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THE ARCHAEOLOGY OF CENTRAL CALIFORNIA
I: THE EARLY HORIZON

BY

ROBERT F. HEIZER

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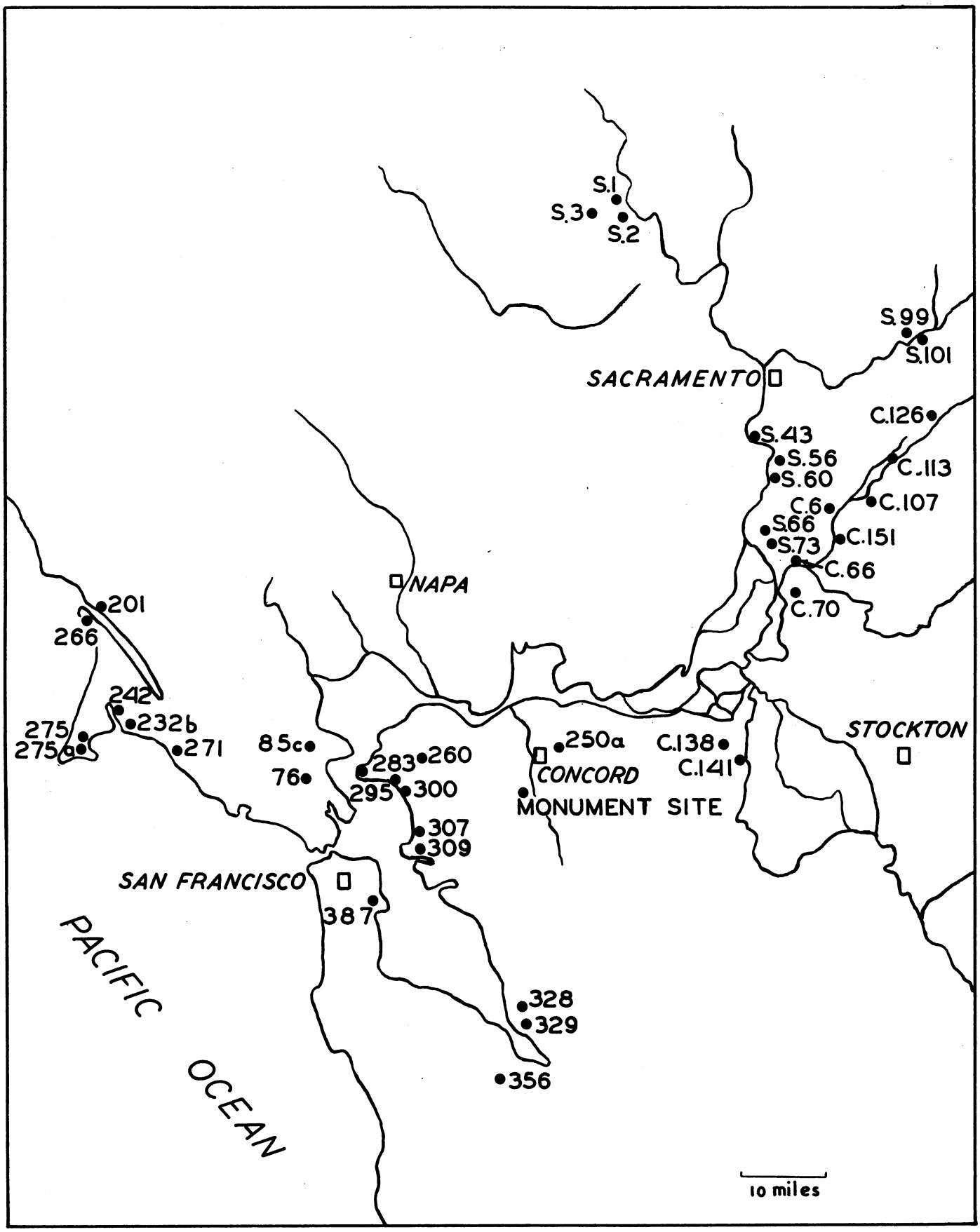

Map 1. Central California Sites

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INTRODUCTION

Although brief accounts have appeared of the archaeological remains recovered from sites of the lower Sacramento Valley (C.107, C.56, C.68, C.142, etc.),[1] there has been until now no opportunity to analyze the excavation data and to present the culture as a whole. Particular interest attaches to this group of prehistoric settlements since they yield evidence of the oldest culture horizon yet discovered in the Sacramento Valley proper. The stratigraphic position of the Central California Early culture horizon was proved at site C.107. Its antecedence is further attested by evidence of local physiographic change which has involved occupation deposits, development of calcareous hardpan caps over site deposits, and extreme degree of calcareous mineralization of all bones, human and animal, contained in these sites.

The present report constitutes a summary of the culture of the Central California Early horizon more readily available than that which appeared in the Sacramento Junior College publication of 1939 cited above. Final intensive analyses of individual sites are promised but must await time and opportunity.

None of the four sites here discussed has been completely excavated. Sacramento Junior College first excavated site C.107, that investigation being followed with additional work by the University of California. Site C.68 was first excavated by Elmer J. Dawson, who, with Egbert W. Schenck, published his observations in 1929. The University of California did some excavating here on a small scale in 1938. Site C.56 was dug by Sacramento Junior College and C.142 by the University of California. All collections made by the Sacramento Junior College, E. J. Dawson, and the University of California are in the University of California Museum of Anthropology (UCMA) at Berkeley. All catalogue numbers with the prefix 1- or 12- refer to the UCMA catalogue; those preceded by L- are in the Lillard collection (see below).

I wish to acknowledge my indebtedness to Franklin Fenenga, who most generously has made available to me his excavation data on sites C.56 and C.107. Mr. Fenenga is preparing a companion paper on the Middle horizon culture which succeeds, and is in part an outgrowth of, the Early Central California horizon. His analysis will include sites excavated by the Sacramento Junior College and the University of California.

After the death of J. B. Lillard, President of Sacramento Junior College, in 1940, the archaeological collection of the Sacramento Junior College Museum was deposited in the University of California Museum of Anthropology, where it is known, most fittingly, as the "Lillard Collection." Early in 1948, after this report was finished, Mr. Harold S. Gladwin, Director of Gila Pueblo, was generous enough to send to the Museum of Anthropology all of the skeletal material and artifacts which had been placed in the Gila Pueblo collections by J. B. Lillard. This considerable amount of material has now been reincorporated in the Lillard Collection, and all California archaeologists will thank Mr. Gladwin for his thoughtful action in making the collection complete.

The present study was begun in 1940 with the encouragement of the late Dr. Edgar B. Howard, a member of the University of Pennsylvania Museum's Committee on Early Man. In 1945 the University Museum, through Mr. Malcolm Lloyd, made a grant to aid in the preparation of this report. To all of these I express my appreciation for their assistance.

The excavations by the University of California of sites C.107, C.142, and C.56 were supported through the Department of Anthropology Research Grant 217 from the University Committee on Research.

Mr. E. W. Gifford, Director of the University of California Museum of Anthropology, has been of constant aid in the preparing and care of the collections utilized here. I have been assisted by James Bennyhoff, who prepared most of the final copies of the charts and diagrams, and by John Goins and W. B. Schwarz, whose excellent drawings comprise the illustrations of artifacts.

Finally, to Dr. A. L. Kroeber, under whose guidance the field work was done and who never failed in his helpful advice, criticism, and encouragement, I acknowledge my indebtedness.

[1] Heizer and Fenenga, 1939; Lillard, Heizer, and Fenenga, 1939, pp. 23-43, 74-76, pls. 5-15. See also Kroeber, 1936, 1938. Site numbers with a prefix C- are those of the University of California survey; those with an S- prefix indicate the Sacramento Junior College Survey.

CULTURAL CLASSIFICATION

In earlier publications dealing with Sacramento Valley archaeological sites a simple threefold culture sequence was proposed. These cultures were called Early, Transitional, and Late Sacramento. This conception proves useful so far as it goes, but each year sees more sites investigated, many of them stratified, and it has become increasingly difficult to visualize and discuss these variable site manifestations as simple equivalents in one or the other of these single cultures. In simplest terms, we are faced with the difficulty of conceptualizing an ever-increasing mass of data and we need some systematized scheme whereby cultures and their variants may be classified.

This problem is not new; it has presented itself in other areas where masses of data became too difficult to manipulate without a classificatory framework. The Midwest and Southwest have produced the McKern and Gladwin (Gila Pueblo) systems. Both have been attacked and defended, and both are being used by archaeologists. A careful assessment of these classificatory techniques, with a critical discussion of taxonomy in archaeology, has recently been presented by J. O. Brew,[2] who pleads for more reports based on the "narrative approach" without primary emphasis on making cultures fit into a mechanistic taxonomic scheme.

The chart presented in figure 1 is open to most of the objections which may be leveled at the McKern and Gladwin systems, but in the present state of Central Californian archaeological knowledge it does represent a distinct advance. We are now abandoning our earlier, oversimplified classification of cultures by expanding them into what appear to be related intracultural groups. When this classification no longer serves, we shall abandon it in favor of one that permits inclusion of new data.

The present classification, made up in a series of informal conferences at Berkeley, represents the ideas of local workers as of early 1946. The introduction of a new series of terms ("horizon," "province," "facies") is intentional, since to employ either the Midwest or Gila Pueblo terms would imply strict semantic equivalence. The term "base" is the rough equivalent of "pattern" or "root" and refers to fundamental or essential elements. Our label "Californian" has reference to the Central Californian type of culture as the term is used by Kroeber,[3] and the determinants include such elements as the stone mortar, charmstone, shell beads and ornaments. Our term "horizon" is roughly equivalent to "phase," and we carry over our older terms of "Early," "Middle," and "Late" to represent broad temporal levels (i.e., time periods) which have been observed stratigraphically and which exhibit distinctive trait assemblages or cultural complexes.[4] We have selected the term "province" because our provinces are essentially geographical subdivisions within horizons. To what extent these provinces are culturally distinct must yet be demonstrated, but we feel that the regional differences are not based simply upon different environments (e.g., littoral as against interior) but are, rather, divergences which, evolving through spatial separation of groups, resulted in regional subtypes. Here our chart loses any pretense of exhibiting time relations between provinces of the same horizon--that is, we cannot now state whether Alameda is earlier or later than, or contemporaneous with, Colusa or Delta or Marin. Our "facies" is more or less similar to "focus," designating a group of settlements which may be distinguished from another group within a province, again on the basis of recurrent trait assemblages. A series of closely related settlements becomes a facies; communities within a facies are generally assumed to be contemporaneous. Our "settlement" is, of course, the familiar "component" or "community," replacing our older term of site, which had to carry additional qualifying terms, since more than one horizon settlement can occur at one site. Where only one occupation period is represented, we have a pure culture site, and the terms "site" and "settlement" are synonymous. Stratified sites (multi- or series-settlement sites) are very abundant in the Interior Valley, and this method of referring to different horizon settlements at the same site makes description much simpler. The capital letters A, B, C, etc., in connection with settlement numbers or names refer to stratigraphic-cultural deposits, A being latest and uppermost, B and C indicating successively deeper and older remains.

Finally, we can now classify two settlements in the uncertain category. One of these, Strawberry, is a deeply buried occupation level just south of the city of Sacramento. It yielded a number of unique material culture forms and is presumably ancient, since it was covered by 18 feet of river-laid alluvium. The other settlement, Tyler Island No.3, is also ancient. It is known thus far from a small series of "fossilized" human burials lying imbedded in an old terrace remnant which rises out of the peat near the edge of one of the saucer-shaped islands of the interior delta.

Wherever time differences can be demonstrated by stratigraphic position we have indicated these in the chart by a horizontal line. Thus, all three horizons are distinguished on this basis, as are several facies of different provinces. Provinces, whose nature is basically geographic, obviously will show no direct stratigraphy, but it may be possible to infer, by use of the comparative technique, time differences between them. Our present assumption is that provinces within a single horizon are contemporaneous. The Interior province facies of the Central California Middle horizon

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[2]Brew, 1946, pp. 32-73.

[3]Kroeber (1923; 1925, chap. 59) has shown that only Central California has what might be considered a native culture, since Northwestern California has been colored by the Northwest Coast, and Southern California has many ties with the Southwest.

[4]See Lillard, Heizer, and Fenenga, 1939; Heizer and Fenenga, 1939. We have proceeded from the first on the basis of assemblages of artifact types associated with burials, matching one group of contemporaneous burials (in a single-period cemetery) with another series of intracontemporaneous burials from the same or a different site. On the basis of similarity or difference, aided by stratigraphy, we determine horizon, province, and facies. Were it not for the abundance of stratified sites, the present picture of culture sequence would rest on much less certain grounds.

	Littoral Zone		Interior Valley Zone				
	MARIN PROVINCE	ALAMEDA PROVINCE	DELTA PROVINCE			COLUSA PROVINCE	
HISTORIC TRIBES IN AREA	Coast Miwok	Bay Costanoans	Plains Miwok Southern Patwin Nisenan			Patwin	
LATE CENTRAL CALIFORNIA HORIZON Phase II	Estero facies Settlements 232b-A 242-A 266-A 201	Fernandez facies Settlements 260-A 328	Mosher facies Settlements S.56 C.6 S.60 C.138			Miller facies Settlements S.1-A S.2-A	
LATE CENTRAL CALIFORNIA HORIZON Phase I	Mendoza facies Settlements 275 242-A	Emeryville facies Settlements 309-A 387-A 356-A 76-A 250a 236	Hollister facies Settlements S.66 C.6 S.60 C.107-A C.138			Sandhill facies Settlements S.3 S.1-B	
MIDDLE CENTRAL CALIFORNIA HORIZON	COASTAL PROVINCE		INTERIOR PROVINCE				
	McClure facies Settlements 266-B 232b-B 242-B	Ellis Landing facies Settlements 295 309-B 300 307 Monument (?)	Morse facies Settlements C.66 S.73 S.60 C.113 C.107-B C.126-B	Deterding facies Settlements S.99 S.101	Brazil facies Settlements S.43	Need facies Settlements C.151 C.70	Orwood facies Settlements C.141-B
EARLY CENTRAL CALIFORNIA HORIZON	(UNKNOWN)		UNNAMED PROVINCE				
			Windmiller facies Settlements C.107-C C.142 C.56 C.68				

Fig. 1. Classification of Cultural and Temporal Relationships for Central California

represent localized culture manifestations which have not yet been invested with time seriation. Middle horizon communities are abundant and widespread, hence this Middle period may have been of fairly long duration, and the several facies could therefore represent local subcultures, some of which, but not all, were contemporaneous. Time differences between facies will be difficult to determine until more archaeological work is done.

The Early Central California horizon has been described in print as the Early Sacramento Culture. It is known from a small series of four geographically restricted communities and has not been assigned a province designation. All are similar enough in content to fit within a single facies called Windmiller, the name of the site where first identification of this horizon was made by stratigraphy. It is the oldest known culture of the lower Sacramento Valley.

PHYSIOGRAPHIC BACKGROUND

Central California comprises parts of three major physiographic sections (map 2).[5] These are, in order from west to east: (1) the California Coast Ranges; (2) the California Trough or Great Valley of California, sections of the Pacific Border province; and (3) the Sierra Nevada section of the Sierra-Cascade Mountains province. The California Trough or Great Valley section is further subdivided into four subsections called: (1) the Delta Country or Delta Tidal Plain; (2) the Victor Alluvial Plain; (3) the River Flood Plains and Channels; and (4) the Arroyo Seco Dissected Pediment. These four land forms have been produced by the Mokelumne River and other streams subsequent to the tilting of the Sierra Nevada block in the Pleistocene epoch.

The Mokelumne River, the stream most closely associated with the settlements of the Early Central California culture horizon, is one of the many drainways that flow westward along the tilted volcanic plain of the Sierra Nevada. It joins the San Joaquin River near that river's confluence with the Sacramento about twenty miles east of the head of Suisun Bay. The Mokelumne drains an area about 47 miles long and 16 miles wide and has a course about 130 miles in length. The lower or western portion of the Mokelumne River basin lies on the central valley plain in northern San Joaquin and southern Sacramento counties. Here on the plain the river grade is flattened to an average of two feet to the mile between the Sierran foothills and tide water, and in this reach the stream is commonly bounded by ill-defined remnants of natural levees along each rim of the river trench. Our site C.56 lies on one of these natural levees.

The Delta Plain forms the lower (western) part of the Mokelumne area. Under natural conditions, i.e., prior to levee building and land reclamation by draining, leveling and filling, it was a tidal marsh traversed by the meandering sloughs of the San Joaquin, Mokelumne, and Sacramento rivers. Most of the sloughs have now been confined by artificial levees and the enclosed "islands" reclaimed for cultivation. These "islands," if we disregard the sloughs, form an extensive and fertile plain of which the greater part is at or below mean sea level. Along the eastern edge of the Delta Plain and between the Mokelumne and San Joaquin rivers are six "blind" sloughs, which head near the zero or sea-level contour and extend westward into the south fork of the Mokelumne River. These are probably to be interpreted as remnants of abandoned distributaries of the Mokelumne which have been succeeded by the river as it formed the Victor Alluvial Plain and established its course farther north. The thick deltaic alluvium[6] is replaced in the marshy sea level island areas west of Lodi by peat accumulation in excess of fifty feet thick. This depth indicates that the historic environment of sedimentation has prevailed for a considerable period, since tules do not grow in water much more than ten to fifteen feet deep and a conservative estimate places the period required for the accumulation of one foot of peat at about seventy-five years.

The Victor Alluvial Plain, lying above sea level and to the east of the Delta Tidal Plain, is from 12 to 16 miles wide, rising to the east between 5 and 8 feet per mile. The Victor Plain forms a relatively flat cone between Laguna Creek and the Calaveras River, the apex of the cone being situated close to the Mokelumne River where it debouches from its canyon. This cone is a typical alluvial fan built by an ancestral Mokelumne River. Upon this old cone are impressed several intermittent and ephemeral drains, which are old channels of distributaries on the initial slope of the plain. Bear Creek and Jahant Slough are the principal streams of this class. The surface of the central part of the Victor Plain is covered with brown alluvium which is underlain, at a depth of from 2 to more than 6 feet, by a partly consolidated substratum comparable to the older red alluvium of the upper (easternmost) portion of the Victor Plain where it abuts on the Arroyo Seco Dissected Pediment.

This dissected upland region is one of flat-topped mesalike ridges with broad, flattened summits of poor drainage and thin, sterile, red-colored soil strewn with coarse gravel and rounded stream cobbles. This intricately dissected pediment, 8 to 15 miles wide, which lies at the western foot of the Sierra Nevada, is most conspicuous at its eastern or Sierran margin; on its western margin, contiguous to the Victor Plain, it constitutes a belt 4 to 8 miles wide, with small rounded hills and ridges. These are the "red lands" of Bryan.[7]

Of the evidence of Sierran uplift to the east and subsidence in the Delta peat lands, Stearns says:

> The conditions here afford an excellent illustration of the theory of isostasy, for long periods of unloading of the mountain block have always been followed by uplift, and subsidence has always accompanied the deposition and subsequent loading of the valley floor.

