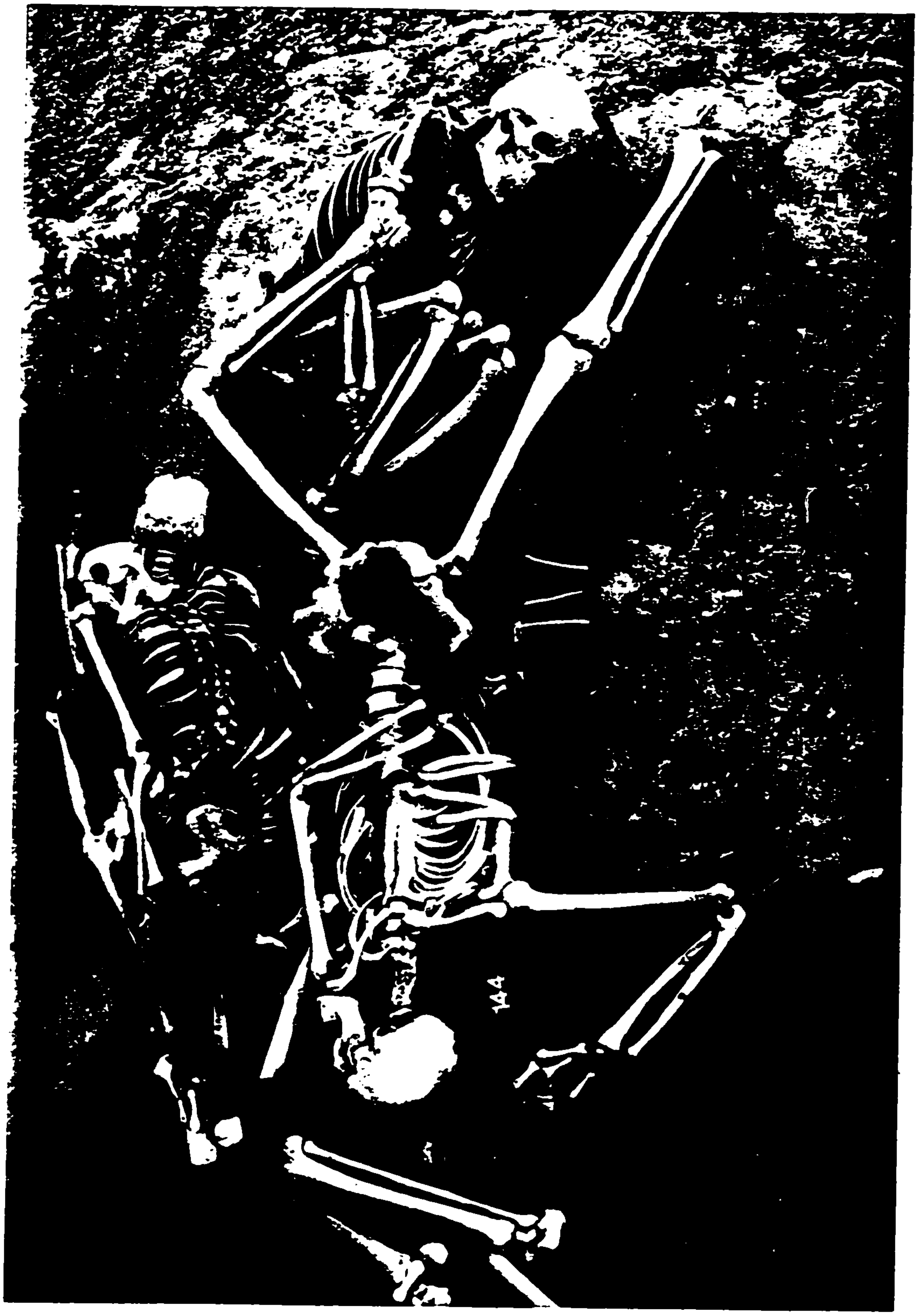


Figure C-57 Burials 141-144, Multiple Burial

Figure C-58 Burial Cluster in Central Location

Figure C-59 Obsidian Tools

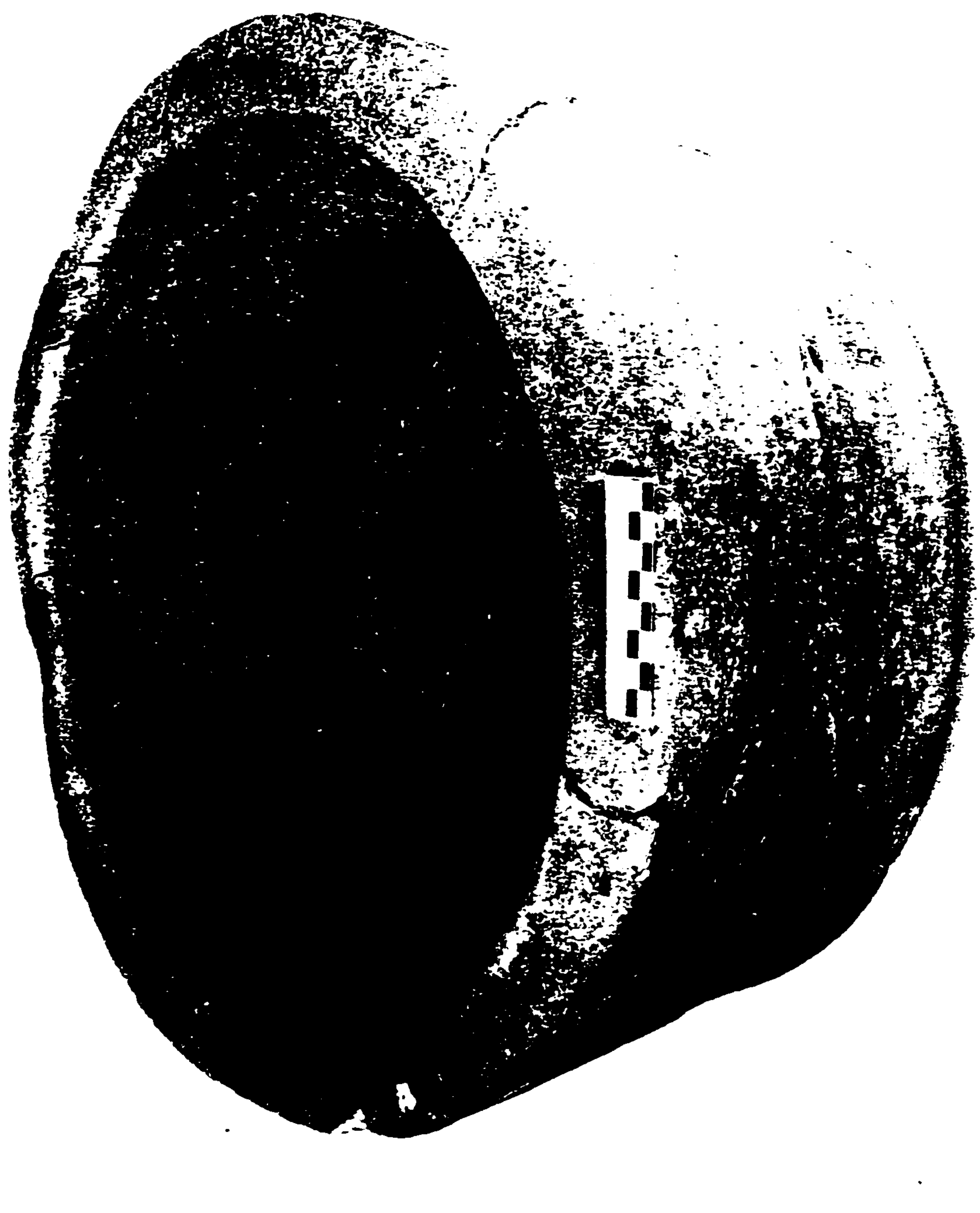