Archaeological site locations support Stearns's contention. The base of one of our sites (C.68) lies about four feet below present mean sea level. Since the present land level near the site is now at mean sea level and there is abundant evidence of intensive sedimentation which has buried the site, the only conclusion possible is that subsidence has occurred since occupation by the Early horizon group.[8]

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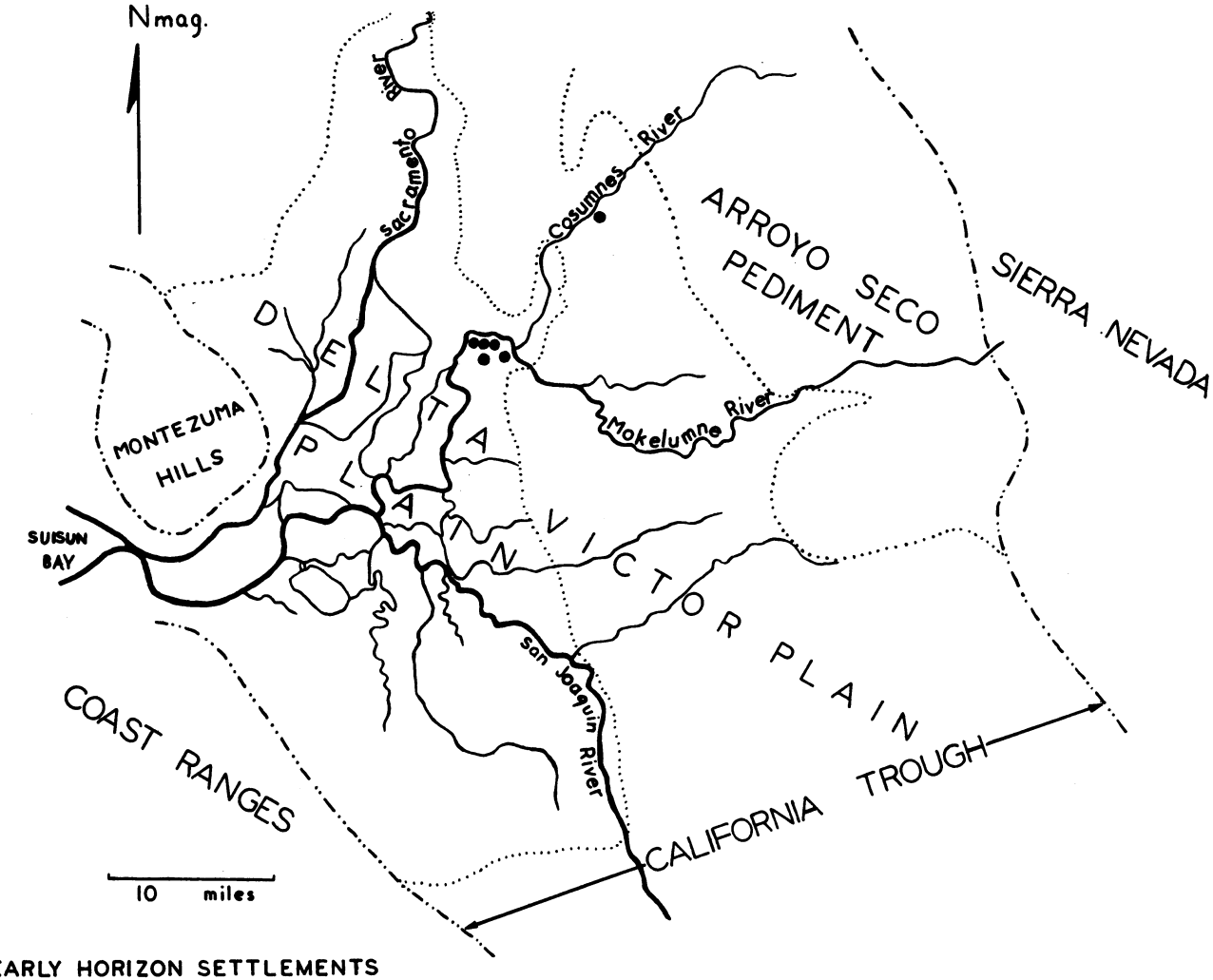
[5]Taken largely from Piper, Gale, Thomas, and Robinson, 1939; Stearns, Robinson, and Taylor, 1930; Cosby and Carpenter, 1937; Bryan, 1923, pp. 7-45, 68-79. The geology of the whole Interior Valley is treated by Clark, 1929. Schenck and Dawson (1929, pp. 293-305) give an excellent survey of the geographic and biotic background of the region discussed here.

[6]At Thornton one well record shows 234 feet of alluvium.

[7]Stearns, et al., 1930, pp. 15-25.

[8]Bryan, 1923, pp. 79-89. Stearns, et al. (1930, p. 32) says: "Evidence that subsidence has occurred in this area since the advent of the Indians is found in the mounds formerly inhabited by them that are now below sea level."



Map 2. Physiographic Provinces of Mid-central California (after Piper, et al., 1939)

DESCRIPTION OF SITES

Site C.107 (Windmiller C community). This stratified site lies in the overlow bottom of the narrow Cosumnes River valley (pl. 4,g), and is located in the Northwest quarter of the Northwest quarter of Sec. 15, T.6N., R.6E, MDB and M (Elk Grove quadrangle sheet), about 4 miles southeast of the town of Elk Grove. Sites along the Cosumnes River are either on the "uplands" which parallel the stream or on small natural clay elevations which rise out of the alluvial floodplain. C.107 is one of these bottomland sites, the altitude of the crest of the site being 9 feet above the valley floor (map 3). The river, which now flows 200 yards to the west of the site, has been diverted by man, in the historic period, from its ancient course about 400 yards east of the site.

The natural elevation itself is composed of a highly compacted sandy, reddish brown clay in which were dug grave pits that contain extended burials accompanied by artifacts of the Early Central California horizon. The grave pits are filled with the sandy red-brown clay and the bones are very heavily mineralized (pl. 4,b). Covering the natural clay elevation which contains the clay-filled grave pits is an accumulation deposit which is soft, black, ashy "kitchen-midden" refuse containing burials of the Middle and Late culture horizons. This superficial refuse layer[9] reached a maximum depth of 84 inches on the west slope and averaged 36 inches on the crest of the elevation. Although Late and Middle period burials occurred in pits, these never penetrated into the clay subsoil, presumably because it was too difficult to excavate. The compaction and induration of the subsoil containing Early horizon graves is therefore likely to have already occurred by the time the knoll was occupied by the Middle horizon group. Late and Middle human bone material is markedly different from that of the Early period, being less mineralized.[10]

Site C.107 was excavated by the Sacramento Junior College intermittently from 1935 to 1937. Skeletal material was not systematically saved, so a check of sex determination, age, and anthropometric observations cannot be performed. The University of California excavated there in the summer of 1937. A total of 168 burials bear full and complete field recording; of these, 59 are Early, 15 Middle, and 94 Late Central California horizon.

Site C.68 (Blossom site and community). This is a pure-culture site of the Early Central California horizon lying in the alluvial plain, 1.2 miles south of the Mokelumne River and 1.5 miles northwest of the town of Thornton (formerly New Hope). It is located in the Northeast quarter of the Southeast quarter of Sec. 32, T.5N, R.6E, MDB and M (New Hope quadrangle sheet). The site itself is a mound measuring 93 by 68 feet, the long axis running in a northeast-southwest direction, the elevation rising only 24 inches above the valley floor, which here is at mean sea level (map 4,b).

Since interpretation of the midden profile is a pedologic problem, this is left for the report of Dr. S. F. Cook and Dr. Hans Jenny.[11] The midden deposit consists of 5.5 feet (65 in.) of calcareous accumulation refuse, with burials occurring at the depths of 6 to 66 inches from the surface. There is a loose topsoil cover, not more than 6 inches deep, underlain by an extremely compacted cementlike calcareous "occupational hardpan"[12] 12 to 18 inches thick (pl. 4,a,d,f,). The upper surface of the occupational hardpan is fairly smooth, but the lower surface is irregular and becomes less compacted at depth until it grades into the unconsolidated refuse deposit. Base of the site is a reddish brown sandy clay.

Site C.68 occupies, at present, an unfavorable situation for aboriginal settlement. The nearest fresh water is 1.2 miles away and the fact that the land level is at mean sea level indicates a marshy terrain with a tendency to accept overflow waters. The problem of living on such a plain surface would present so many difficulties that settlement by recent Indians would simply not be considered. There are no Late horizon communities in the proximity of site C.68. We may infer from these evidences that physiographic alteration by alluvial filling and shifting of water courses has taken place since the site was occupied by the Early horizon culture group.

E. J. Dawson of Thornton excavated site C.68 in 1921, exhuming between 75 and 80 burials. His notes indicate that all burials were extended and lay with the head pointed westerly, though whether the skeleton lay on the dorsal or ventral side is not stated. The University of California excavated in 1938 a total of 17 burials from this site.

Site C.56 (Phelps settlement). This site is located about 1.75 miles southeast of site C.68 within the "big bend" of the Mokelumne River in the Northwest quarter of the Northeast quarter of Sec. 3, T.4N, R.5E, MDB and M (New Hope quadrangle sheet). It is situated about 900 yards west of the river in the overflow plain. Proximity to the river, which deposits a heavy silt load upon overflowing its normal banks, has raised the land level slightly, and the site's summit is now 9 feet above sea level. The midden is approximately 300 feet in diameter, rising above the surrounding plain to an elevation of 30 inches.

The upper site deposit consists of 12 inches of loose, dark-colored (ashy) topsoil. No burials came from this surficial layer. Under the topsoil is a calcareous "occupational hardpan" stratum 14 inches thick. A few burials were found imbedded in this, which indicates that calcareous cementation and consolidation is post-occupational in time (cf. site C.68). Below the hardpan layer is a somewhat hardened or compacted refuse deposit averaging 28 inches in thickness; it is in this stratum that most of the burials were found. The subsoil is an undisturbed yellow sandy loam which bears no evidence of man's activities.

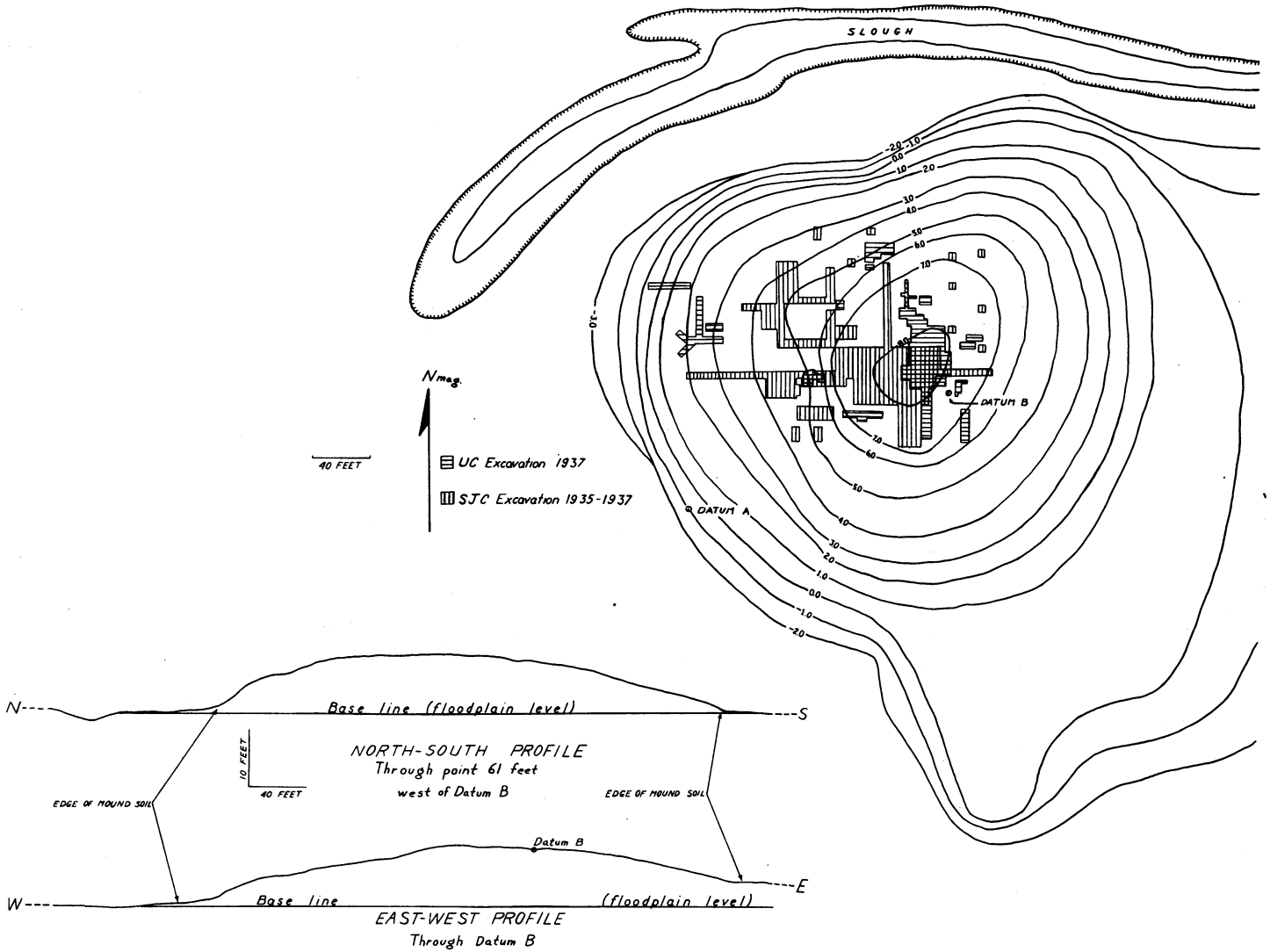
Burials occur from depths of 18 to 54 inches, and a total of 73 were excavated by Franklin Fenenga for the Sacramento Junior College in 1938. All of these lay in

[9]Measuring 280 feet in diameter.

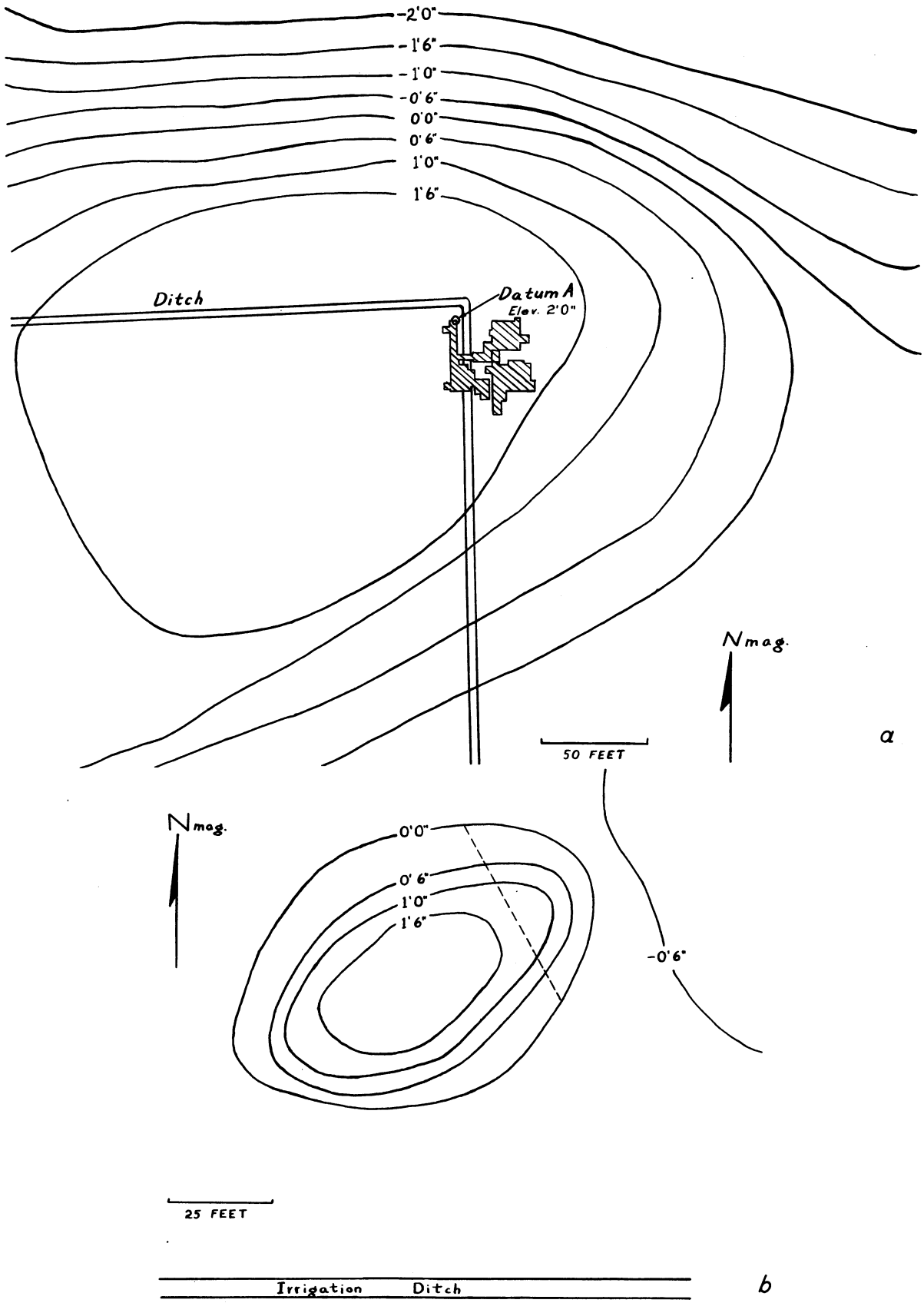
[10]Cook and Heizer, 1947, table 1.

[11]See p. 40.

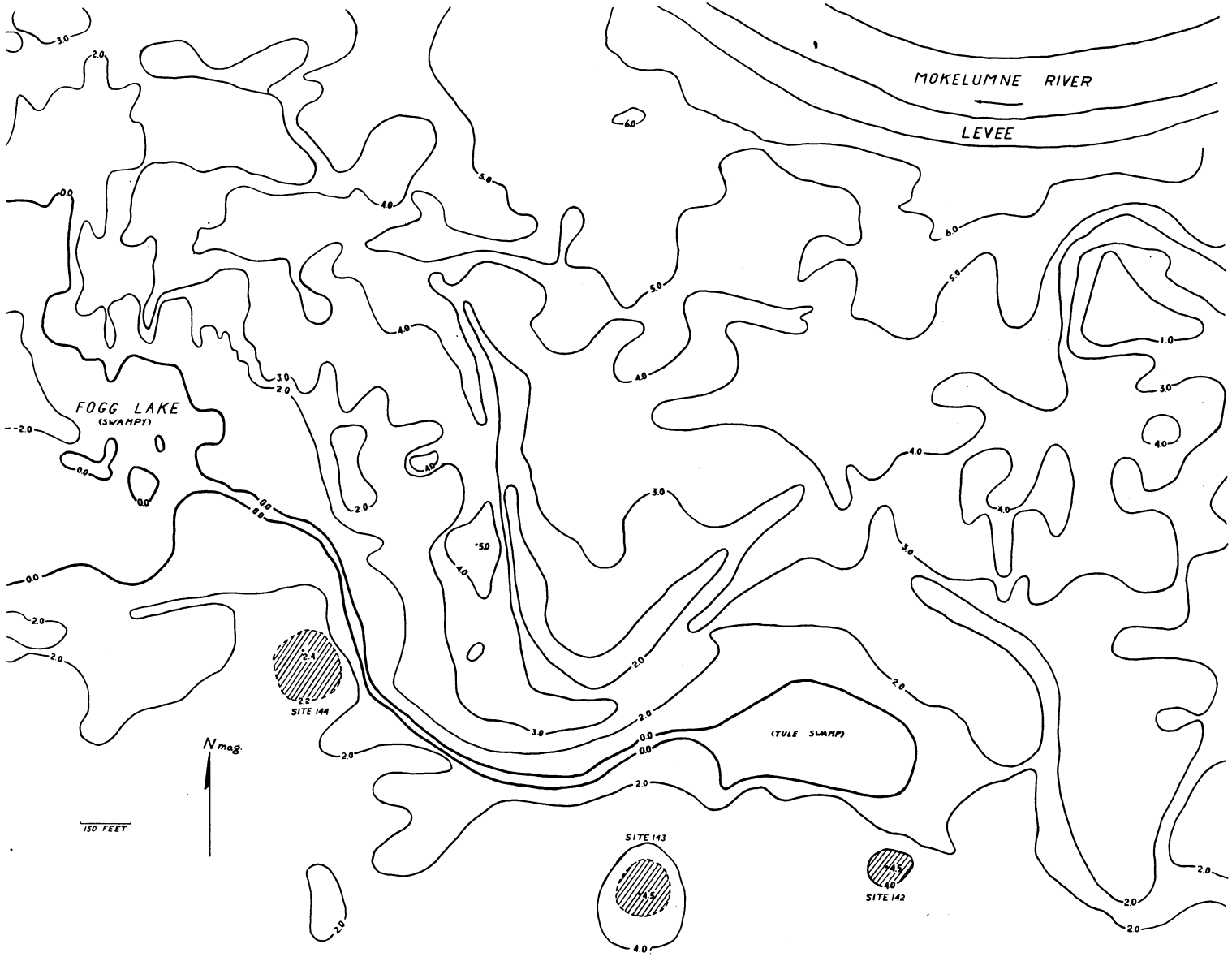
[12]The term "occupational hardpan" is used here to denote a calcareous hardpan layer which occurs in habitation site deposits. It may or may not be a true hardpan in the pedologic sense.