Figure C-60 Show Mortar

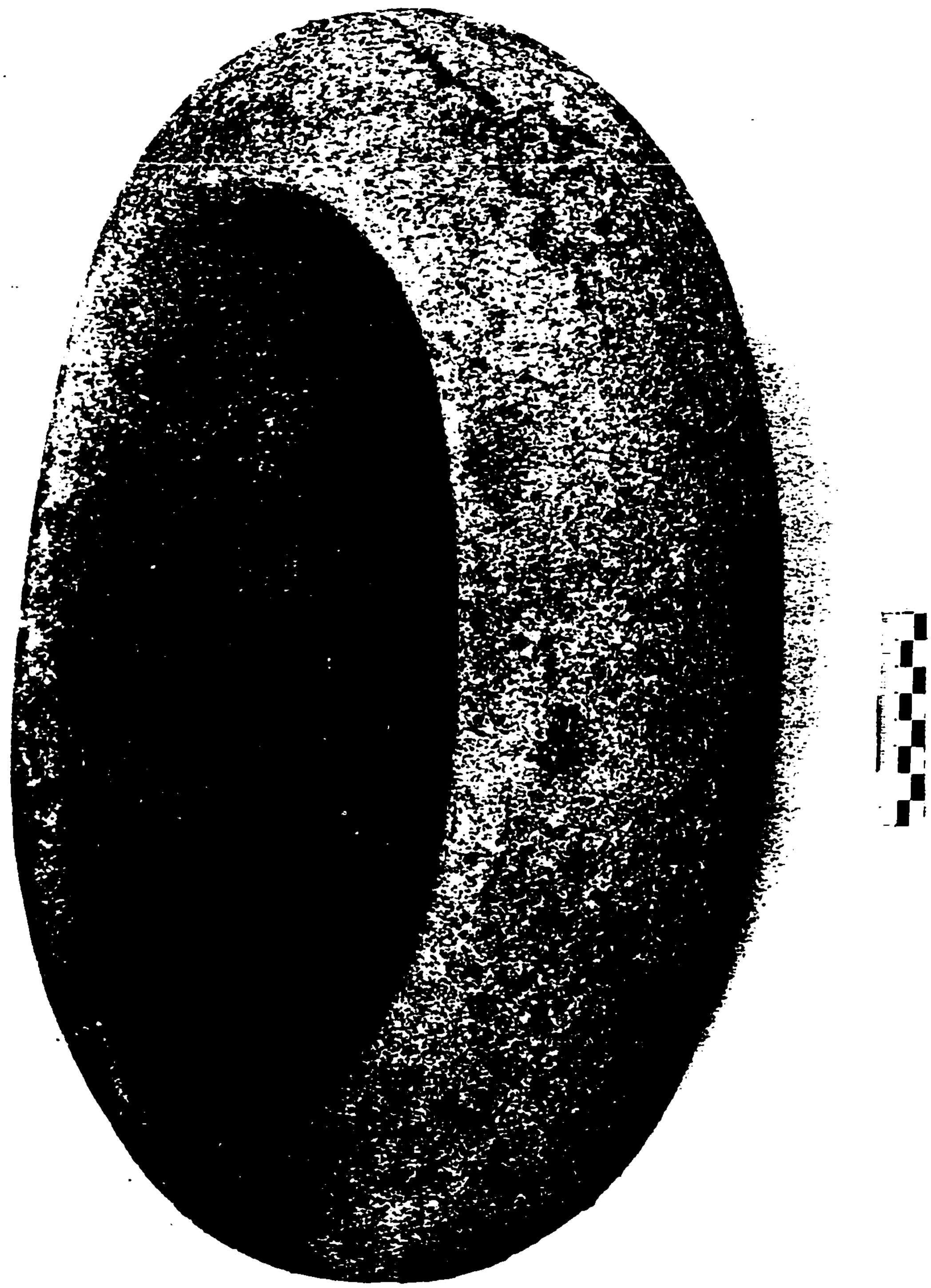


Figure C-61 Oval Bowl Mortar