Map 3. Site C.107



Map 4. Sites C.142 and C.68. a. Site C.142, showing extent of excavations by hachured area. Occupation deposit bounded by 1' 6" contour line. b. Site C.68. Total area west of dotted line excavated in July, 1947.



Map 5. Sites C.142, C.143, C.144.

extended (prone) position and belonged to the Early horizon, except two which were flexed and lay close together at a depth of 24 inches. There were no artifacts in association with these two flexed burials; the bones were yellow in color, light in weight, and unmineralized, and the disturbance of the hardpan layer shows that they were intrusive into the deposits. They are thus late intrusions into an Early horizon deposit and may be omitted from further consideration.

Site C.142 (McGillivray settlement). This Early Sacramento culture community was discovered by a farmer when he was digging an irrigation ditch. There is a very slight surface elevation to mark the site outline, the highest point of the elevation being only 12 inches above the surrounding land level (map 4,a); surface indications of the site deposit are scarcely noticeable. The site is in the Southeast quarter of Sec. 29, T.5N, R.5E, MDB and M (New Hope quadrangle sheet), about 1,000 yards south of the Mokelumne River. Just north of the site and extending to the west is a depression called Fogg Lake, which is filled with tule and rushes (pl. 4,e). The south rim of the depression, running in an east-west direction, is slightly higher than the surrounding land, and it is along this rim that site C.142 lies, with C.143 about 100 yards west and, some 150 yards to the northwest, C.144 (map 5).

A fairly loose topsoil cover not more than 6 inches thick overlies a distinctly gray-colored stratum. The gray layer is about 10 inches thick and is indurated, but not to the extent that it may be called hardpan. Below this lie 30 inches of brownish red mixed soil containing human burials, burned clay pieces, charcoal, and an occasional stone and animal bone. Burials are found to a maximum depth of 38 inches, the majority occurring under 30 inches and almost without exception lying in shallow pits dug into the tight yellow sandy clay which constitutes the base of the site.

The University of California excavated, in 1937 and 1938, a total of forty-four burials from site C.142. Of these, five were intrusive Middle horizon flexed burials lying at the same level with, or just under, the gray soil horizon.[13] In addition, in the immediate area of the site five Middle horizon cremations had been intruded from the surface, as were the five burials of this period. The evidence of intrusion in the form of pit outlines and the dissimilarity of accompanying artifacts substantiate here the later time of the Middle Central California horizon.

It may be suggested that the slight elevation upon which sites C.142, C.143, and C.144 are based might have been high enough until recent times to become islands in times of not too severe river flooding. Thus Middle horizon people might have selected these high spots as burial places. The resulting association of interments of two different horizons may therefore be purely fortuitous, this association depending upon a similar desire of two peoples to inter the dead in some spot above the reach of floodwaters.

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[13]Burials nos. 24, 29, 30, 33, 34.

NATURE AND PHYSICAL CHARACTER OF THE MOUND MASS

One of the most puzzling features of these four sites is the nature of their Early horizon deposit mass. At site C.107 there is no stratum which can properly be called an Early horizon occupation deposit. Burials lie in pits dug into the clay substratum at depths ranging from six to eighteen inches. The pits are filled with clay which is slightly but noticeably discolored by small amounts of finely divided charcoal. This would suggest that there was no appreciable layer of ashy midden deposit in Early horizon times, since if there had been, the grave-pit fill would contain midden material. When the top occupation stratum (dark, ashy midden refuse) is removed and the surface of the clay substratum is swept clean, one gets the impression that this was an old exposed surface which was perhaps camped on occasionally (as evidenced by occasional stones and animal bones imbedded in the clay surface), but which served primarily as a spot for interment of the dead. C.107 may therefore be an Early horizon cemetery rather than an occupation site. The possibility should be kept in mind that there is a hiatus between the time when the clay elevation was used as an Early horizon burial spot and the time of its intensive occupation by people of the succeeding period (Middle horizon, Morse facies). This is indicated strongly by the extreme degree of mineralization of human skeletal material in Early horizon graves and the lesser amount of mineralization of Middle horizon skeletal material. The two series of graves are simply of different time orders. There is yet another possible interpretation of the site C.107 stratification which could be argued. This would assume some fairly thin Early horizon occupation deposit on the old clay surface which has eroded away, leaving only the harder objects (stone, animal bones) as residual remains on the surface. This does not seem to be so, however, and all workers familiar with site C.107 feel that this explanation should be considered only a very remote possibility. An aggraded midden deposit would almost surely leave more detrital remains.

The site mass of C.142 represents the type of deposit which possibly once capped the site C.107 knoll. The mass, down to an average depth of about 40 inches, is definitely disturbed and contains finely divided charcoal or ash flecks in only sufficient quantity to tinge the parent material so it appears brown rather than yellow like the undisturbed base from which we assume it is derived. Only occasionally does a rock fragment, burned clay chunk, or animal bone occur in the excavation of this disturbed material. It is difficult to understand why, if this stratum is a true refuse deposit, it does not contain more evidence of man's activities. The most reasonable interpretation is that it is a disturbed zone which became mixed with a slight amount of ash and camp refuse while being turned over during the digging of grave pits. The ash would have thus derived from surface occupation debris which, as suggested in the description of site C.107, has disappeared through erosion. The same conditions prevail at sites C.143 and C.144, both of which await full excavation.

We may generalize by saying that sites C.107 and C.142 are primarily cemetery areas chosen by the Early horizon people because of their elevation and that these elevations also served as living spots where fires were occasionally built. There is no evidence of long-continued, intensive occupation of these spots, which seem at most to be only temporary camping areas.

Conditions at sites C.56 and C.68 are considerably different. At both, ash concentration, greater numbers of animal bones (remains of food), and a higher incidence of unworked stone fragments than at sites C.107 and C.142 give abundant evidence of intensive occupation. Occasional whole or broken artifacts (lost or rejected pieces) turn up in excavating. The site C.56 deposit reaches a total depth of 54 inches, and the mound base of site C.68 lies 65 inches below the highest point of the present elevation. These deposits look much like the mound mass referable to either of the later horizons, but they differ from these in their extreme compaction and concentration of lime. The refuse deposits of the earlier horizon differ from those of the later in the absence of large ash pits (fireplaces) and housefloors, and in the relatively small amount of animal bone and shells (freshwater species, Anodonta, Margaritifera). Both sites C.56 and C.68 have basal deposits which were anciently higher than the surrounding land; systematic auger borings indicate that the base deposits drop away to greater depths as one leaves the immediate site area. Thus, the present topography of a sea-level floodplain is a physiographic feature which has evolved since man occupied this region.[14]

From the foregoing we may conclude that both domiciliary and cemetery site situations in Early Sacramento culture times were selected by reason of a natural rise of ground. This indicates an ancient environment resembling that prevailing today. The river flooding was then, as now, a problem most easily met by living on a spot high enough to escape inundation, but physiographic conditions differed from those of the present time, since the terrain, though essentially level, was relieved at some points by knolls or rises which obtruded from the surface. At present there are no such natural elevations in the site C.142-C.68-C.56 triangle.

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[14]There is no real necessity to suggest a rising land surface through alluvial deposition. Since the present land surface is at 0 ft. 0 in. (mean sea level) one would then be forced to assume sea-level fluctuations or a different configuration of San Francisco Bay. The simplest explanation is, as Stearns suggests, to assume isostasy and the depression of land levels to adjust to sediment load, thus maintaining a constant land level.

BURIAL COMPLEX OF THE WINDMILLER FACIES

Under this heading will be discussed specific aspects of the interment complex. These include: (1) burial posture; (2) orientation of the skeleton; (3) mortuary offerings; (4) grave pit; (5) cemetery locations. The tables in Appendix I treat exclusively burials which were associated with artifacts. Burials without associated artifacts are discussed below in the text.

BURIAL POSTURE

As table A, Appendix I, shows, the Early horizon people held rather firmly to the idea that a properly interred corpse was laid fully outstretched, or extended, face down, the arms lying straight along the sides with the hands either beside the innominates or lying under the pelvis. In nearly all burials the legs were tied together at the ankle. In some, but not all, the wrists were apparently tied together loosely. This description of the normal burial holds for all Windmiller facies settlements (C.107, C.142, C.68, C.56).

There were no variations in the standard posture of the burials found at C.56 (fig. 2,a), but differences were noted in the other three communities. C.107 produced six exceptional burials, of which three were fully extended, lying dorsally, and three were flexed. C.68 yielded extended burials predominantly (fig. 2,b), but for the majority we lack specific data on ventral or dorsal placement. The University of California excavated 17 extended burials at C.68, of which 13 lay ventrally and 4 dorsally. Table D, Appendix I, treats only burials with artifacts. Of those excavated by the University 7 were ventrally extended and 4 dorsally extended. To judge from this sampling, the percentage of dorsally extended burials is higher here than at any other Windmiller facies settlement.[15] C.142 produced 2 dorsally extended burials (fig. 3). Posture variants thus number 12 (8 per cent) of 150 burials with complete records. There appears to have been no regular position for the head, which may lie face down or on the right or left side of the face.

ORIENTATION OF THE SKELETON

Here, as in posture, we have a nearly invariable practice. The body is oriented with the head west. A true west position is noted in 100 per cent of the C.56 burials.[16] At C.68 the 17 burials dug by the University of California were oriented west; the same orientation may be safely inferred for Dawson's 75 to 80 whose direction he notes as consistently westerly. At C.142 all the skeletons were also oriented west, the only variants from true west being 4 whose position varied only 10 to 15 degrees north or south. C.107 again shows the most divergent series, with three Early horizon flexed burials, two of which were oriented east, the third west. Twenty-one extended burials of C.107 are oriented southwest. Out of a total of 155 burials there are 23 variants (14.8 per cent) from west orientation; of these the majority are directed westerly.

MORTUARY OFFERINGS

Somewhat arbitrarily this report deals primarily with burials which are associated with artifacts. Of the 71 burials from site C.56, 24 (33.8 per cent) were unaccompanied by artifacts. C.142 with 44 burials had only 8 (18 per cent) without artifacts; C.107 with 59 Early horizon burials had 5 (8.5 per cent) without grave offerings, and of the 17 burials excavated from C.68 by the University in 1937, 6 (35.3 per cent) were unassociated with artifacts. The 43 skeletons not accompanied by artifacts all lay ventrally extended and oriented westerly (west to southwest). Combining the numbers of burials with artifacts (197) with those lacking artifacts (43) we have a total of 240 Early horizon burials from our 4 sites.[17] Eighty-two per cent of Early graves contained imperishable artifacts. This is a higher association than is general in Middle horizon sites where the percentage varies between 25 and 50.

Accompanying artifacts (pls. 2, 3) may be either objects, such as shell beads which adorned clothing or regalia worn by the corpse, or artifacts which were placed in the grave, either offerings by friends or relatives or possessions of the deceased in life. This last class probably includes quartz crystals, bone tools and implements, and the like. The presence of one or two projectile points in a grave may also indicate that the person was killed by a weapon bearing the point.[18] The most common mortuary accompaniment (see table A, App. I) is shell beads,

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[15] In 1947 the author, with a crew of six University students, excavated practically the entire visible site area of C.68. A total of 76 adult burials was recovered. Eight infant burials and 5 cremations were found. Artifacts were associated with 50 burials (60 per cent) and with 4 cremations (80 per cent).

Orientation and burial posture were variable, as may be seen in the following summary.

Position	N	S	E	W
Extended ventrally (prone)	3	0	1	38
Extended dorsally (supine)	3	0	1	21
Extended on side	1	0	0	2
Flexed and semiflexed	3	0	3	2

The information from this excavation is so extensive that it will be treated in a separate report. The conclusion arrived at in the present report, written six years before the 1947 excavations, seems justified, since the C.68 material, although identifiable as Early, shows many decided resemblances to Middle horizon culture forms. Our present opinion is that C.68 is the latest of the known Windmiller facies components.

[16] Fenenga (Lillard, Heizer, and Fenenga, 1939, p. 40) states that orientation is "usually slightly south of true west." This means only about 5 degrees on the compass and may be considered true west.

[17] The total includes Dawson's 40 burials itemized in Table D, App. I, but ignores an additional 35 to 40 dug by him from the same site, which he notes simply as "lacking artifacts or associated with only one type of artifact." Dawson was primarily interested in multiple artifact type associations and did not make special record of those accompanied by a single artifact or even several examples of a single type.

[18] This assumption is not necessarily correct, however. To date, only three Early horizon skeletons have been found with a projectile point imbedded in one of the bones. Two are from C.107, the other from C.68.

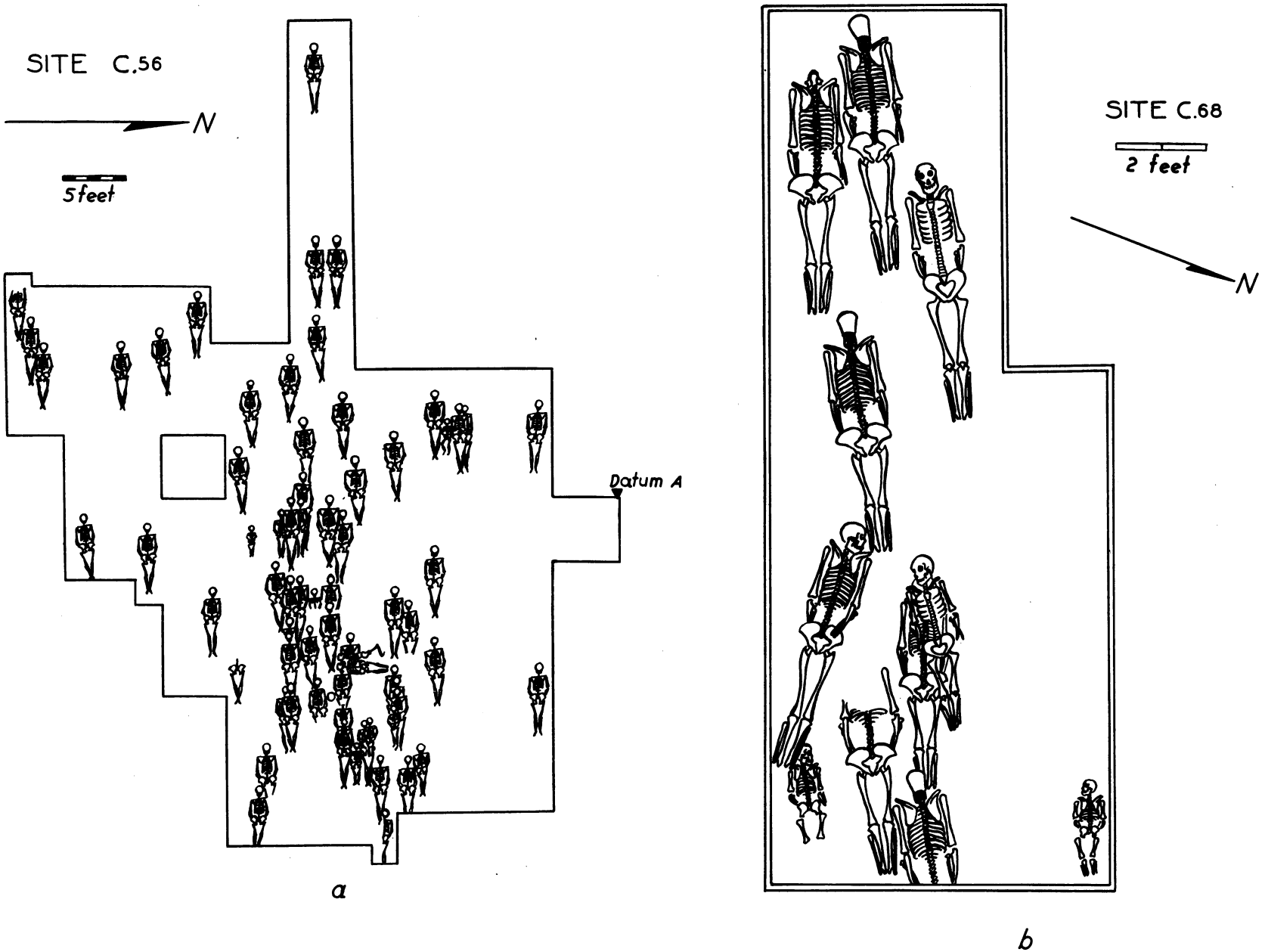

Fig. 2. Excavation and burials. a. Site C.56. b. Site C.68, 1938 excavations.