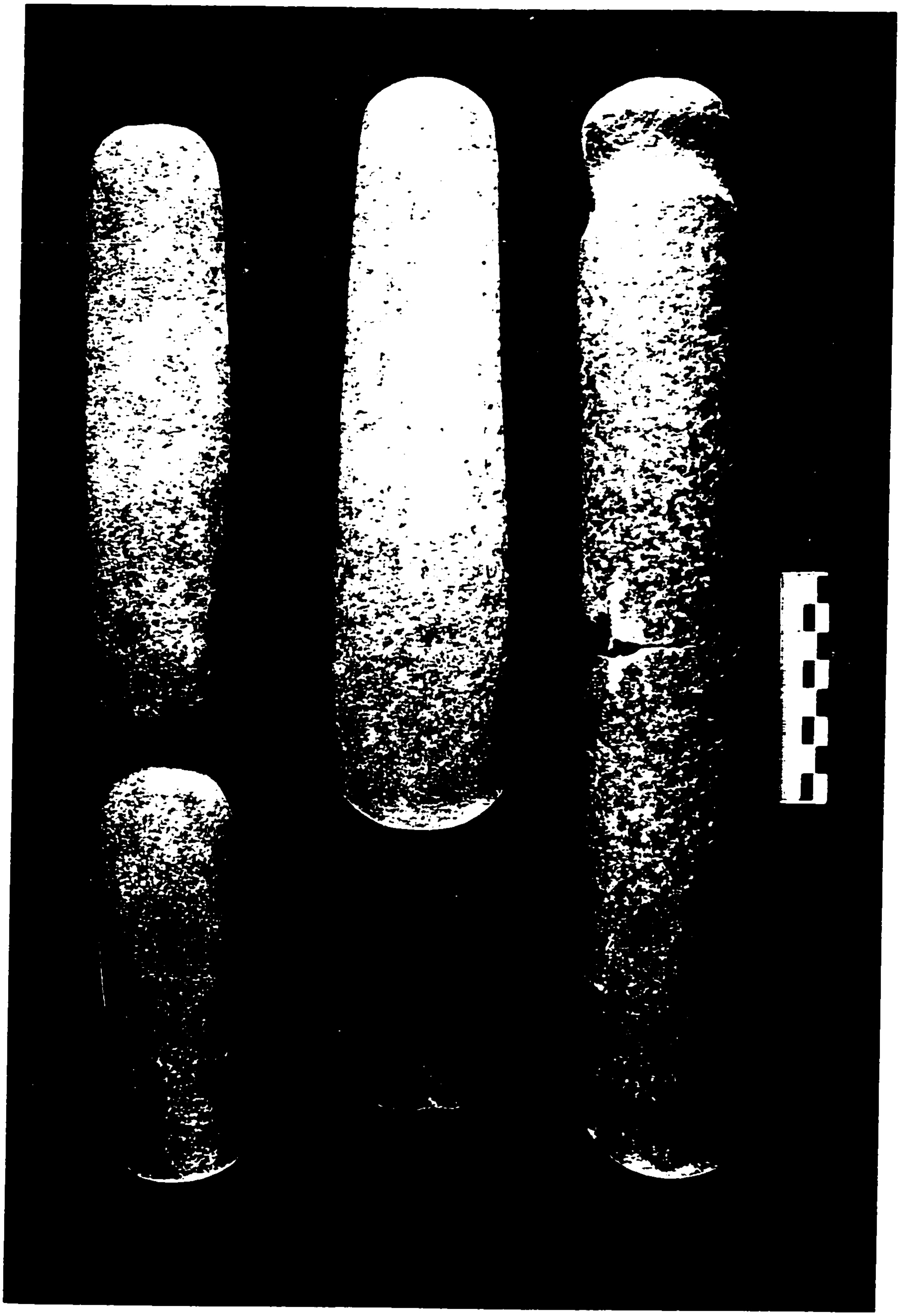


Figure C-62 Pestles

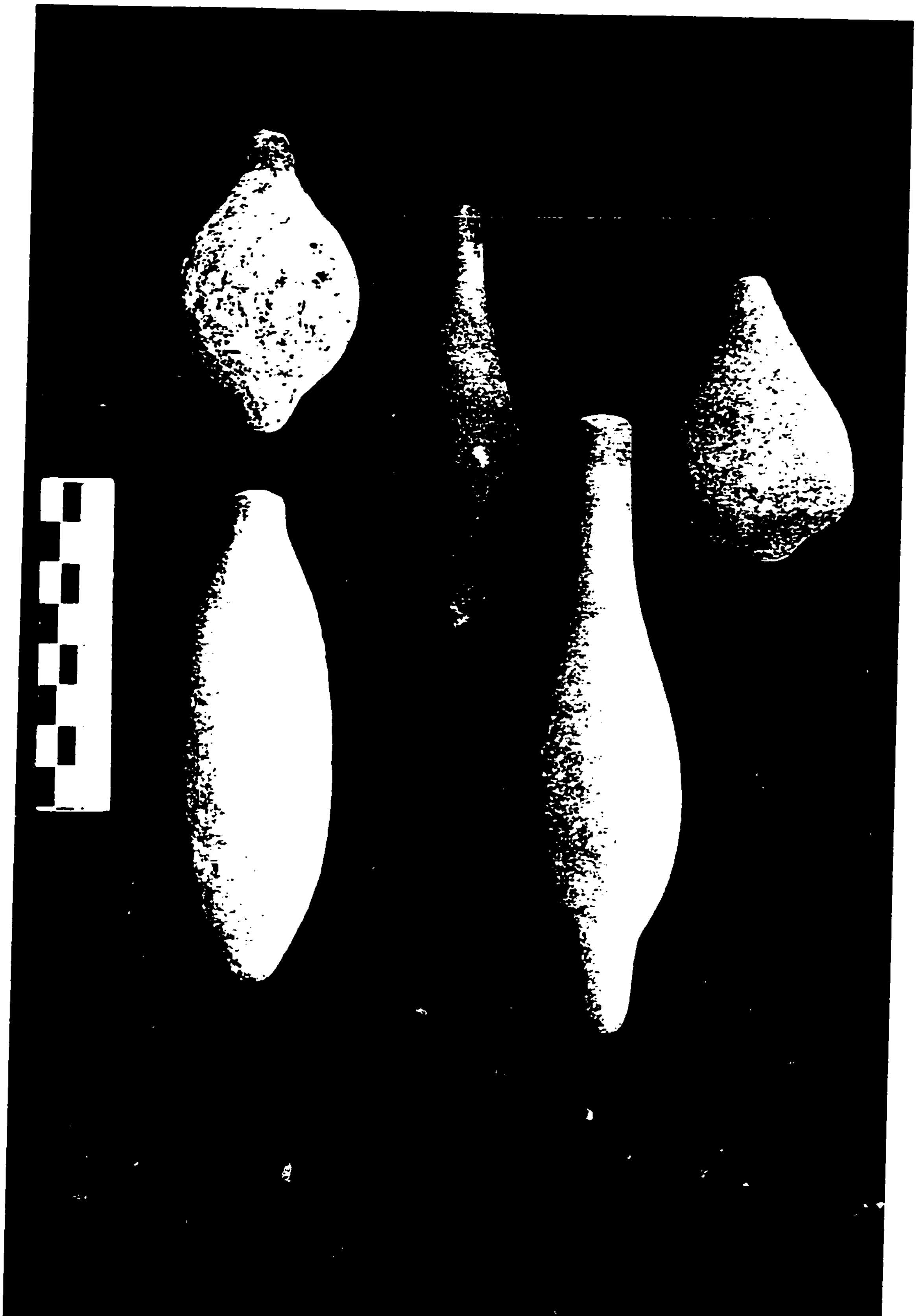


Figure C-63 Charmstones