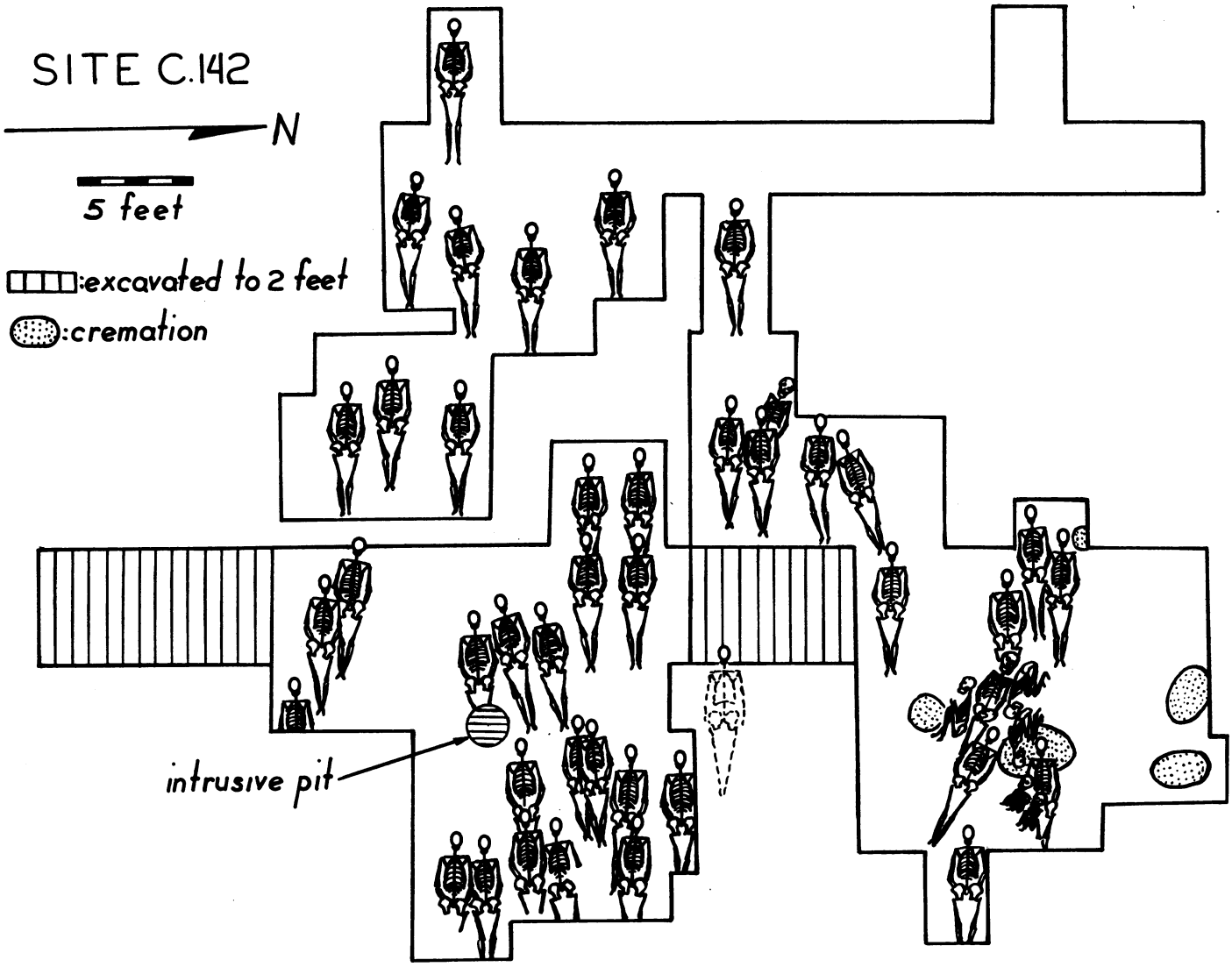

Fig. 3. Excavation and burials, site C.142

followed by flaked projectile points and quartz crystals. Artifacts are concentrated on the upper part of the skeleton, particularly in the neck region, along the sides and under the chest. Rarely, objects are located in the pelvic region and between the lower legs.

GRAVE PIT

Some sort of a pit was prepared to receive the corpse. The nature of the deposit of the Early horizon burial strata makes it impossible to estimate how deep the grave was originally dug, but it is our opinion that a shallow pit, from 12 to 30 inches deep, was ordinarily used. With primitive wooden or stone tools it must have been a considerable task to excavate a pit 2 feet deep and 5 to 6 feet long. Not uncommonly the pit was too short, and the lower legs were bent up on an angle so steep that the feet protruded over the edge of the pit (pl. 1,b,e). There is one clear instance of cutting the lower legs off at the knee in order to make the corpse fit the pit (Burial 1, C.142). There is no evidence of heaping earth on top of the grave.

We may conjecture that graves were not always marked, since in all settlements we have noted burials which cut through earlier interments. The later diggers simply broke the bones of the older burial and threw them back in with the grave fill of the later interment. This accounts in part for the presence of dissociated, often fragmentary, human bones and artifacts. Not all incomplete or disturbed skeletons are ascribable to dislocation as a result of grave digging. Many C.107 skeletons were badly broken up, perhaps the result of their lying in shallow graves and subject to pressure from walking persons or animals for a long period of time (pl. 2). All Early culture sites have yielded some incomplete skeletons.

CEMETERY LOCATIONS

As suggested earlier, C.107 and C.142 are pretty clearly burial knolls rather than habitation spots. Probably these cemeteries lay some distance from the village, the sites being selected because of their elevation. It is thus

not strictly accurate to refer to a cemetery as a component, settlement, or community, but the use of these terms may perhaps be allowed on the ground that the remains are probably those of inhabitants of a single settlement. A site which might be inundated was avoided, perhaps because people might die and require burial in time of flood; hence the cemetery site was selected with an eye to its high-water mark.

At C.68 and C.56, however, burial took place in the village area, the graves being dug through midden deposit. The elevation factor is thus satisfied at these sites in the form of a raised mound accumulation but with a significant difference between the pairs of sites. At C.107 and C.142 burial was away from the village, at C.68 and C.56 within the domiciliary area. This may indicate time differences between the pairs of sites, a suggestion which can be tested by observing intercommunity differences in burial artifacts.

In intersettlement differences, however, there appears to be no significant consistency between any two sites of the Windmiller facies or between any one site and the other three. For example, table A, Appendix I, shows two culture traits, turtle carapace ornaments and conically drilled "pipes," lacking in C.107; one of these is present in C.68 and C.56 but absent in C.142, the other is present in C.142 but lacking in C.56 and C.68. Taking intersettlement differences in the broad view, there appears to be nothing to indicate repeated trait presences or absences which would tend to range one site specifically with another. For this reason we have grouped all four Early horizon components under a single facies. The forms of Early horizon material culture look as much like results of local, village specializations of basic forms as like representatives of different time periods. The only factor which seems to weigh against this interpretation is the restricted area of the C.142-C.68-C.56 triangle. The conception of three groups of people living at the same time in such close geographical proximity yet maintaining specialized implement forms would imply a virtual absence of contacts and cultural exchange between villages situated at most only two miles apart. Total absence of a stone, bone, or shell artifact type at one or two sites may simply mean that further excavation would reveal its presence. At any rate, observable site differences may be theoretically interpreted as evidence of time differences, which cannot now be demonstrated because a consistent pattern of site-to-site differences is not apparent.

MATERIAL CULTURE

SHELL BEADS (OLIVELLA AND HALIOTIS)

Shell beads are abundant in Early horizon burials. Abalone (Haliotis spp) and olive shell (Olivella spp) are the only shells employed for beads (and for larger ornaments). The evidence seems clear that the raw shells themselves were not imported and manufactured in the Delta region into beads, since whole shells, shell rejectage, shell blanks, or incomplete beads are not found in Delta sites.[19] Either the Windmiller facies people of the interior made journeys to the seacoast to make their shell beads or contemporaneous coastal groups were established and were manufacturing beads for interior trade. The latter explanation is more probable and suggests that we may expect to find a contemporaneous coastal culture when excavation in the proper sites is prosecuted.

California archaeologists have learned to look upon shell-bead types as valuable culture-period indicators, since each horizon employs highly distinctive forms.[20]

Olivella shell beads of four types occur in the four excavated Windmiller facies settlements. If we lump the four types, C.68 leads quantitatively, with 47.0 per cent of the burials containing Olivella beads; then, in decreasing order, C.107, with 31.5 per cent; C.142, with 31.1 per cent; and C.56, with 23.4 per cent. Occurrences of each type are shown in table 1 and types are illustrated in figure 5,a.

TABLE 1

Types of Olivella Shell Beads in Burials

(Figures in columns give number of graves)

Type	Site			
	C.68	C.107	C.56	C.142
1a	19	13	6	11
1b	1	0	2	0
2b	7	8	1	6
3b	0	0	0	1

Type 1a (small O. biplicata or O. pycna)[21] may occur in Late and Middle horizon settlements, but with the exception of one C.68 and two C.56 burials, large whole O. biplicata shells with ground spires (type 1b) are not typical of Early horizon interments. Type 2b rectangular beads of O. biplicata are found only in Early horizon sites. These are larger, thicker, and have a bigger central perforation than the type 2.a.1 form with a very small perforation which is found only in Middle and Late horizon interments.[22] The single occurrence of type 3b Olivella beads in the Early horizon (C.142) is interesting because it furnishes a link with the Middle horizon (all facies), where this is by far the most characteristic Olivella bead form.

Haliotis shell beads, again of specific form, occur in all Early horizon cemeteries. Three types of abalone shell beads occur in the following percentages in graves of Windmiller facies cemeteries: C.107, 64.8 per cent; C.142, 42.2 per cent; C.56, 30.0 per cent; C.68, 23.5 per cent. Individual type occurrence is shown in table 2.

TABLE 2

Types of Haliotis Shell Beads in Burials

(Figures in columns give number of graves)

Type	Site			
	C.68	C.107	C.56	C.142
1a	12	26	14	19
2	0	4	0	0
3	0	4	0	1

Type 1a (rectangular to square, centrally perforated) Haliotis beads are the standard bead of this material, just as type 1a is of the Olivella shell. Type 2 Haliotis beads are rectangular to square with straight or concave edges and two perforations. The surfaces at the edges are sometimes incised with short lines, a decorative feature also present on some larger Haliotis shell ornaments. Type 3 Haliotis beads are round and flat with a fairly large central perforation. These are highly characteristic of Middle horizon sites, and we may note here another link with the preceding Early horizon where they occur infrequently.

Site differences in bead types of Olivella and Haliotis (e.g., Olivella types 3b and 1b only in site C.56, Haliotis type 2 only at C.107, and type 3 absent in C.68 and C.56) may indicate either personal preference for a particular bead form, or may be a reflection of temporal differences between, or even within, settlements.

HALIOTIS SHELL ORNAMENTS

These are flat disk and bar-shaped shell pieces made of the iridescent abalone shell (fig. 6,b-g). They were used as articles of personal adornment in the form of spangles or as pendants which were attached by an adhesive, affixed by sewing, or hung from a cord.

Eighteen separate types, delimited on the basis of form, perforations, and decorative features, occurred in the four Windmiller facies settlements (C.68, C.56, C.107, C.142). Of these eighteen types, ten types are limited to single sites, four occur in two sites, two are

[19]Shells of the clam (Saxidomus), so much used by Late horizon groups for beads, were not utilized at all by the Early culture peoples.

[20]Schenck and Dawson (1929, pp. 374, 402) recognized this fact. For the lower Sacramento Valley region see Lillard, Heizer, and Fenenga, 1939, tables, passim, and pls. 11, 12 (Early), 22, 26B (Middle), 26A, 28 (Late). See also Heizer and Fenenga, 1939, fig. 1, pp. 391-392.

[21]Type 1c, small O. pycna with diagonally ground spire, is included here with type 1a. Type 1c occurred only at C.107 (2 instances).

[22]Fenenga (in Lillard, Heizer, and Fenenga, 1939, pp. 40, 42) by error listed Olivella beads of type 2.a.1 from four Early horizon burials in C.56. These are smaller than the usual type 2b pieces, but are clearly related to them rather than to the 2.a.1. form, as shown by the thickness of the shell and large central perforation. They are simply small-sized variants of the typical 2b form.

shared in four sites, and the last one is noted for all four sites. Types are illustrated in figure 6,a.

The percentage occurrence of Haliotis ornaments in relation to total number of burials with associated artifacts is as follows: C.56, 40.4 per cent; C.68, 27.4 per cent; C.107, 31.5 per cent; C.142, 22.2 per cent. Site C.107 had 17 graves containing 10 types of Haliotis ornaments; in decreasing order are C.68 with 7 types from 14 graves, C.142 with 6 types from 10 graves, and C.56 with 6 types from 19 graves.

TABLE 3

Types of Haliotis Shell Ornaments in Burials

(Figures in columns give number of graves)*

Type	Site				Total graves
	C.68	C.107	C.56	C.142	
A.1	..	1	1	..	2
B.1.a. . . .	..	1	..	..	1
B.(1)	2	..	..	..	2
B.(1).1 . . .	2	..	..	..	2
B2	..	..	..	1	1
C.1	..	2	..	..	2
C.(1)	..	4	..	..	4
C.(1).a . . .	6	1	4	2	13
C.(1).1 . . .	..	1	..	..	1
C.(1).1.a . .	1	..	..	..	1
C.(2)	..	3	..	7	10
C.(2).a . . .	13	5	14	..	32
C.(2).1 . . .	2	1	..	1	4
C.(2).1.a . .	..	..	2	..	2
C.(3).a . . .	2	..	1	..	3
H.2	..	1	..	2	3
H.2.a	..	..	3	..	3
H.3	..	..	3	1	4

*More than 1 type may occur in a single grave.

The most frequent forms are C.(2).a (32 grave occurrences); C.(1).a (13 grave occurrences); C.(2) (10 grave occurrences). These are all circular in shape and with one or two central perforations. Their position in graves was almost invariably near the head and in close proximity to the ear-opening (pl. 5,f). They commonly occurred in a matched pair or pairs. Ordinarily the central perforations were filled,[23] and the convex (reverse) surface was smeared, with asphaltum. We are fairly certain that these pieces were the facings for wooden earplugs. These facings were affixed either on one or both ends of each earplug. No stone earplugs or lip plugs have been found in Early horizon sites thus far excavated, but these do occur commonly in Middle horizon settlements and rarely in those of the Late horizon.[24] Type B and H ornaments are commonly found in the neck region; they probably served as necklace pendants.

Almost all Early horizon Haliotis ornament forms are limited to this horizon alone, as are the shell-bead types already discussed.

CHARMSTONES

A large number of charmstones of several types (figs. 7-9) and materials has been recovered from Windmiller facies deposits. C.107 produced the largest number: 35.1 per cent of graves contained these objects; C.56 follows with 19.1 per cent association; C.68 with 11.8 per cent; and C.142 with 4.4 per cent. Site C.107 yielded 19 Early horizon graves containing 93 charmstones of 10 types, and in decreasing order come C.56 with 9 graves and 15 charmstones of 7 types, C.68 with 6 graves and 3 types and C.142 with 2 graves and 3 types. Table 4 shows the occurrence in graves.

TABLE 4

Types of Charmstones in Burials

(Column figures give number of graves)*

Type	Site				Total graves
	C.68	C.107	C.56	C.142	
A.1	..	5	1	..	6
A.2	..	8	..	..	8
A.3	..	6	..	..	6
B.1	7	8	..	1	16
B.1.a	..	..	6	..	6
B.1.b	..	1	..	..	1
B.2	..	6	..	..	6
B.3	1	3	..	..	4
B.4	1	..	1	1	3
C.	..	4	..	..	4
C.3	..	..	..	1	1
E.1	..	2	..	1	3
E.2	..	2	..	..	2
E.3	..	..	1	..	1
F.1	..	..	1	..	1
F.2	..	..	1	..	1

*More than 1 type may occur in a single grave.

It will be seen from table 4 that of the 16 types of charmstones, 11 types are limited to single sites, 3 types occur in two sites, 2 types occur in three sites, and none is common to all four. This indicates a certain amount of specialization by the separate community groups in charmstone forms.

With one C.56 burial there was found a charmstone (type A.1, of blue amphibolite schist) which is identical with the prevailing type from C.107. A single such definite crosstie has interesting possibilities of interpretation. If we are to assume that this type A.1 piece indicates that the two sites were contemporaneous, why then is there not more evidence of exchange of ideas of form,

[23] Since the perforations are filled with the adhesive material, they served no real purpose. It looks as though the disks were received by trade in finished form and used as facings even though the holes were an unwanted and objectionable feature which marred the concave surface.

[24] Stone earplugs from Middle horizon graves often have a Haliotis disk facing, but the latter is rarely perforated.

TABLE 5

Materials Used in Charmstones

(Figures in columns give number of charmstones)

Material	Site			
	C.68	C.107	C.56	C.142
Andesite	..	2	..	..
Amphibolite schist	..	70	1	..
Mottled limestone	1	10	1	..
Alabaster	1	4	10	1
Diorite, andesitic tuff	1	4	1	1
Soapstone, steatite	1	..	2	..
Gray schist	5	..	..	2
Granite	..	3	..	..

raw materials, or actual objects? The villages would not have been too far apart for personal contacts to have been fairly frequent. On the other hand, if site C.56 were slightly later in time than C.107,[25] this would explain the general cultural similarities, as well as the specific differences such as a different choice of charmstone materials (amphibolite schist for C.107, alabaster for C.56). The single type A.1 charmstone found at site C.56 but originating at site C.107 might then be accounted for as an oddity which, coming from an old grave at site C.107, had been acquired by some site C.56 inhabitant. This reasoning has some support in the finding of another type A.1 charmstone of amphibolite schist in a burial of the Late horizon (Phase 1, Hollister facies) at a distant site (C.138) some 35 miles to the southwest. This last artifact was definitely a curiosity; its presence here is best explained in terms of its discovery by some Late horizon inhabitant of site C.107 while he was excavating a pit or grave and its subsequent transportation to its second resting-place in site C.138.

Early horizon charmstones are characteristically perforated near one end (types A,B) and we may presume that they were suspended from a cord. Generally they are too large and heavy to have been worn habitually as pendants; if carried, they were probably held in the hand. These charmstones bear no evidence of heavy duty utilitarian usage and probably served some ceremonial function. The use of charmstones and quartz crystals by recent California Indians for magical purposes apparently has deep roots in the archaeological cultures. Unless we assume that an extremely high percentage of shamans who owned charmstones were buried in our four Early horizon cemeteries, and there seems no reason for such an assumption, we may have evidence of an ancient picture of ownership and use of charmstones and quartz crystals very different from that of the modern California Indians. Apparently these objects were anciently in fairly general use by any individuals who wished to use them. This is, of course, mere speculation, but the abundance of charmstones is an outstanding feature of Windmiller facies burials.

Charmstones of phallus form come from three Early settlements, six specimens in all: C.107, 4; C.56, 1; C.142, 1. They are classified as type E, and several are already illustrated.[26] Similar pieces occur in Middle and Late horizon communities. The double-ended form appears to be the only one which occurs in all three cultures. These phallic charmstones occur widely in Central California, being recorded from a number of Sacramento Valley settlement deposits of the Middle horizon.[27] On the Central coast double and single-ended phallic specimens occur in Late horizon deposits.

I illustrate here (fig. 10,c) a complete phallic charmstone on exhibit in the State Indian Museum on the Sutter's Fort grounds in Sacramento. It is labeled as coming from near Rio Vista, and is made of blue amphibolite schist. It is almost certainly an Early horizon piece and therefore deserves mention here, notwithstanding the fact that nothing further is known regarding its provenience.

A limited number of unfinished charmstones have been found. One, of a quartzite pebble, is shown in figure 9,h. Six type B charmstones (fig. 8,f), with well-finished surfaces but lacking the usual perforation, came from a C.107 grave (pl. 3,d). No unworked masses of amphibolite schist, alabaster, diorite, granite, or limestone, from which charmstones might have been made, have been found in any of the Early horizon sites.

QUARTZ CRYSTALS

A noteworthy and characteristic cultural item in the Early horizon complex is the abundance of clear quartz crystals as burial accompaniments. An average of one out of every four graves contained quartz crystals. In form they may be either the complete crystal or "cores," i.e., crystals which have had their crystalline facets flaked off. These last are ordinarily the size of the end of a man's little finger. One grave at site C.107 (burial no. 180) contained 16 complete quartz crystals. This was exceptional, however, the average number per grave in C.107 and C.142 being about 4. Dawson found 109 crystals with nine burials in C.68.[28] C.56 produced 13 whole crystals from seven graves and 238 crystal "cores" from twelve burials.

Most California Indians of recent times believed charmstones and quartz crystals to be magically potent, hence they were ordinarily owned and used by people with special powers, that is, by shamans.[29] In Windmiller facies sites there is no significant correlation of crystals and charmstones or occurrence in the same graves. Granting that crystals did have some special esoteric significance, we may note here again an ancient generalized utilization contrasting with a recent, i.e., ethnographic, individualized use of magically endowed items such as we noted for charmstones. Neither quartz crystals nor charmstones

[25] "Slightly later" is used advisedly, since the cultures of both sites are very similar.

[26] Heizer and Fenenga, 1939, fig. 1, nos. 25, 26; Lillard, Heizer, and Fenenga, 1939, pl. 14, h-i.

[27] Specimens in UCMA. See also Blake, 1873; Rau, 1884, fig. 319; Beardsley, 1947.

[28] Schenck and Dawson, 1929, pp. 392-393. Note also that site C.68 produced more crystals than all of their other sites combined (ibid., p. 347).