Figure C-64 Stone Pipes

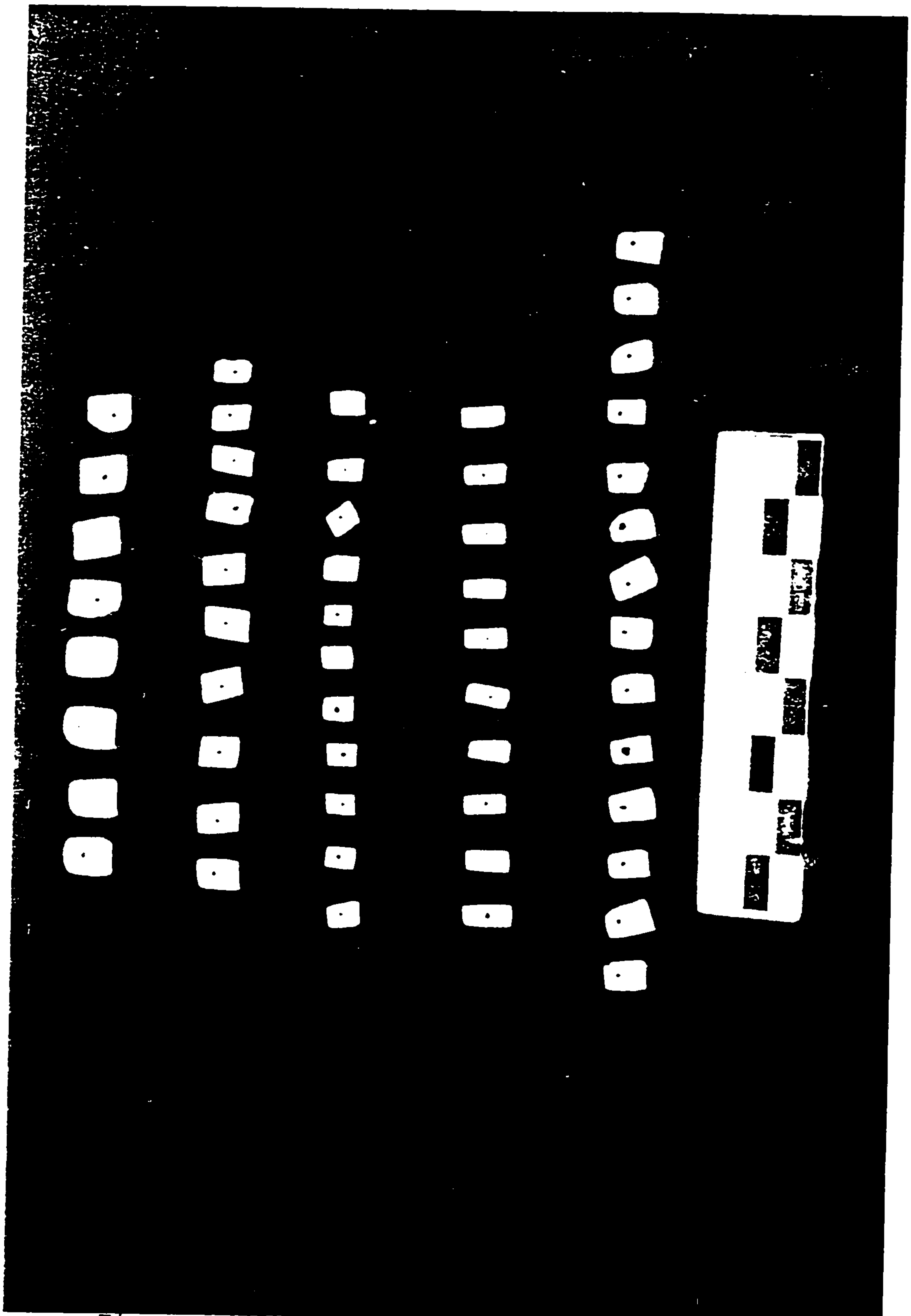


Figure C-65 Olivella Type L and Type M Beads