[29] Heizer and Treganza, 1944, pp. 331-332, map 4.

are limited to graves of either males or females. They occur with adult skeletons of both sexes and not rarely with skeletons of adolescents and infants.

Projectile points were occasionally made from clear quartz crystals. A C.107 grave produced a splendid specimen measuring 12 cm. long, type SAa (fig. 12,x).

The source of these crystals is unknown; it was probably the foothills of the Sierra Nevada to the east,[30] or the Lake County area to the northeast where clear crystals lacking plane crystalline faces occur naturally.[31]

The sharp edges of some crystals have been worn down, as clearly illustrated in figure 15,l,m,n. No obvious reason occurs to us for this.

MORTARS AND PESTLES

The stone mortar is present, though not abundant, in communities of the Windmiller facies. Schenck and Dawson report one fragment from C.68,[32] and the University of California recovered a rim fragment there in 1938. The first of these, of tough diorite, indicates a mortar with shaped exterior, rounded lip, and a diameter of about 22 cm. inside the cavity. The other piece, of vesicular basalt, is nearly identical with the first. C.142 and C.56 yielded no evidence of Early period mortars.[33]

Buried in the Early horizon clay stratum at C.107 was a rough cobble mortar made of an igneous rock. The disk-shaped cavity is 3 cm. deep and 13 cm. in diameter; it bears a heavy coating of iron oxide, which indicates its use as a paint grinder. The outside measurements are 18 cm. diameter and 10 cm. height.

Also from C.107 came an unusual mortarlike implement made of gray andesite, 8 cm. high. The upper or top surface (21.5 cm. x 25 cm.) is worn, as though the slab were originally a metate which was later used for a special purpose served by the long U-shaped groove. The groove is 60 mm. wide at the top, 53 mm. deep, and 20 cm. long; its sloping walls are highly polished. It is impossible to say what use this implement served or the manner in which it was employed.

A long, unshaped, subrectangular cobble of brown quartzite from the red clay subsoil of C.107 has been used as a pestle. It is 25.5 cm. long and 9 cm. in diameter. Only the point shows evidence of grinding, but the smooth, conical tip is clearly a pestle point which was worn in a stone mortar.

From C.107 came a pestlelike stone implement, a long, flattened cylinder, of blue amphibolite schist measuring 37.5 cm. long and 6.5 cm. in diameter. One end is rounded, the other has a chisel point. This schist is used only for charmstones in burials of the Windmiller facies,[34] and it is probable that this implement is of ceremonial, rather than profane or utilitarian, significance. Numerous blue schist charmstones occurred with the same burial in which the pestlelike stone was found.

METATES AND MANOS

Two stone metates (pl. 5,e) from the red clay subsoil of C.107 may be attributed to the Early horizon. C.56 and C.68 yielded no metates. The two C.107 metates are fragmentary; roughly half of each remains. One is 16 cm. long, 25 cm. wide, 6.5 cm. thick at one edge and 2.5 cm. thick at the center. The grinding depression is ovoid, about 5.5 cm. deep. The other metate is 25 cm. long, 19.5 cm. wide, 4.5 cm. thick at the edge, and 1.5 cm. thick in the center. The edges have been worked so the shape is more or less squared and the bottom is smoothed. The depression is ovoid with the deepest point in the center.

In July, 1946, A. E. Treganza found a broken metate in C.142, but it was lost in transit. He describes it as having straight sides, a concave grinding surface, and a smooth-pecked flat bottom. It was dug from the mound mass and was not a burial accompaniment.

No distinctly recognizable manos have been found, but a number of round, flattened stream cobbles have been recovered which may have been so used. These are all roughly fist-size. From C.107 came a bifaced "mano" 11 cm. long, 7.5 cm. thick, and 11 cm. wide, with a wedge-shaped cross section. Another, of greenish quartzite, is round and flattened, 9 cm. in diameter and 4.5 cm. thick. The flat surfaces show peck marks rather than the smooth grinding surface which would result from metate wear. It is problematical whether this should be considered a mano or a small anvil.

FLAKED STONE IMPLEMENTS

Chipped implements (figs. 11-14), which are probably to be identified as projectile points and knife blades, are common burial accompaniments in graves of the Early horizon. The typology of chipped implements (fig. 11,a) follows that of W. D. Strong. It is not very satisfactory, since occasional examples do not strictly conform to the type. Such intermediate or doubtful forms are arbitrarily disposed of by assigning them to one or another shape group. The percentage of burials with chipped implements in Windmiller facies communities is as follows:[35] C.68, 41.2; C.107, 40.7; C.142, 31.1; C.56, 25.5. Site C.107 yielded 22 Early horizon burials with flaked implements of 5 types, and in decreasing order come C.68 with 21 burials and 12 types, C.142 with 14 graves and 7 types, and C.56 with 12 burials and 11 types.

Summarized, class NA chipped implements (fig. 11, b-w) occur as burial artifacts from each settlement, in a total of fifty-five graves; class NB has a single occurrence in C.56; class SA (figs. 12, 13,a-g) is noted in all

[30] Durrell, 1944.

[31] Information from Dr. Olaf P. Jenkins, Chief, Calif. State Div. Mines and Geology.

[32] Schenck and Dawson, 1929, p. 386. We recovered fragments of at least 8 mortars from this site in 1947.

[33] The intrusive Middle horizon burials of site C.142 were accompanied by stone pestles of the type used with a wooden mortar. See Lillard, Heizer, and Fenenga, 1939, pp. 8-9, 36-37.

[34] Site C.107, 70 specimens; site C.56, 1 example.

[35] After Lillard, Heizer, and Fenenga, 1939, pp. 12-13. Table 6 shows only types in burials. Two or more examples of one type often occurred in the same burial. This accounts for the discrepancy in totals between this and the three following tables which treat the total number of chipped implements recovered, regardless of association.

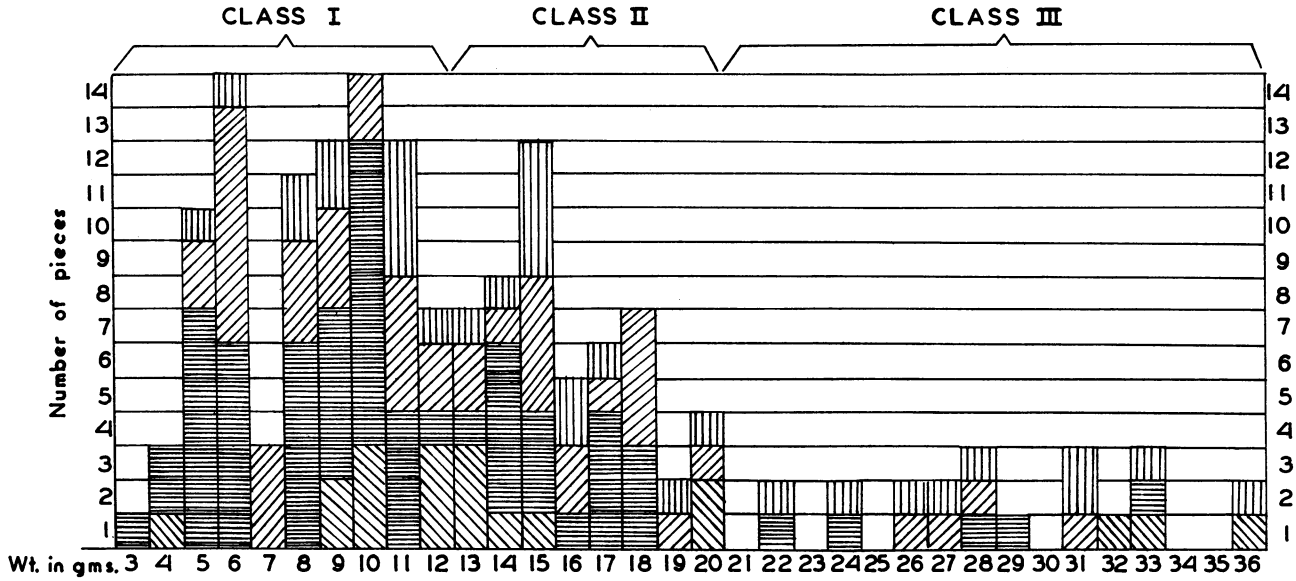

Fig. 4. Weights and frequencies of chipped points, all sites. All weights in grams; points weighing a fraction of .5 gm. or over take the next whole number.

TABLE 6

Types of Flaked Stone Implements in Burials

(Figures in columns give number of graves)*

Type	Site C.68	C.107	C.56	C.142	Total graves
NAa	12	..	7	...	19
NAb1	9	5	3	2	19
NAb2	3	2	3	1	9
NAb3	7	1	..	..	8
NBa	..	..	11	..	1
SAa	7	3	16	4	30
SAa2	..	..	..	1	1
SAb	1	..	..	..	1
SAc	..	..	1	1	2
SBa	4	5	12	3	24
SBc	1	..	..	..	1
SCa1	1	..	4	1	6
SCa2	..	..	5	..	5
SCa3	..	..	1	..	1
SCa4	1	..	..	..	1
SCa6	1	..	1	..	2
SCb3	2	..	..	..	2

*More than 1 type may occur in a single grave.

four communities, with a total of 34 grave occurrences; class SB (fig. 13,h-z, a'-c') from all four communities from 25 burials; and class SC (fig. 14,a,s) is found in all communities except C.107, with a total for six subclasses from 17 graves. It appears that class NA (leaf-shaped, pointed at both ends, pointed at one end with convex, straight, or concave base) is the most characteristic Early horizon form. This is followed by class SA (contracting stem), class SB (parallel-sided stem), class SC (expanding stem), and finally class NB (triangular).

Materials.--Since the later cultures in our area employed obsidian almost exclusively for chipped points and blades, it is a matter of interest to note the variety of additional materials used by the Early horizon people. Table 7 shows materials employed for flaked implements from our four settlements. The totals include both grave items and dissociated specimens recovered from the mound mass of Early horizon deposits.

As table 7 shows, obsidian is the most frequently used material. The occurrence of all other materials combined does not equal that of obsidian.

We are apparently dealing here with a people who could obtain obsidian as easily as more refractory materials. It seems probable that the use of slate, flint, chert,

TABLE 7

Materials Used for Flaked Stone Implements

(Figures in columns give number of implements)

Material	Site C.68	C.107	C.56	C.142	Total implements
Obsidian	36	9	30	7	82
Quartzite	..	1	3	1	5
Flint and chert	7	9	20	4	40
Slate, schistose, basalt	4	13	8	7	32
Quartz crystal	..	1	2	..	3

TABLE 8

Weight of Flaked Stone Implements

(in grams metric)

Type	Number of points	Weight			Average weight by sites			
		Total	Average	Range	C.68	C.107	C.56	C.142
NAa	22	296.2	13.5	4.4-28.3	(8)* 15.6	(4) 13.7	(9) 11.7	(1) 11.5
NAb1	16	177.8	11.1	5.2-35.9	(9) 8.0	(3) 22.0	(3) 9.8	(1) 10.0
NAb2	17	213.2	12.5	6.0-20.0	(5) 13.1	(7) 13.1	(5) 11.2	....
NAb3	10	186.0	18.6	6.5-31.5	(6) 12.3	(3) 26.9	....	(1) 31.5
NBa	4	28.5	7.1	3.0-13.0	(1) 7.2	....	(2) 4.2	(1) 13.0
SAa	39	583.7	15.0	4.5-32.7	(7) 13.9	(8) 19.7	(17) 12.8	(7) 15.7
SAa2	1	12.5	12.5	....	....	....	....	(1) 12.5
SAb	1	27.5	27.5	....	(1) 27.5	....	....	....
SAc	5	92.7	18.5	9.4-31.5	(2) 23.3	(1) 16.7	(1) 9.4	(1) 20.1
SBa	27	342.3	12.7	4.2-28.0	(2) 16.1	(6) 14.1	(15) 13.4	(4) 10.0
SBc	1	5.2	5.2	....	(1) 5.2	....	....	....
SCa1	6	95.7	16.0	4.8-36.4	....	(1) 25.7	(3) 8.4	(2) 22.5
SCa2	9	67.9	7.5	5.2-15.0	(3) 9.6	....	(6) 6.5	....
SCa3	1	3.7	3.7	....	....	....	(1) 3.7	....
SCab	2	38.4	19.2	....	(1) 26.5	....	(1) 11.9	....
SCb3	1	8.1	8.1	....	(1) 8.1	....	....	....

*Figures in parentheses indicate number of specimens.

and other nonglassy materials is to be explained in terms of cultural preference, percussion flaking method, and sources of supply. Either the large-scale exploitation of the obsidian quarries[36] and the import of the prepared blade-blanks was not yet established at this time, or the Early horizon population residing on the south bank of the Mokelumne River preferred to use the cryptocrystalline rocks because these materials were traditional and their flaking techniques (see discussion under "Technological Aspects") were adjusted to them. I am inclined to accept the latter explanation and point to the limited Early horizon use of obsidian as a purely cultural feature reflecting a still earlier period when obsidian was not known or used.

Size and weight.--From the time of excavation of the first Early horizon burials (at C.107) it was obvious that the chipped implements tended to run to large and heavy forms. The technique of flaking is excellent and well controlled, so large size and weight cannot be attributed to crudity resulting from technical inability to produce refined points.

Figure 4 summarizes, without sacrifice of detailed data, the information on average weights of Early horizon chipped points as a whole; table 8 summarizes average weights by type. Harrington notes weights of eight Gypsum Cave chipped points.[37] These eight pieces range from 4.8 gm. to 13.0 gm., and average 8 gm. Vaillant (quoting Kidder) states that Anasazi dart points range from 4.8 gm. to 11.3 gm.[38] We suggest that the weight curve in figure 4 can be broken down into three weight classes (table 9): Class I, dart points; Class II, spear points; Class III, knife blades or possible heavy spear points.

TABLE 9

Weights of Flaked Stone Implements by Classes

Class	Number or points	Weight (in gm.)		
		Range	Average	Total
I. Dart points	87	3-12	8.3	722
II. Spear points	51	13-20	16.0	819
III. Knife blades	24	21-36	28.0	676

[36]For obsidian sources see Heizer and Treganza, 1944, pp. 303-306, map 1.

[37]Harrington, 1933, p. 92.

[38]Vaillant, 1931, pp. 300-302. See also Kidder, 1938, p. 156.

Since concrete evidence of the type of throwing weapon itself has not been recovered, it cannot be proved that the atlatl was the weapon used by the Early horizon people. It seems probable, however, that it was, if we judge by the weights of Early horizon penetrating points. These are sufficiently close to the weights of points definitely known to be atlatl dart points.[39]

Patination.--Obsidian, highly resistant to chemical alteration, exhibits no surface patina. But most of the chert, flint, and slate chipped implements are noticeably altered in surface color and texture through chemical oxidation or other alteration. Sometimes the surface patina is one millimeter thick (fig. 12,a,b). These metamorphic rocks are not by nature particularly subject to rapid alteration, and the patina of the chipped points and blades of the Early Sacramento culture must be viewed as additional evidence of its antiquity.[40]

LARGE CEREMONIAL (?) BLADE

Unique to the Early horizon is the obsidian blade shown in figure 14,w, from a grave at C.107. The material is less opaque than most of the other obsidian implements at C.107. This may indicate a different quarry source and foreign origin of the large blade. It now measures 15.5 cm. long, 6.0 cm. wide, and is 1.5 cm. thick.

OBSIDIAN FLAKE KNIVES

About 8 thin, subrectangular obsidian flakes, averaging 6 cm. by 4 cm., with one long, retouched edge probably served as knives or scrapers. These came from two C.107 graves. These pieces deserve emphasis since they represent practically the only examples of partially flaked implements from Windmiller facies settlements.

POLISHED FLAKED IMPLEMENTS

One flaked implement from each of three Windmiller facies settlements (C.68, C.56, C.142) has been ground and polished.[41] The concave surfaces of the flake scars are still visible. These three pieces may be evidences of purposeless industry, a possibility suggested by their rarity, and may reflect the general emphasis on polishing of stone materials (e.g., charmstones), or, on the other hand, they may be survivals of a nearly forgotten trait which earlier was more generally practiced. Their presence is sufficiently unusual, however, to deserve explicit mention.

Numerous flaked points have their basal edges smoothed by grinding, a feature commonly associated with some of the more ancient chipped flint forms of North America. The practice here may reflect a survival of this ancient trait.

[39]Cressman and Krieger (1940, p. 43) give the weight of atlatl dart points from the Oregon caves as ranging from 2.0 to 6.2 gm. The range and average are somewhat smaller than those proposed for the Sacramento Valley points identified as dart heads.

[40]Patina of artifacts is well treated by Service, 1941.

[41]Schenck and Dawson, 1929, pl. 91b (site C.68).

SANDSTONE "PALETTE"

This piece, made of a fine-grained sandstone slab, is one of the most singular pieces recovered from any of the Early horizon deposits. The rectangular slab (pl. 5,c) is nicely smoothed on both surfaces and all corners are squared. It is 58 cm. long, 28 cm. wide, and 4 cm. thick. The rectangular depression measures 31 cm. by 9.5 cm. and is 1 cm. deep. The top surface and depression are heavily caked with red pigment.

OBJECTS OF GROUND SLATE

Some slate was used in raw form as a material from which chipped points were fashioned (e.g., fig. 11,d,i,g). The most characteristic use of this rock, however, was for making ground and polished objects of the three types discussed below. Community differences in occurrence of ground slate objects are noteworthy. They were entirely lacking in C.142, occurred only once in C.56, yet at nearby C.68 were found in 5 burials. C.107 leads with 9 grave occurrences.

TABLE 10

Ground Slate Artifacts in Burials

(Figures in columns give number of artifacts)

Artifacts	Site			
	C.68	C.107	C.56	C.142
Rectangular pendants, perforated	2	1	..	..
Cylindrical "pencils" and rods	3	8	..	..
Cylindrical rods, perforated	..	2	1	..
Flat abrading stone	..	1	..	..

Rectangular pendants, perforated.--There are two pieces from C.68 (fig. 15,h) and one from C.107 (fig. 15,g). The C.68 pieces measure 1 mm. by 55 mm. by 2 mm. and have a small biconically drilled hole near one end. The C.107 piece is not perforated but bears a pecked depression which was apparently the start of a hole near one end. It is longer than the C.68 pieces, measuring, though incomplete, 11.6 cm. in length, 16 mm. in width, and 6 mm. in thickness.

Cylindrical "pencils" and rods.--These are pointed rods of ground slate whose cross section ranges from round to oval or subrectangular. There are two types, differentiated by size, one large, the other small. Grave occurrences total 11 from 2 sites (C.68, C.107).

The small form (fig. 15,d,e,f,i) occurs at both C.68 and C.107; these rods are consistently 5 mm. in diameter, the lengths ranging from 9 cm. to 11.8 cm. There are 9 grave occurrences with a total of 19 pieces; one end of these is pointed, the other blunt and somewhat flattened, with scratches or scorings on the flattened end. These would be well suited to employment as simple projectile points, awls, or perforators.

The large form is similar to the small type. From two burials at C.68 came 9 examples 15 cm. long, 12 mm. wide, and 6 mm. thick (fig. 15,b). From site C.107 are 3 pointed tips of cylindrical slate points which are now

6.5 cm. and 11. cm. long with diameters of 9 mm. and 12 mm. (fig. 15,j). These must originally have been much longer, judging from their diameters. A final example, from C.107, is unique in size, measuring 23 cm. in length, 16 mm. in width and 12 mm. in thickness. One end is pointed, the other flattened and scored for binding (fig. 15,a).

Cylindrical rods, perforated.--These are not very different from some specimens of the group (large form) just discussed, but are here set aside because of a drilled hole near one end.