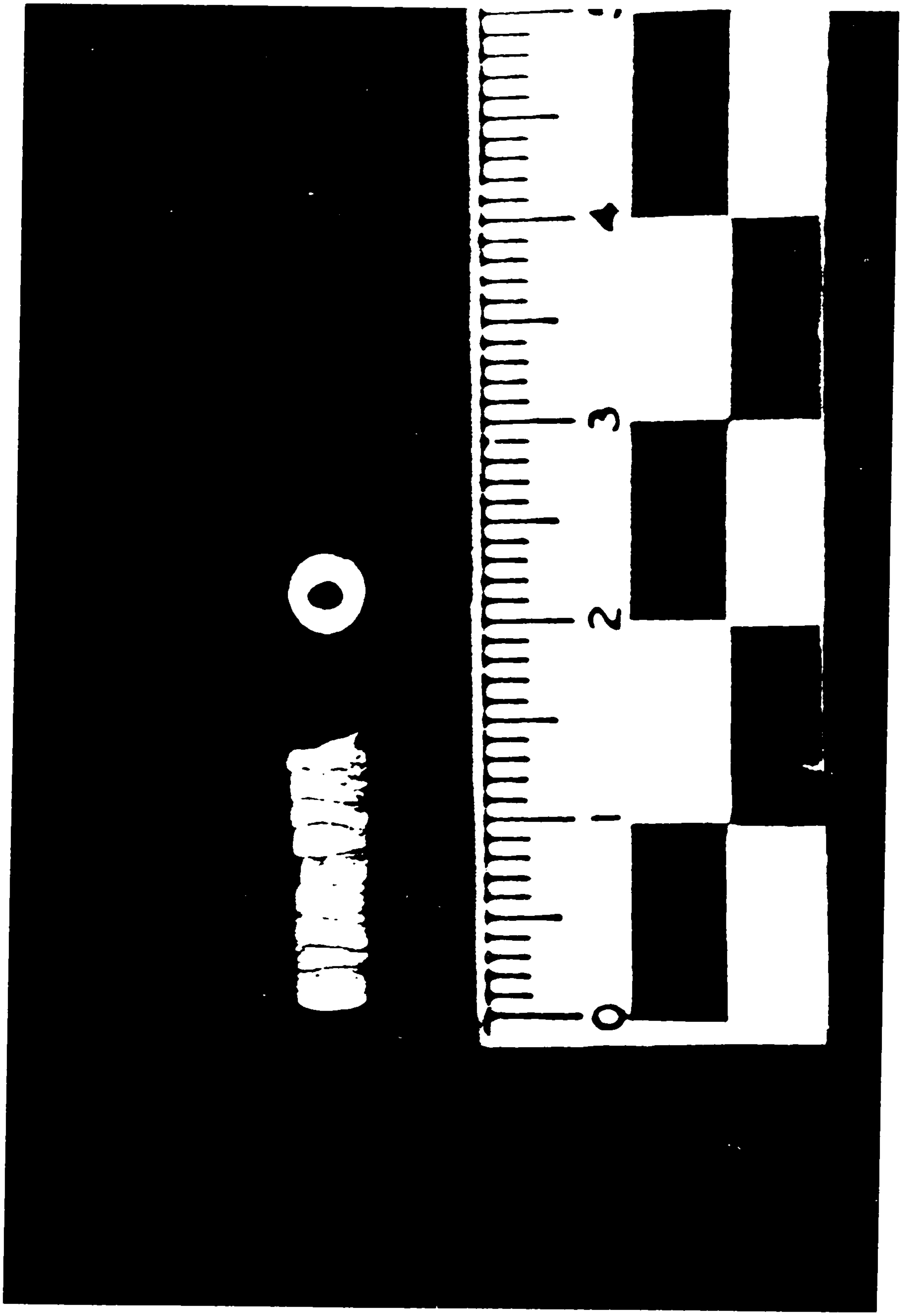


Figure C-66 Olivella Type K Beads