From a C.56 burial came two broken slate rods 1 cm. in diameter (fig. 15,c,k). Both are broken at the perforation, and one has the tip missing. Probable length of the most nearly complete piece is 15 cm. and, since they are otherwise similar, it may be presumed that they were an identical pair.

Flat slate abrading stone.--This unique specimen (fig. 16,a) from a C.107 burial shows abundant signs of use. The edges are rubbed, there are surface scratch marks and hollows or wide grooves resulting from repeated scratching of pointed objects. It is made of a flat piece of laminated gray slate 10 cm. square and 1 cm. thick. On two opposite edges are V-shaped ground notches.

LARGE STEATITE BEAD

A thick circular ring of gray-green steatite (fig. 16,f) came from a C.107 burial. It is 2.7 cm. in diameter, 1.3 cm. thick, and the central biconically drilled hole is 11 mm. in diameter. The piece is unique for the Windmiller facies, and the material is also rare in this horizon. Steatite was extensively employed by the Late and Middle culture horizon groups in this area.

HAMMERSTONES

Only two clearly identifiable hammerstones have been recovered. One, from C.144, is made of jasper, tan chocolate in color (fig. 16,j). It was originally a stream cobble of flattened cylindrical form. Both ends are much worn and pitted. It is 4 cm. thick and 6.5 cm. long. The pitted ends indicate its probable use in flaking flint or obsidian implements. The piece was found in general digging and was not associated with a burial.

From the C.56 mound mass comes a long, flattened pebble whose ends show abrasion of the sort ordinarily characteristic of flaking hammerstones. It is 12 cm. long by 4.5 cm. wide and 2 cm. thick.

TUBULAR STONE "PIPES"

From C.142 came two tubular stone "pipes." Each occurred with an extended burial which lay on the back (i.e., dorsally). This posture is atypical for the site, and one may speculate whether this correlation between stone "pipe" and dorsally extended burial is not evidence that pipe owners were marked persons who were accorded special burial posture. In one interment there occurred, besides the pipe, a few Haliotis beads of type 1a and a quartz crystal; the other burial contained only a pipe. In each, the pipe lay near the head.

Both pieces are conical. One is of blue steatite (fig. 16,e) with a bowl-end diameter of 40 mm., stem-end diameter of 22 mm., and length of 70 mm. The other (fig. 16,c), made of white tuff, has a diameter of 50 mm. at the bowl end, 20 mm. at the stem end, and is 85 mm. in length. In both the perforation is conical,[42] with hole diameters tapering from 20 mm. to 10 mm. and from 36 mm. to 8 mm. Each piece is thick-walled (11 mm.-14 mm.) and neither bears any evidence whatsoever of interior charring, discoloration, or dottel ashes.

Specimens closely comparable in size and drilling come from certain Basketmaker sites;[43] they, too, show no signs of use in smoking. It seems possible that the Sacramento Valley pieces were shamans' sucking instruments; they may have some connection with stone tubes so used by recent Indians in southern California, northwestern Mexico, and Baja California.

PERFORATED BIOTITE ORNAMENTS

These pendants are noted only from C.107 and C.68 (fig. 16,b). They are commonly about 30 mm. in diameter, roughly circular in shape, and about 3 mm. thick. They are perforated near one edge. Source of these green biotite plates was probably the Sierran region immediately to the east of the Mokelumne area.

CHRYSOTILE ASBESTOS SPLINTERS

Thin, long aggregates of asbestos crystals of a blue-green color have been recovered from Early horizon graves in C.107 and C.68. They probably came from a single source, presumably the Sierra Nevada to the east. The pieces are unworked, and were probably brought home as mineralogical curiosities.

OBSIDIAN "BANGLES"

These are slender prismatic flakes (average length 11 cm.) of natural origin which may be found in quantity around certain Napa Valley and Clear Lake obsidian outcrops. They were used by the recent California Indians chiefly as tinklers tied to skirts.[44] Twenty specimens occurred in five graves of the Early Central California horizon (C.107, 4 graves; C.56, 1 grave). These flakes are extremely numerous in Middle and Late horizon burials, their abundance being partly explainable in terms of the almost exclusive use of obsidian by these later peoples. The C.107 pieces (fig. 14,u,v) were heavily coated with red ochre; those from C.56 are plain (fig. 14,t).

UNWORKED COLORED STREAM PEBBLES

A relatively common item accompanying burials of the Windmiller facies is one or two smooth quartzite stream pebbles, which are generally about the size and shape of a slightly flattened hen's egg. They are naturally colored (red, pink, light green, light tan, white) and were no doubt selected by the Indians partly because of their

[42]Tubular pipes from Middle and Late horizon sites are invariably biconically drilled. An additional example which is almost identical with the 2 specimens from C. 142 was recovered from the deeply alluviated Strawberry occupation-burial deposit just south of the city of Sacramento. The collection is unpublished but is described by H. and F. Riddell, MS on file in UCMA.

[43]Kidder and Guernsey, 1919, fig. 94; McGregor, 1941, p. 220.

[44]Kroeber (1925, p. 76) cites their use by the Yurok.

attractive color. C.107 yielded six burials with such pebbles; C.56, six; C.142, seven. The trait is present in C.68, but the number of grave occurrences is not recorded in Dawson's notes.

The pebbles are unworked and are therefore artifacts only in the sense that their natural form was such that they were picked up, retained, and considered of sufficient value as possessions to have been repeatedly selected as grave offerings. They can hardly have been slingstones, since they are too heavy. The stoneless floodplain might induce a man who happened to be in the gravelly area some miles to the east to carry back with him these nicely shaped and colored stones as curiosities.[45] They may have been weapons, serving as throwing stones, which a man carried with him for special purposes in hunting or war. Their employment in some ceremonial or magical context is not to be overlooked as a possibility, particularly since they repeatedly occur (as offerings?) with the dead.

BAKED-CLAY OBJECTS

The occurrence of hand-molded objects of fired clay in the Early Central California horizon is of considerable interest, not only because the trait can be construed as near-pottery in a presumably ancient horizon, but also because it may represent the germ of the Late Sacramento culture magnitude of molding and baking clay objects.[46]

My 1937 analysis of the baked-clay art of the lower Sacramento Valley is deficient chiefly on interpretative grounds because the three Central California culture horizons had not then been clearly defined. Instead of a simple twofold sequence, wherein the earliest horizon was recognized from only one site (C.107) and in addition was but ill defined,[47] we now recognize three successive culture horizons, each of which is known from a series of scientifically excavated settlements.

In emendation of my earlier hypothesis that the baked-clay trait is more or less directly derived from the ceramic complex of the Anasazi area, it is proposed here that the practice of Late horizon cultures of molding and baking clay objects may be an outgrowth of the small-scale practice originating in the Early horizon.[48] The following forms are known from Early horizon settlement deposits: C.107, 2 small (1 in. long), well smoothed, pecan-shaped balls with a cut or cord-impressed groove traversing the longitudinal exterior surface and 2 biconically shaped balls (fig. 16,i); C.68, 8 grooved pieces identical with the last except that they exhibit variations in length from one-half to one and one-quarter inches; a flat, thin, round disk with center perforation; 1 plain clay ball; and an angular piece with twined basketry impressions (fig. 16,g,h). No baked-clay objects were found with burials in C.56 and C.142, although the site deposits show evidence of baked-clay fragments and chunks which may occasionally bear a smoothed surface indicating hand-molding. A large angular piece with twined basketry impression, in a private collection, is reported to have come from the surface of C.142, and there is little reason to doubt this in view of an almost identical piece from C.68 (fig. 5,f).

Middle culture horizon deposits produce a greater variety and frequency of baked-clay objects than Early horizon sites. S.66 yielded 1 flat perforated disk, one cache of 6 baked-clay objects in three matched pairs (2 longitudinally grooved and 4 loaf-shaped), 1 tule-impressed, and 3 plain, spool-shaped objects. The perforated disk and plain ball forms, known only from single occurrences in one Early horizon deposit (C.68), carry over to Middle horizon times, but the small pecan-shaped form with cut groove is unique to the Early horizon where it is known from only the C.68 and C.107 communities.

Late horizon sites excavated since 1937 by the Sacramento Junior College and the University of California[49] have yielded a great number of baked-clay objects all of which are in the University collection,[50] awaiting study.

In conclusion, it now appears likely that the Late Central California elaboration of the baked-clay art has a vertical or local, rather than horizontal or outside, derivation. But there remains the problem of the origin of the Early horizon baked-clay forms, rare as they are.[51]

BONE IMPLEMENTS

Only 59 bone implements[52] were recovered from the four communities of the Windmiller facies. In view of the amount of the deposit excavated and the number of burials found, it is apparent that bone was not a material particularly favored for implements in the Early period. The later cultures (Middle and Late horizons) operating in the same area apparently utilized bone more extensively, although in these horizons we may be dealing with the special factor of deeper refuse accumulation deposits containing larger numbers of discarded or lost implements. The nature of the deposits may partly explain the paucity of bone implements in Early Sacramento culture sites, yet in Middle and Late burials the bone objects tend to be more numerous and of more varied types than those of the Early horizon. This observation is submitted as evidence of significantly less interest of the Early people in bone as a tool material.

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[45] This custom of carrying home unusual mineral specimens is known from other evidence (cf. the zincblende and malachite in site C.68, Schenck and Dawson, 1929, p. 394).

[46] For a general discussion see Heizer, 1937, which gives additional references.

[47] As presented by Lillard and Purves, 1936.

[48] See also Heizer and Fenenga, 1939, p. 383.

[49] In July, 1937, a University of California summer field party under the author's supervision excavated seven stratigraphic test pits in site C.6, the Late horizon focus of the baked-clay art. Several thousand baked-clay objects were recovered, each assignable to a 12-in. level in a stratipit. When these are analyzed, we should learn something about type sequences in the Late horizon, where the art reached its zenith.

[50] In 1947 Mr. Russell Newman, with a crew of eight University students, conducted extensive excavations at site C.6. His collection includes several hundred pounds of these baked-clay objects. New collections from Walnut Grove, Isleton, and west of Rio Vista will aid materially in defining the distribution of types of baked-clay forms.

[51] Cf. Ford and Quimby, 1945, pp. 31-32.

[52] Antler and bone implements are separately discussed. The total of 59 here, however, includes for convenience 3 antler implements of the flat spatula class from C.56 and C.107.

TABLE 11

Bone Artifacts in Burials

(Figures in columns give number of artifacts)

Artifacts	Site				Total bone artifacts
	C.68	C.107	C.56	C.142	
Human bone objects					
Skull receptacle	..	1	..	..	1
Fibula dagger	..	..	1	..	1
Radius whistle	..	..	..	1	1
Short bone tubes					
Bird-bone	2	..	2	1	5
Mammal-bone	..	5	..	..	5
Bone awls					
Bird-bone	5	..	..	..	5
Mammal-bone	7	2	..	..	9
Flat bone or antler spatulae	..	3	1	..	4
Long, cylindrical pins					
Bipointed	..	2	..	2	
One end flattened, other end plain	..	4	1	..	5
Wide, heavy, split animal-bone tubes	..	2	..	..	2
Flattened bone tools, blunt end	1	3	2	..	6
"Dagger" of cannon bone	..	..	1	..	1
Bipointed gorge hook	..	..	1	..	1
Single-piece curved fishhook	1	..	..	..	1
Notched bone point	1	..	..	..	1
Perforated "needles"					
Bipointed, cylindrical	1	..	..	..	1
Flat, thin, long	..	..	1	5	6

Objects of human bone.--From C.107 came a unique piece, a calvarium used as container, the edges showing cutting, chipping, and smoothing marks (pl. 5,h). It may have been of ceremonial use.[53] The skull from which it was made may have been that of an enemy brought home after a battle.

A fibula dagger or poniard, 32.7 cm. long, was recovered from a C.56 burial (fig. 17,g). The point is sharpened and the proximal end of the bone furnishes an enlarged grip. This end has a perforation angled at about 45 degrees.[54]

A radius whistle (now lost) came from a C.142 burial.[55] It was about 8 cm. long and was made of the proximal end of a human radius. There was a single oval perforation, but no evidence of a clay or asphalt stop. Aside from the three questionable whistles from C.68 (described below under "bone awls"), this human-bone whistle is our only evidence of this class of object, so abundant in Late horizon sites. Middle horizon settlements furnish heavy mammal bone whistles while the Late horizon forms are almost invariably of thin bird bone.

[53]When found, the skull case contained red ochre and rectangular Haliotis shell beads. Type A charmstones of blue amphibolite schist occurred with the burial.

[54]Illustrated in Lillard, Heizer, and Fenenga, 1939, pl. 10,i.

[55]Described, by misprint, as from site 69 in Heizer and Fenenga, 1939, p. 391.

Short bone tubes.--Ten pieces only were recovered from our four settlements. Numerically they are evenly divided between tubes made of bird bone and of heavier mammal bone. The bird-bone tubes (fig. 18,h,m) average 38 mm. in length and 7 mm. in diameter; the heavier animal-bone tubes (fig. 18,g) average 69 mm. in length and 11 mm. in diameter. All the heavy animal-bone tubes came from C.107; the other three communities yielded only bird-bone tubes. All were probably beads, though in a C.107 burial (No. S.166) a mammal-bone tube was found resting on the malar bone, which suggests its possible use as an ear-tube.

Bone awls.--It was believed for some time that there were no awls in Early horizon sites, but we were in error on this point. Bone awls are rare; only fourteen specimens exist, and many of these may be specialized tools which served purposes other than basketmaking, the function usually ascribed to archaeologic bone awls in this region where coiled basketry was so extensively used by later native groups.

From C.107 came two fragmentary awls, flat and thin, with tapering, more or less blunted, points. They are 65 mm. long and 9 mm. wide. Both appear to have been fashioned from a fortuitous splinter of animal bone. From the same settlement came two short, broad awls of split animal tibiae, one of which (fig. 18,i) has a cut end. The most complete specimen, whose tip is missing, measures 73 mm. long and 20 mm. wide (fig. 18,k). Two coyote ulnae from C.68 have been fashioned into awls by the simple expedient of grinding a beveled point on the distal end of the

bone (fig. 18,d). Also from C.68 came three awls made from fortuitous splinters (lengths of 2 complete pieces, 11.5 cm. and 6.5 cm. respectively) and one awl of the split leg bone of some animal (coyote?), with a sharp beveled point. This piece is 16 cm. long and 9 mm. wide. Bird-bone awls made by grinding a beveled point like a quill pen occurred only at C.68. Four specimens were recovered by E. J. Dawson, but three of these may possibly be fragmentary whistles, the slanting break occurring at what appears to be the edge of the ovoid opening. The other piece, however, is definitely an awl of this type (fig. 18, l). From C.68 comes another slender awl of bird bone also from a fortuitous splinter; it measures 5 cm. in length and could not have served any heavy duty purpose. Generally speaking, awls recovered from settlements of the Windmiller facies are an unstandardized, scrappy lot which do not compare well with the abundant, well-made, basketry awls of Middle and Late horizon sites.

Flat bone or antler spatulae.--These pieces have been referred to as sudatores or strigils. Four examples are known, three from C.107 and one from C.56. Similar pieces also occur in some Middle horizon sites.[56]

The largest example is from C.107; although fragmentary, it is 39 cm. long, 3 cm. wide, and 3 mm. thick. It appears to be made of antler (fig. 17,f). A similar specimen from C.107, a fragment showing a curved cross section and rounded end, is 26 cm. long and 4 cm. wide and is also of antler. The third piece from C.107 is very thin, being fashioned probably from a scapula blade. It is 22.5 cm. long and 3.5 cm. wide at the broad end, tapering to a point at the other.

The C.56 spatula (fig. 17,e) is made of antler (probably elk) and is complete. It has a concave base and lenticular cross section and measures 32.8 cm. long and 4.5 cm. wide.[57]

Long bipointed cylindrical pins.--Four of these well-fashioned "pins" were recoverd, two from C.107, two from C.142. The C.142 pieces (figs. 17,c, 19,f) are 28.2 cm. and 20.5 cm. long respectively; each is 8 mm. in diameter. The longest bears definite wrapping marks which appear to have been of a very fine twisted string. These binding impressions, occurring for about 4 cm. near one end, completely encircle the object, indicating that it was not bound to a shaft but was probably a wrapping to which feathers or some other decorative materials were affixed. The two fragmentary C.107 pieces are similar but show no traces of wrapping.

Flattened bone tools with blunt ends.--This appears to be a specialized Early culture horizon form. Six pieces come from three settlements (C.107, C.68, C.56). Three C.107 specimens came from one burial. All are fragmentary, now measuring 7.2 cm., 10 cm., and 11.5 cm. in length, 1.1 cm. average width, and 4 mm. average thickness. Two C.56 pieces (fig. 19,d,e) are somewhat curved and appear to have been formed from a split animal rib. They measure 19 cm. and 22.5 cm. long, respectively, and each is 1 cm. wide. One has a sharp point, the other is blunted. Since both are somewhat irregular (i.e., broken or unfinished) on the broad end, it may be that they were originally perforated. If so, they would fit the classification of the pieces described below as "perforated, flat, thin, long needles." The C.68 piece (fig. 18,c) was found in the mound mass without association; it is 14.2 cm. long, 1.2 cm. wide, and 5 mm. thick.

"Dagger" of cannon bone.--This unique Early horizon piece from site C.56, represented now by the handle end fragment, is formed from a split cannon bone with the epiphysis nicely ground down (fig. 18,e). It is 8.2 cm. long and 3 cm. wide; the original length may have been as much as 20 cm. Its function may have been that of a dagger or perhaps a scraper but its use cannot now be determined, since the working point is missing.

Long cylindrical or elliptical pins.--Five pieces of this class were recovered, four from C.107 and one from C.56. Two of the C.107 pieces (shown in fig. 19,c,g) are now lost[58] but their measurements are recorded as 22.5 and 20.0 cm. long with an elliptical cross section 17 mm. by 14 mm. The remaining specimens are, respectively, 29.2 cm. and 21.8 cm. long with one pointed end and one flattened or beveled end (figs. 17,d, 19,a). The central diameter of each is 9 mm. The C.56 piece of this class (fig. 19,b) is 23 cm. long.

Wide, heavy, split animal-bone tools.--The two examples of this group come from C.107. These are rough service implements, judging from their rugged construction. Of flattened cross section, with one end rounded to fit the hand and the other pointed for a working tip, they may even have served as weapons. Both are now fragmentary, measuring about 20 cm. long, 1.5 cm. wide, and 1 cm. thick.

Bipointed gorge hook.--This is the sole evidence for bone gorge hooks of the Early horizon. The piece (fig. 18,b), measuring 8.8 cm. long, 10 mm. wide, and 5 mm. thick, was found dissociated in the deposit mass of C.56.

Single-piece curved fishhook.--A single specimen (fig. 18,f) came from the burial of an adolescent male (No. C.9) in C.68. It is unlike other single-piece bone or shell fishhooks from the Santa Barbara and Humboldt Bay localities, which are the only sites outside our area known to yield such hooks.[59]

The hook lay in the grave with a notched bone "point" lying along the shank of the hook proper in such a position as to suggest that the two were originally bound together.[60] The hook itself is 6 cm. long and 22 mm. from tip to outside of shank; the end is somewhat enlarged to permit attachment of the line. The bone "point" is described below.

The only other single-piece curved bone fishhook known from our area comes from site C.117, a Late horizon settlement. It is in the private collection of Mr. S. Martine of Sacramento.

Notched bone "point."--This is a difficult piece to describe, and the reader is referred to the illustration in

[56]Lillard, Heizer, and Fenenga, 1939, pp. 45, 48, 51 (listed as "sudatores"). See also Gifford, 1940, p. 172.