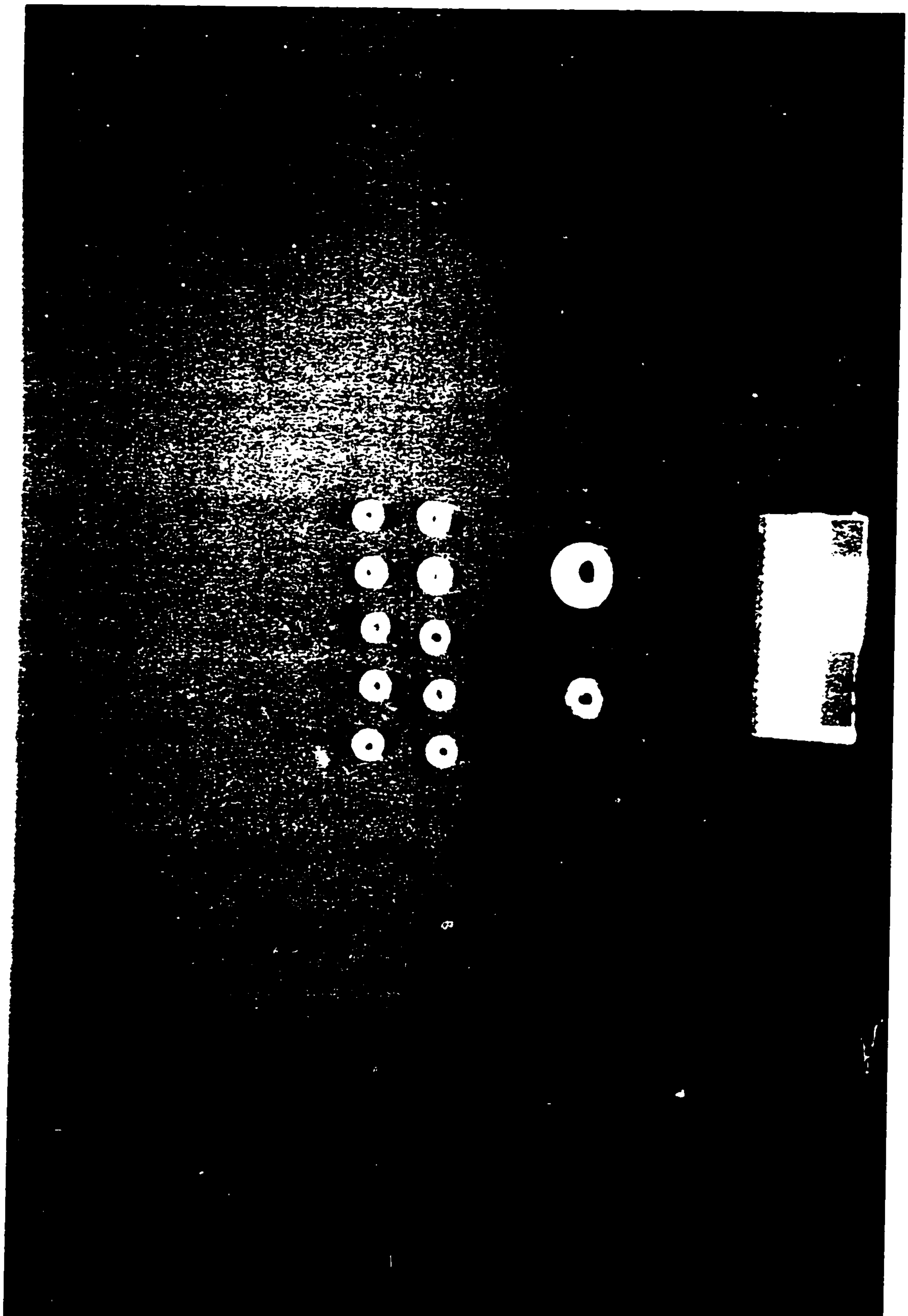


Figure C-67 Stone Beads

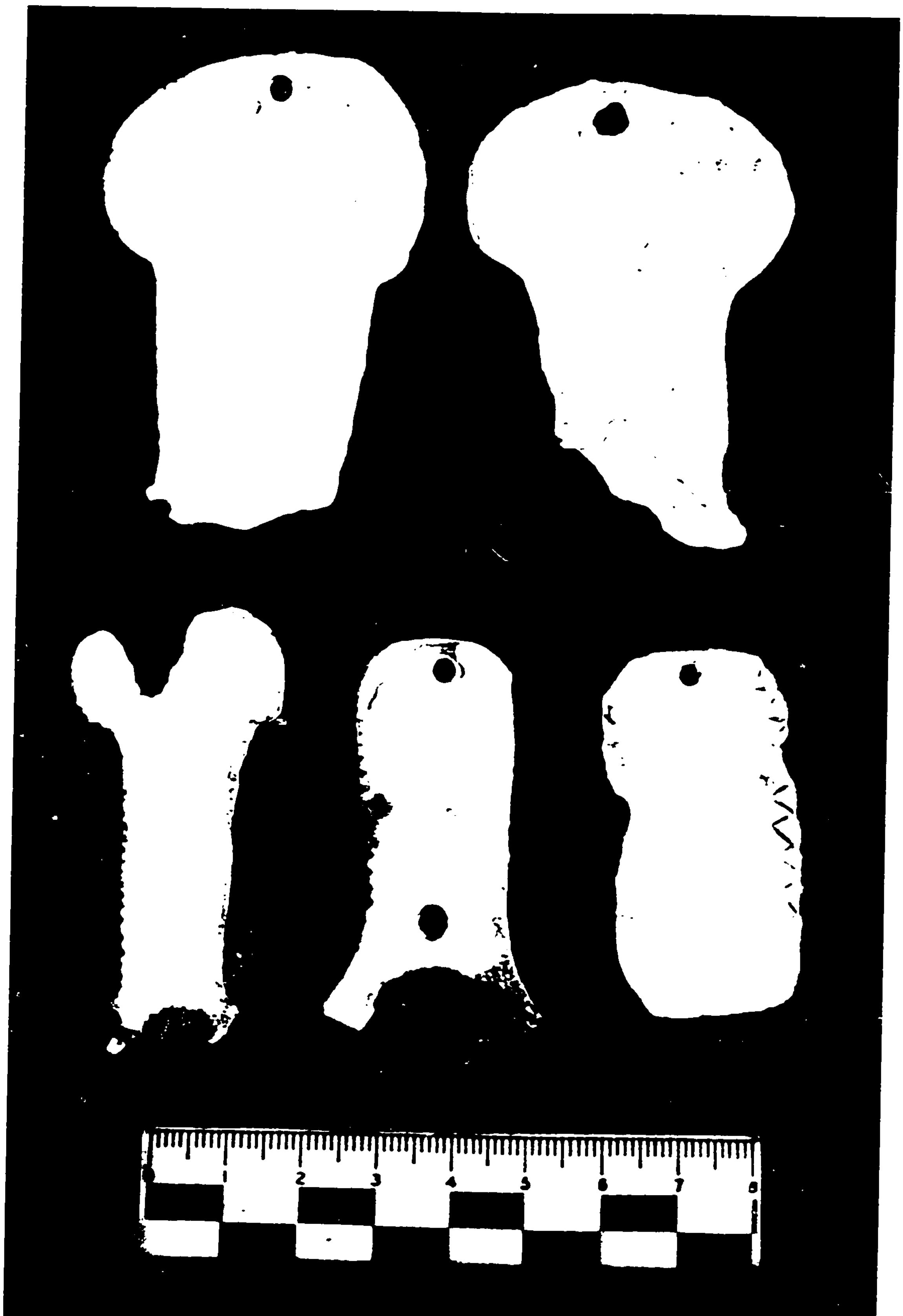