[57]Illustrated, ibid., pl. 10, j.

[58]Between 1940 and 1942 a number of complete artifacts were stolen from the Lillard Collection, which in this period was in the Sacramento Junior College without curatorial supervision. Among the stolen pieces were all of the phallic charmstones, several obsidian blades, and a number of bone objects.

[59]Santa Barbara types are illustrated by Gifford, 1947, p. 110; Woodward, 1929; Robinson, 1942; and Orr, 1947, p. 127. The Humboldt Bay hooks, of bone, are in the collection of Dr. H. H. Stuart of Eureka. Examples are on exhibit in the State Indian Museum, Sacramento.

[60]As illustrated, Lillard, Heizer, and Fenenga, 1939, p. 66, pl. 20, k.

figure 18,g. The bone piece is 5 mm. thick, 7 cm. long, 9 mm. wide at center and somewhat less on the ends, one of which angles off slightly. Both ends, like the shank end of the fishhook with which it was associated, are slightly bulbous or enlarged, presumably to allow a line to be tied securely.

We may be in error in supposing that the two pieces found comprise a compound hook. It may be that the curved fishhook is complete in itself, the notched bone "point" being a separate shank with a wooden barb attached. In evidence may be cited the definite scoring on the angled end, which may have served to hold the binding of the base of the wooden barb to the bone shank.[61]

It may be observed that similar "points" occur commonly in settlements of the Middle Culture horizon and that no instances of single-piece curved fishhooks are thus far recorded from this culture.

A possible separate fishhook barb (fig. 18,j) comes from C.56. It shows binding marks at the thinner and flatter end, which is angled.

Perforated bipointed cylindrical "needles."--From C.68 came a perforated implement worked down from some heavy mammal bone. It is cylindrical and made of solid, dense bone 1 cm. in diameter, with a drilled hole 3 mm. in diameter 8 mm. from the end. It has been broken, its present length being 9 cm., but originally it may have been 20 cm. long, judging from the fact that the portion we possess shows no diminution in diameter.

Perforated flat, thin, long "needles."--There are six of these pieces, five from a single grave at C.142, the other from C.56. The C.142 pieces are all similar, being widest at the perforated end and tapering gradually to the tip, and were presumably made by a single person (fig. 17,a,b). Their measurements are as follows: lengths, 32.2 cm., 34 cm., 31.7 cm., 20 cm. (broken at tip end, estimated original length 30 cm.), breadths at perforated end, 1.6 cm., 2.0 cm., 1.1 cm., 1.3 cm., 1.7 cm.; thickness averaging about 6 mm. The C.56 piece (fig. 19,h) is fashioned from a large rib. It is 20.5 cm. long and 1 cm. wide. Actually similar in all respects except the drilled hole near one end and the sharp point are the two pieces from C.56 described above under "flattened bone tools with blunt ends."

These flat needles may have been used in matmaking.

OBJECTS OF ANTLER, TURTLE CARAPACE, CANID TEETH

This is a miscellaneous classification of implements and ornaments fashioned of these materials. Types and occurrence in graves are shown in table 12.

Trident fish-spear points of antler.--The trident is an exclusively Early horizon tool, evidenced from three of the four excavated settlements. The individual points average 7 cm. in length, and are cylindrical with a definite curvature. The base on the outside of the arc is notched for attachment to a chamfered or mortised shaft end, as illustrated by us earlier.[62] Our evidence for the reconstruction employing three points rests upon finding three points in this approximate position in a child's burial at C.68.[63] In site C.56 a single point was found in the mound deposit without association. Of the five C.107 pieces, three occurred in one burial and one each in two burials.

TABLE 12

Artifacts of Antler, Turtle Carapace, Canid Teeth

(Parenthetical figures are actual specimen counts; plain figures show grave occurrence)

Artifacts	Site C.68	C.107	C.56	C.142	Total occurrence
Trident fish-spear points of antler	3	5	1	..	9
Antler "wedge" (scraper?) . . .	1	..	..	..	1
Antler tines with cut base	..	3	2	..	5
Rectangular turtle-carapace pendants	2	..	6	..	8
Canid teeth	8 (40)	2 (8)	1 (2)	..	11

Antler wedge (scraper?).--This implement (fig. 18,a) comes from site C.68 and would unquestionably be classed as a wood-splitting wedge except for the fact that the butt shows no batter marks. It is probably to be classified as a hand tool, perhaps for scraping skins. It is 14 cm. long, with an expanded base 5.5 cm. wide, and tapers gradually to a rounded chisel point.

Antler tines with cut base.--Three antler spikes from one burial in C.107 average 7.5 cm. in length and 1 cm. in diameter. Two are plain, one has a filed notch across the flat base. Their function is not obvious; they may have been raw material saved for making implements.

Two tine ends with worn points from the general mound mass of C.56 may have served as pressure flaking tools.

Rectangular turtle-carapace pendants.--Only two settlements yielded these thin, undecorated, rectangular pendants. Two from C.68 (fig. 5,d,e) measure 3.2 cm. by 2 cm. and 3.8 cm. by 2.5 cm. The smaller has a single hole near the edge, the larger has four holes, one in each corner. Six pieces in three pairs, two with rectangular *Haliotis* shell bead, and one with rectangular *Olivella* bead, appliqué, came from a single burial at site C.56 (fig. 5,b,c). These pieces are all trapezoidal in form with a single perforation at the narrow end.

Canid teeth.--From two C.107 burials came eight drilled coyote teeth, which probably served as ornaments.

From eight C.68 burials were recovered forty undrilled coyote teeth, and a single burial at C.56 yielded two teeth. These bear no evidence of cord attachment, but absence of direct evidence of attachment does not preclude their use as pendant decorations.

EVIDENCE OF HEAD-TAKING

Burials in which the skull is lacking perhaps constitute archaeological evidence of the recent California Indian practice of head-taking in war. There were three such

[61] Cf. Schenck, 1926, fig. 4.

[62] Lillard, Heizer, and Fenenga, 1939, pl. 20, i, j.

[63] Illustrated, ibid., j.

burials from C.107 and one from C.142. Also from one C.107 Early horizon burial came an extra skull, which was clearly a grave offering; it may also have been an enemy's head.

UNWORKED ANIMAL BONES IN GRAVES

The presence of unmodified animal bones in graves is a common Early horizon culture trait. Table 13 summarizes occurrences.

TABLE 13

Unworked Animal Bones in Burials

(Figures in columns give grave occurrence)

Animal Bone	Site			
	C.68	C.107	C.56	C.142
Bear (Ursus americanus): claws	1	..	..	..
Deer (Cervus): astragali	2	..	..	2
Raptorial birds (Falco, Cathartes, Haliaeetus): wings, crania, legs, feet	3	2	3	4
Beaver (Castor): mandibles	3	3	1	1
Coyote (Canis): teeth	35	..	2	..
Duck or goose (Anser): mandible	..	1	2	..

The significance of these various animal remains has already been discussed within the larger context of "animal ceremonialism."[64] The single occurrence (C.68) of bearclaws may be evidence of regalia, possibly a skin cloak.[65] The unworked deer astragali may have been dice, though none bears special markings. In recent times unmodified deer astragali were used by the Pomo as dice,[66] and sites in Napa Valley and the lower Sacramento Valley yield sufficient numbers of these distinctive bones to indicate that they were collected and preserved. Their commonness is a possible reason for rare occurrence in burials. The coyote teeth, discussed elsewhere, were probably objects of personal decoration.

EVIDENCE OF BASKETRY

In an area where basketmaking had an ethnographic climax, it is of some interest to determine the historical depth of the trait and the ancient weaves used. For the Late horizon there is abundant archaeological evidence of basketry in the form of carbonized remains and impressions on baked-clay objects.[67] No charred basketry has been encountered in any Early horizon site so far excavated.

From two settlements (C.68, C.142) have come two large, subrectangular, hand-molded objects of fired clay which bear surface imprints of basketry. Both appear to have been pressed when moist against a flat, closely twined basket surface and then fired, thus preserving for us evidence of at least one contemporary textile technique. The C.142 piece is rectangular, measuring 11.3 cm. long, 6.9 cm. wide, and 3.8 cm. thick, and the twined basketry impressions occur on the flat surfaces, sides, and squared ends. The second example from C.68 (fig. 5,f) is of similar size and shape.

The several heavy flat, eyed bone needles described on page 28 were probably used in making twined mats of rush or reeds.

Fine two-ply twisted string (probably of Apocynum or Asclepias fibers) is attested by impressions in asphalt on the ends of charmstones and bone objects.

The rarity of sharp-pointed bone awls has suggested to us the possibility that coiled basketry was not present in Central California in Early horizon times. Coiling must have entered Central California from either the east (Great Basin) or south (Southern California). The close twining shown in the textile impressions on the two baked-clay objects from C.68 and C.142 reminds one of recent Northwestern California and Pomo fine-twined basketry.[68]

[64] Heizer and Hewes, 1940.

[65] This trait (burials associated with bearclaws) is reported from the buried Concord site and C.141, both of which seem to fit fairly well within the Middle Central California horizon.

[66] Cf. Culin, 1907, fig. 155.

[67] Heizer, 1937, p. 40. A detailed analysis of archaeological textile materials from evidence of clay impressions and carbonized fragments is now being made by William J. Wallace, and A. E. Treganza.

[68] Kroeber (1923, p. 131) long ago made a guess that twined basketry preceded coiling in Central California.

ECONOMIC COMPLEX

Any attempt to sketch the economic pattern of the Early horizon people is limited because most of our knowledge of the culture is based upon the mortuary complex. It must be determined, therefore, to what extent artifacts occurring with burials represent, on the one hand, special grave offerings (objects of ceremonial use or made expressly for burial with the dead) and, on the other hand, items of an ordinary workaday nature used in life by the deceased or by some of the burial party, which were placed in the grave as offerings to, or belongings of, the dead.

We may with some reason eliminate as utilitarian objects (artifacts which served directly as work tools for manufactures or food getting) the following: shell beads and ornaments (Olivella, Haliotis), charmstones, quartz crystals, rectangular sandstone palette, tubular stone "pipes," flat perforated biotite ornaments, chrysotile asbestos splinters, obsidian "bangles," unworked colored stream pebbles, various objects of bone, turtleshell, teeth, and certain ground-slate forms. These are all referable to the aesthetic and ceremonial or nonutilitarian aspects of the culture of the people responsible for the Windmiller culture facies.

Although there are two thick refuse accumulation deposits of this period (settlements C.56, C.68), finds of dissociated artifacts are quite rare. It is difficult to say why more broken or rejected objects are not found, but this is the fact, and real enlightenment as to the ordinary household articles of these people is still to be achieved. The remains of seed-grinding implements are extremely rare, and it may be suggested that seeds, such as the acorn, were not very important as a food item. The hypothesis of a Central California group which did not place greater dependence upon acorns than on any other single food resource will seem revolutionary, but this is nevertheless suggested by our present evidence.[69] Further indications that the historic acorn complex was lacking, or at best undeveloped, are the scarcity of cooking-stones (for stone-boiling), the near absence of bone awls, which would indicate a slight development of basketry (in which acorn meal is cooked), and the near absence of large fire pits where stones were heated (pl. 5,g). Elsewhere in this paper will be found the data on the mortar and metate seed-grinding implements. Both implements are known, but are rare. Indeed, they are found so seldom that one also familiar with sites of the later horizons, where these implements are abundant, reaches the logical conclusion that the Early culture people were not much interested in seeds.

Chipped points of obsidian, chert, flint, and other cryptocrystalline rocks may have served either for projectiles or blades for knives or spears. They are relatively common grave items. Because only three human bones with projectile points imbedded in them have been found in any Windmiller culture facies settlement, we may believe that warfare was then weakly developed.[70] The chipped points probably were tips for weapons used in hunting or were hafted as knives. The former use is more likely in view of the fact that a contracting stemmed or rounded base blade is difficult to haft firmly as a knife. The weapon used is unknown, but it has been suggested[71] that the atlatl may have been known to the Early culture horizon groups, this suggestion being based on the large, heavy size of the chipped points. This theory is likely to remain unproved unless some certain evidence of the spear-thrower, such as stone weights or bone shaft-engagement hooks, is recovered in future excavations.[72]

It is suggested here that hunting was more significant than seed gathering as a food-securing technique. The idea, however, remains only a working theory based upon the interpretation of evidence thus far collected. The only possibly contradictory evidence is the relative scarcity of animal bones which represent the leavings of food, but bones are present in sufficient numbers to indicate that a large number of animals were successfully hunted.[73] The following animals, all known to be of recent occurrence in our area, have been identified from osteological remains recovered from sites C.107, C.56, C.68, and C.142: mule deer (Odocoileus), tule elk (Cervus nannodes), beaver (Castor, cf. subauratus), coyote (Canis cf. ochropus), jackrabbit (Lepus cf. Californicus), lynx (Lynx cf. fasciatus), racoon (Procyon), bear (Ursus), antelope (Antilocapra).

There is no indication of the dog, either of his bones or activities in the form of gnaw-marks on food bones. The historic absence of the dog is apparently reflected anciently in this region.[74]

Various types of bone tools, many with blunted ends, indicate specialized implements for doing specific work, but these uses cannot be guessed. Few tools are sufficiently sharp-edged to have served as knives, and the rounded tips do not suggest their utility as perforators. They may have served any number of purposes ranging from fish scalers to matmaking tools.

Fishing is attested not only by the presence of salmon vertebrae, ribs and jaws of smaller species, and plates of the sturgeon, but also by a peculiar trident fish-spear and two types of angling hooks. The trident tips are made of antler and are attached by binding in a basal notch to the end of a shaft. They are attested from all settlements except C.142. From C.56 came a straight, bipointed gorge hook (not with a burial but found in the mound mass as a dissociated object), and from C.68 the single-piece curved bone hook. Large net sinkers are not recorded, and of nets there is no indication. Two-ply twisted string was known, and could have served as net cord. The small baked-clay balls with cut groove would have served nicely as fishline sinkers, but there is no evidence that they were so employed.

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[69]For the recent acorn complex of California see Merriam, 1918; Gifford, 1936; Kroeber, 1925, passim.

[70]In cemeteries of Middle and Late horizon settlements bones with chipped projectile points imbedded in them are common. Cf. Schenck, 1926, p. 242, pl. 48, o, for instances at Emeryville shellmound on San Francisco Bay. Emeryville is a Middle horizon site of the Coastal Province. Note also the suggestion of head-taking and trophy (?) skulls (supra).

[71]Lillard, Heizer, and Fenenga, 1939, p. 74; Heizer and Fenenga, 1939, p. 397; Heizer and Fenenga, 1941.

[72]From three Middle culture horizon sites have come "boat-stones" identical with those identified elsewhere as atlatl weights.

[73]Grateful acknowledgment for identifying mammal bones is here expressed to Dr. L. C. Eiseley (University of Pennsylvania), Dr. B. Schultz (University of Kansas), Dr. R. A. Stirton (University of California), Miss Sheilagh Thompson (University of California), and Dr. Hildegarde Howard (Los Angeles Museum).

[74]Heizer and Hewes, 1940, p. 601; Kroeber, 1941, p. 7. (In the summer of 1947, after this was written, the partial skeleton of a dog was recovered from site C.68. The ancient presence of the dog is thus attested; its recent absence must be due to local extinction.)

CEREMONIAL COMPLEX

One of the most striking features of the Early culture horizon is its ceremonial development. Not only does this imply a previous history, it is also interesting because this culture has a fairly respectable antiquity. We submit that there is nothing extraordinary in a "ceremonialized" American culture several thousand years old. There will be, however, those whose "intuition" advises against accepting our age estimate because the cultural remains include an abundance of objects of ceremonial usage.[75] This, we believe, should not constitute any deterrent to acceptance of an age estimate, since the ceremonial items (for example, charmstones, or plummets, and quartz crystals) are of types which have hemispheric spatial distributions and are therefore presumptively ancient. They are, furthermore, tenacious and enduring traits in Central California, being known from the earliest recorded cultures to the ethnographic present.

Among those objects recovered which belong to the ceremonial aspect of life we list: charmstones, quartz crystals, sandstone paint "palette," skull cup, and unworked animal and bird bones accompanying skeletal remains.

Charmstones are made, almost invariably, of lithic materials chosen for their color and beauty rather than for ease of working (pl. 6,a). Thus, blue amphibolite schist, the characteristic material of C.107 charmstones, is dense and difficult to work, but yields a finished object of real beauty. Banded translucent marble (alabaster) was favored by the people of the C.56 settlement, and the appearance of these long, polished, banded plummets evokes aesthetic appreciation in any sympathetic person of the present day. These charmstones, therefore, are art objects upon which extra care and effort were expended. Since they are not battered, worn, or chipped in any way, there is every reason to assume they had no ordinary use but were carefully guarded from injury and breakage. Early horizon charmstones are almost invariably perforated, clear evidence that in use charmstones were suspended. Asphaltum traces near the hole, bearing the imprint of fine twisted cord, are often preserved. Whether these pendants were worn around the neck on ceremonial occasions or perhaps were suspended in certain sacred places for special reasons, we shall never know, but the principle of suspension does notably characterize charmstones of this period.

Quartz crystals have been discussed elsewhere (pp. 19-20), and their inclusion here as items of ceremonial usage rests on the observation that the use of such crystals with religious connotations has a world-wide distribution. Recent California Indians commonly consider them sacred.

The two tubular stone "pipes" from C.142 graves are unique. They may have served as smoking instruments, yet there is no evidence of a cake or charred residue which is found in pieces of similar shape from Middle and Late culture horizon settlements. These may have served as sucking tubes used in curing illness.

The taking of heads, presumably those of fallen enemies, is suggested by the absence of skulls in a few graves. This is a widespread trait of the war complex in recent California Indian culture.[76]

Unworked animal bones (chiefly those of raptorial birds) found in graves suggest an ancient use of regalia similar to that of recent California Indians.[77]

The "skull cup" (pl. 6,h), if judged by its single occurrence, is hardly to be considered an ordinary utilitarian object. When found, it contained powdered red ochre and Haliotis beads of type 1a. This unique specimen reinforces the general impression that the Early horizon culture had a highly ceremonialized flavor.

The rectangular sandstone palette served for grinding paint. Here again there is evidence of attention to form and of considerable effort to produce an object whose use was probably directed toward religious activity.

The generalization to be drawn from the evidence above is that the Early culture horizon groups must have had a rich pattern of ceremonial or religious activity, which entailed, at least for nonperishable items, a great deal of manufacturing effort. These material items are abundant and were commonly selected as grave offerings (see Table A, App. I). On the assumption that all of the four communities under consideration were roughly contemporaneous, we note extreme local, or village, specialization in forms and materials used for charmstones, though the essential element, the charmstone itself, is common to all settlements. Quartz crystals are more common than charmstones. Both these items are often used as grave offerings and as such they are found with the remains of men, women, and children alike, not limited to association with any one sex or age group. This is possibly evidence that charmstones and quartz crystals were owned by families or lineages and were placed in family graves. This would suggest that about 17 per cent[78] of the families of all four settlements owned such items, an incidence which would be an acceptable figure for the numbers of initiates in a restricted ceremonial organization. The activities of such an association might theoretically range from those of practicing shamans to those of an occupational group whose efforts were directed toward hunting or fishing for ceremonial purposes.[79] This is all speculation, but it is the sort of thing which one familiar with California ethnology might find not too unreasonable. Its purely speculative nature results, of course, from the fact that our data are from a dead culture seen through a time gap of several millennia. But it is also worth noting that charmstones, quartz crystals, birdskin regalia, and other items mentioned above are part of the recent Central California Indian culture and that a cultural stability of these elements through a very long time period is thus implied.