Figure C-68 Haliotis Banjo Pendants

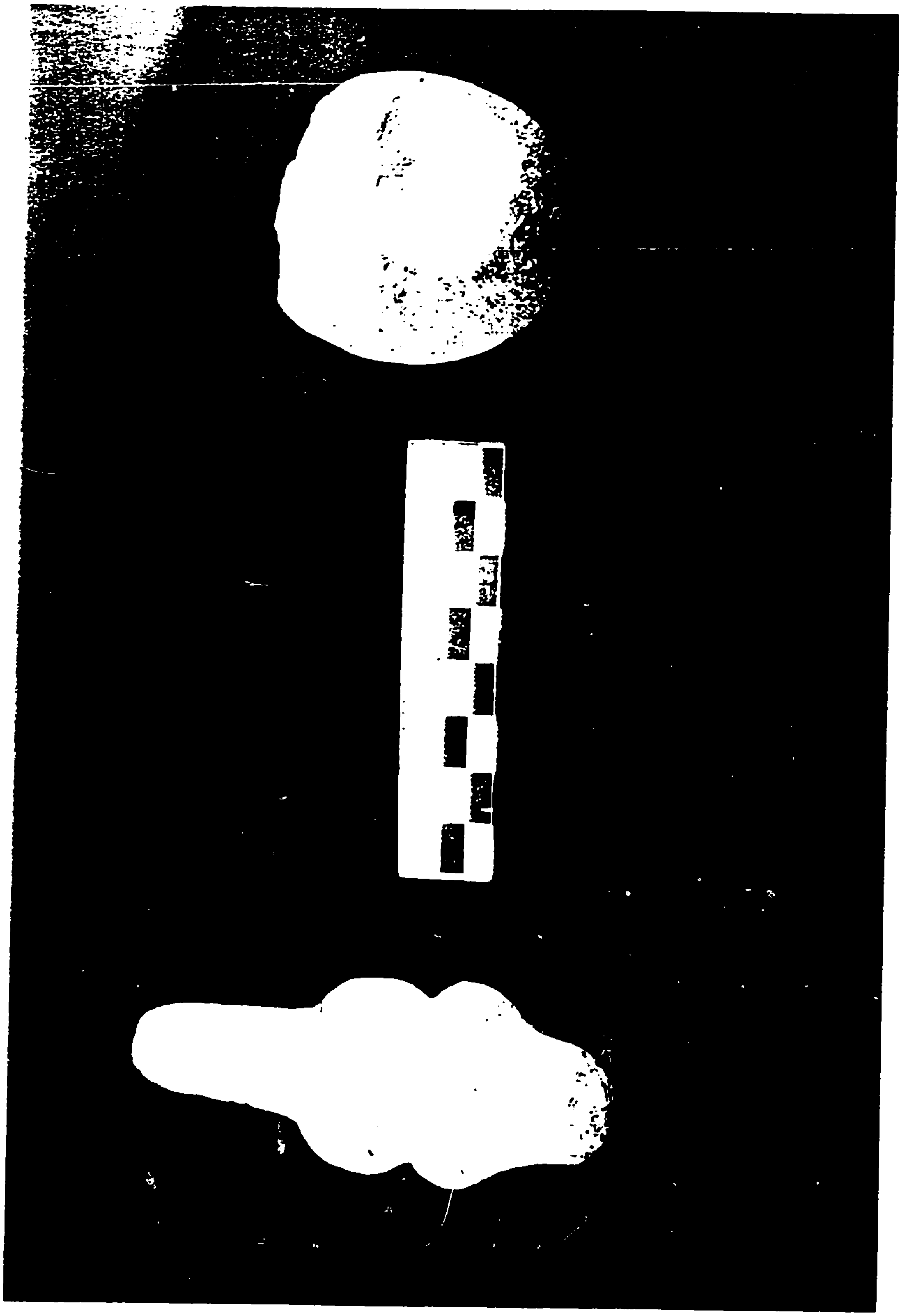


Figure C-69 Charmstone and Cobble Mortar