[75]Perhaps we shall all be surprised at the nature of the burial accompaniments if a cemetery of the Folsom culture group is ever discovered. They may include some rather elaborate items.

[76]Kroeber, 1925, pp. 843-844.

[77]Heizer and Hewes, 1940.

[78]Calculated from table 1. Total number on percentage basis would be for 400 persons.

[79]Kroeber, 1925, pp. 638, 936. Yates (1889, pp. 300, 303-305) cites Indian testimony, now three-quarters of a century old, on the sacred nature of California charmstones. They were used by the Chumash and Wappo for curing the sick, bringing rain, and putting out fires in the mountains, and in connection with securing luck in fishing, hunting, and war.

AESTHETIC COMPLEX

The mortuary remains of the Early culture horizon group show a love of ornament which is closely similar to that of more recent California Indians. Beads of shell are common, the most abundant being made of Olivella and Haliotis. Beads of clamshell (Saxidomus), which are the standard ethnographic variety, are completely lacking. The most common Early shell bead shape (regardless of species employed) is rectangular with a center perforation. These were not worn in strings or necklaces, but were sewed like sequins to a garment foundation. The only bead which may have been strung linearly was the simple spire-lopped Olivella (type 1a), and here the archaeological evidence points equally to the application of these beads as individual ornaments on a garment surface. Pendants of stone (slate, biotite), carapace, or shell (Haliotis), with a single perforation for stringing, occur in all sites, though not in large numbers. We may presume that persons of each sex had the ear lobes pierced for wearing wooden tubes or plugs or spools with a facing of iridescent Haliotis shell. The style of clothing is difficult to determine, though there is some indication of a garment with a definite neck and wrist-length sleeves, suggested by the repeated occurrence of lines of rectangular shell beads and small ornaments at neck and wrists. Abalone shell pendants were worn strung as a necklace. No evidence of footwear, hats, tattooing, scarification, etc., has been noted. Red paint occurs in graves in the form of powder or molded lumps, and we may infer from the presence of this pigment that body painting was practiced.

Charmstones were sometimes painted, those from the C.56 settlement most often exhibiting evidence of this practice. From C.107 came two charmstones with Olivella beads affixed to one surface with asphaltum (figs. 7,c, 8,e).

TECHNOLOGICAL ASPECTS

Attention is directed here to several technological aspects of the Early culture horizon, most of which have been briefly mentioned elsewhere.

FLAKING TECHNIQUE

It is apparent from inspection of the chipped points and blades that a percussion flaking technique was employed. Edges may be refined by pressure flaking and some implements may have been fashioned entirely by pressure chipping, but percussion flaking was the most frequent technique. This fact may account, at least in part, for the employment of more or less refractory materials (slate, chert, flint) rather than the obsidian which was available. Two percussion hammerstones and several doubtful antler flint-flaking tools have been recovered.

STONE POLISHING

Numerous ground or polished stone implements are found. Charmstones, ground slate "pencils" and pendants, tubular "pipes," and the sandstone "palette" may be listed as having been produced by this means. Charmstones were roughed out by pecking, then polished by rubbing on an abrading stone. Slate, which is soft, was probably rubbed into the desired form. Pecking and grinding were thus the two techniques for producing polished implements. A pebble bearing a shallow, wide, pecked groove is shown in figure 17,d.

DRILLING

Charmstones all exhibit biconically drilled perforations. These appear to have been made with a solid, conical tipped shaft drill rather than a perforator held in the fingers. A quartz crystal hafted on a shaft and twirled between the palms would have served, but we have no indisputable drill points. The two tubular "pipes" from site C.142 are conically drilled.

BONE WORKING

There is evidence of bone sawing by the common scoring technique. Bone was drilled with biconical perforations in the same manner as stone. The few bone artifacts recovered are nicely smoothed and polished and are to be considered equal in workmanship and finish to bone tools of the later local cultures. Incised decorations on bone, so characteristic of later local cultures, are completely absent.

SHELL BEAD APPLIQUÉ

A notable decorative technique of the Early horizon is seen in the use of shell beads affixed to the surface of charmstones (figs. 7,c, 8,e) and turtle-carapace pendants in an asphaltum mastic (fig. 5,b,c). This is not inlay, since the recipient surface is not lowered or depressed.[80] Later cultures in the lower Sacramento Valley area and on San Francisco Bay possessed this appliqué technique, but employed different adhesives than asphaltum, such as fish glue or perhaps plant gum.

PLASTIC ARTS

Wet clay was modeled into various forms (perforated disks, angular lumps, flat circular shape with fingertip pittings) and then intentionally fired. The number and variety of baked-clay forms noted in Late horizon settlements do not occur in the Early culture horizon.

SKIN DRESSING

A slight indication that skin dressing was an Early culture horizon trait is to be seen in the limited number of scrapers of horn and bone. The few bone awls recovered could have served as perforators for sewing skins for clothing. Stone scrapers are known to occur, but are not found in sufficient numbers to indicate an emphasis on scraping of hides.

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[80] True inlay occurs in the Santa Barbara region, as does appliqué.

COMMERCIAL RELATIONS

Much has been said about raw materials and manufactured goods which were apparently introduced to the Mokelumne region from outside. These items, when taken together, are evidence of trade relations.

Obsidian is apparently from the Napa Valley quarries rather than from those of the Clear Lake region.[81] Each area produces a distinctive type of obsidian which permits specific determination of ultimate source of material. Settlements of Windmiller culture facies yield only finished chipped implements, and there is little evidence of raw material chunks or chipping rejectage. This would indicate that lithic materials were valuable and were immediately converted into finished products. In Late horizon settlements, grave and cache finds of numbers of rough obsidian blanks are not uncommon, and one infers that either this was undisposed stock of some aboriginal entrepreneur, or obsidian was then more easily available than in the Early period. There is some variation in amounts of obsidian in different sites. Of flaked implements in C.68 those of obsidian comprised 71.8 per cent; figures for other sites give 58 per cent in C.142, 45.6 per cent in C.56, and 18.5 per cent in C.107. One possible interpretation of these percentages is that obsidian was rare at first, becoming more plentiful as time went on and regular commercial relations became established with distant groups. This assumption would place C.107 as the earliest and C.68 as the latest in our series of four settlements.

Since the Windmiller facies settlements lie on the stoneless alluvial plain, it is certain that the wide variety of lithic materials[82] found in these settlements (in addition to obsidian) was brought in from outside. Some of the stone probably derives from the Sierra region to the east[83] and some probably comes from the Coast Range region which borders the Great Valley on the west.[84] It is thus apparent either that the Early Sacramento people were extensive foragers or that they had trade relations with Sierran and Coast Range groups who could supply these varieties of stone. It is impossible at present to decide which of these two explanations would best account for the presence of foreign lithic materials; on purely speculative grounds, I incline to the theory of trade relations.

A point in favor of this hypothesis is the use of centrally perforated Haliotis shell disks as facings for wooden ear ornaments. Again, the rectangular Olivella shell beads, though also perforated, are used for appliqué. Actually, the ideal shell form for such facings or appliqué work would be imperforate disks and rectangular pieces unmarred by holes. It would appear that the Delta people obtained beads and ornaments in finished form from groups living on the coast which controlled the supply sources of the shells. These they used in lieu of more desirable unperforated ones.

We may therefore assume resident coastal groups contemporaneous with the interior villages, but of these there is no hint in sites thus far excavated in the Central coast region, Early culture horizon settlements being apparently very rare. Possibly some shoreline sites of the Early period have been destroyed through subsidence or aggradation,[85] but in some particularly favored spot there must remain sites of this culture horizon awaiting discovery.

Middle and Late culture horizon sites are mapped by the score, but known Early culture sites can be counted on the fingers of one hand. Physiographic change may in part account for this rarity, but there is also the possibility that the people of the Early culture horizon were a numerically small group aggregating, say, several hundred in the interior and a similar number on the coast. From the abundance of habitation-burial communities of more recent cultures it is pretty clear that Central California did not achieve its optimum population density until the Early horizon period was long past.

The curious fact has been discussed that individual settlements of the Early culture horizon yield implements of one particular type of stone, whereas this stone is either very rare or lacking in other settlements of this period. This may indicate intersite time differences or it may simply reflect mode or fashion; a group of people may favor one material to the exclusion of all or certain other materials. If these differences do reflect time, then different supply sources available at the moment to one or the other of the several Delta groups may be inferred. A careful determination of the source of these various rocks and minerals may be our best clue to areas in which to search for equally old remains.

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[81] Heizer and Treganza, 1944, p. 304 (Napa Valley and Clear Lake).

[82] These include amphibolite schist, quartz crystals, sandstone, marble, alabaster, flint and chert, slate, diorite, vesicular basalt, steatite (very rare), quartzite, biotite, asbestos crystals, malachite, and red ochre.

[83] Quartz crystals, marble, alabaster, quartzite, biotite, asbestos crystals, malachite, steatite (?), and red ochre (?).

[84] Sandstone, obsidian, chert, slate, steatite (?), red ochre (?).

[85] Some San Francisco Bay sites have undergone subsidence. The clearest example is the Ellis Landing shellmound (Nelson, 1910). As inspection of fig. 1 shows, this is a settlement of the Ellis Landing facies of the Coastal province of the Middle Central California horizon, and therefore later than our Early horizon settlements (Gifford, 1947, p. 57). Nelson (1909, pp. 315-316, 322-323) gives evidence for the removal of Bay shellmounds through shore erosion and lists several sites which have been covered by alluvial deposition. See also Beardsley, 1947 (MS).

COMPARATIVE NOTES

We had expected to analyze the distribution of the distinctive traits of the Windmiller culture facies in an attempt to determine, if possible, cultural relationships outside the immediate lower Sacramento Valley region. This has not proved worth while because a large number of material forms are unique, and others are so generally distributed in time and space, both locally and outside our immediate area, that distributions soon become meaningless element lists.

The few culture traits selected for comparative distributional analysis do, however, offer some indications of relationship. The container made of a human cranium (C.107) is an outstanding example. The only similar piece from western North America appears to be that from southern Oregon described by Cressman[86] as a "skull-cap which had been cut off and drilled with three holes, seemingly for the insertion of a suspending cord." A number of long bone "foreshafts," sharp at one end and beveled at the other, from the same locality in southern Oregon (Lower Klamath Lake) are similar in most details to our bone implements from C.142. This type is also interesting, since it occurred at Clovis, New Mexico, in association with Folsom points,[87] and is apparently old in Florida.[88] The period of the Oregon finds is not definitely known, but it has been estimated as the beginning of the Early Postpluvial (8000-5500 B.C.).

The use of human bones for artifacts (fibula dagger, C.56; whistle of radius, C.142; skull cup, C.107) is also noted for the Lower Klamath Lake area,[89] from Level 3 in Deadman Cave, Utah (period estimated as 1500 to 3000 years ago),[90] sporadically in the Southwest,[91] and from Mexico.[92] Specific types do not carry through from one area to another, and it does not seem likely that such a general practice indicates connection between Central California and the regions far removed to the south and north.

The flat rectangular sandstone "palette" with a rectangular depression in one surface is unique for our area. There are no comparable pieces on record from Oregon or Nevada and, although the Santa Barbara Channel region produces slab implements with squared corners, none of these are specifically like the C.107 piece. From Pecos [93] and Snaketown[94] come palettes which do resemble our specimen, but the geographical gap between the Californian and Southwestern occurrences is so great that direct connection is difficult to conceive.

If the atlatl was used by the Early Sacramento people, this would indicate the presence in the Central California area of a widespread western North American weapon attested in the Basketmaker horizon, west central Nevada (Lovelock Cave), and southern Oregon.[95] This distribution includes the Central California area, and in itself offers reasonable grounds for the inference that the atlatl was known here at an earlier time.[96]

Charmstones are apparently a Californian phenomenon, at least in a western North American perspective. There remains the possibility, pointed out by several authors in the last century, that the similar plummets of the eastern United States are historically connected with those in the Californian areas.

In more restricted perspective, the Early Sacramento culture has what must be considered a close relative in the Oak Grove culture discovered in the Santa Barbara mainland region by D. B. Rogers.[97] The Oak Grove culture exhibits the unusual supine and prone burial positions, but burial accompaniments are rare and of crude form (leaf-shaped heavy points, flake scrapers, bone bodkins, metate, and mano) and are not specifically like any of the Early Sacramento culture forms. Oak Grove sites, like those of the Early Sacramento culture, lie in locations which at the present time are unfavorable for habitation; they contain calcareous hardpan levels, are extremely indurated, and yield heavily mineralized bones.

The Oak Grove culture has not yet been identified south of Santa Barbara, but there are suggestions of its presence to the north of this region. At a Point Sal coastal midden, George F. Carter adduces its presence in the lower levels,[98] and there is a possibility that it may be identified in the deepest strata of the Buena Vista Lake region sites in the southern San Joaquin Valley.[99] If these identifications hold, one might infer a distribution of the Early Central California culture type extending from the Mokelumne River region as far south as the Tehachapi and present along the coastal strip between Santa Barbara and Point Sal. This distribution would imply presence of the culture on the Central coast between San Luis Obispo and San Francisco bays, but of this there is so far not the slightest evidence.

There is no evidence in the Central California interior or Central coast of the interior desert and littoral cultures of Southern California which have become known through the work of the Southwest Museum group and Malcolm J. Rogers of the San Diego Museum. On the basis of the northernmost manifestation of this culture

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[86]Cressman, 1942, p. 101.

[87]Cotter, 1937, p. 14, pl. 2. E. B. Howard, who inspected the specimens at Berkeley, thought they were very similar to the Clovis pieces.

[88]Jenks, 1941, pl. 24.

[89]Cressman, 1942, p. 101.

[90]Smith, 1941, pp. 41, 42.

[91]Kluckhohn and Reiter, 1939, p. 138.

[92]Vaillant, 1935, p. 246.

[93]Kidder, 1932, figs. 48, 49.

[94]Gladwin et al., 1937, chap. 10.

[95]Cressman, 1942, pp. 69-70, 1944.

[96]Woodward, 1937, proposes its ancient presence in the Los Angeles region.

[97]D. B. Rogers, 1929, chap. 9. See also Heizer, 1939; 1941.

[98]Carter, 1941.

[99]Wedel, 1941, pp. 88, 145-147. The mooted Tranquillity site (Hewes, 1941, 1943, 1946) does not seem to fit into the known Central Valley culture sequence.

type (at Topanga Canyon, western Los Angeles County), Edwin Lemert and I have suggested[100] that a line just south of the Santa Barbara region may represent an ancient cultural or ethnic boundary between Southern and Central California which has persisted to the ethnographic period.[101] If there is some real basis for this theory or if it can be demonstrated by further archaeological investigation, it presents a major problem of the time relations between the sequential cultures of Southern and Central California. The very nature and simplicity of cultural forms in Central California make it difficult here, as elsewhere in the State, to trace clear correlations or to attribute dates.[102] Several approaches to this time problem are suggested. First, we need more archaeology and fuller publication of results. Stratified sites will almost certainly be discovered, and these will supply the most necessary key to basic time relations. Geologists, soil chemists, and geomorphologists working together may also produce answers regarding elapsed time. Until the present this group has not been interested in attacking the difficult problems of dating. A second approach is to determine sequences by working from the present back in time.[103] California natives had contacts with Caucasians in the sixteenth century, half a century after America was discovered, and these historic datum points may prove useful in determining historic culture levels. This has been possible in Central California where such a datum is presented by the ethnographic record of Francis Drake's sojourn among the Coast Miwok in 1579.[104] A third point of attack on the time problem might be a careful study of prehistoric trade relations and imported objects. Southern California archaeological sites yield material evidence of long continued economic exchange relations with the Hohokam and Anasazi culture provinces of the Southwest.[105] Perhaps the oldest evidence of this trade is to be seen in a Pacific Coast Olivella shell from Ventana Cave, southern Arizona. There is a probable range of several millennia during which trade was carried on, and it is possible to anticipate at least in the later Southwestern horizons, for which we have dendrochronologic dates, a direct cross-chronology between the Southwest and California in terms of actual year dates. Once all these approaches can be explored, some sort of dated sequence can surely be established. There will be inconsistencies, lacunae of data for critical areas or periods, and other difficulties, but the ultimate goal of a time scale more exact than the one with which we must now be satisfied is sufficient justification for increased effort toward this end.

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[100]Heizer and Lemert, 1947. This site has since been excavated (July, 1947) by a joint University of California expedition of the Berkeley and Los Angeles Departments of Anthropology. A report is being prepared by A. E. Treganza and C. G. Malamud.

[101]Kroeber, 1920, 1923, 1925.

[102]For the early Southern California cultures there are two opposed chronologies. The Southwest Museum group favors one which correlates cultures with pluvial periods, whereas Malcolm Rogers (1939, chart at end) places the whole archaeological picture in one quarter of the time (since 2000 B.C.). My impression is that the first chronology uses excessive dates and the second is too compressed.

[103]For a general statement see Kroeber, 1923, pp. 139-142.

[104]Heizer, 1941a, 1947. See especially the introductory remarks by Dr. A. L. Kroeber in the 1947 paper. A preliminary attempt to distinguish the historic and protohistoric Late Sacramento culture phases has been made (Heizer, 1941b). An application of the 1579 and 1595 Central Coast time datum points, which derive from the accounts of Sir Francis Drake and archaeological evidence of the wreck of Cermeño's ship, has been attempted by Richard K. Beardsley, 1947 (MS).

[105]See my brief account (Heizer, 1941c) which is further useful for its bibliographic citations. A much fuller report, but written from the viewpoint of the Southwest proper, has recently appeared (Tower, 1945). On the general subject of Southwest-California connections see Heizer, 1946; Gifford, 1947, pp. 61-62.

ANTIQUITY OF THE WINDMILLER FACIES CULTURE

The archaeologist is ever under pressure to make age estimates of his cultures. The same interest which leads the archaeologist to investigate prehistoric cultures also impels any person interested in archaeological remains to ask their age. This should be clearly understood. The archaeologist is notoriously reluctant to make age guesses, but he is at the same time more concerned than anyone else with this very problem, since one of his chief purposes is to establish a chronology. The exactness of this sequential scheme is as much a measure of the nature of the remains as of his ability.

It is well known that Californian archaeology consists of unspectacular remains without masonry ruins or pottery from which fine temporal-stylistic distinctions can be deduced, or timbers from which a tree-ring chronology can be derived. It was not until forty years after scientifically conducted archaeology was instituted in Central California by Nelson and Uhle that the sequence of cultures, of which the one under present discussion is the oldest yet known, was determined. Stratification is the basis of all earth sciences, and the investigation of this feature of Californian archaeological sites has produced notable results. Differences in cultural-stratification levels have been recognized and their temporal significance has been investigated in detail. Thus we may now point to a firmly established sequence of Early, Middle, and Late Central California culture horizons. The geographic limits of these are not yet fully defined, but they include the San Francisco Bay region of the Central coast, the Sacramento-San Joaquin delta region to the east of the Bay, and the Interior Valley floor for a distance of perhaps a hundred miles to the north (i.e., lower Sacramento Valley) and for some as yet undetermined distance south (lower San Joaquin Valley).

The oldest remains reported by Wedel from sites 1 and 2 in the Buena Vista Lake region of the Southern San Joaquin Valley[106] have been judged by him to be more ancient than the Early horizon remains treated in this paper.[107] Wedel's opinion is that "nothing revealed at our sites 1, 2, 3, 4, and 5 on Buena Vista Lake has an antiquity of much, if any, in excess of 1,200 - 1,500 years."[108] The significance of the deep level culture of Buena Vista sites 1 and 2 is that it produced ventrally and dorsally extended burials and metates, all of these being specific Windmiller facies traits. Some genetic connection, therefore, is to be suspected between these widely separated manifestations. According to the chronology proposed below for the Central California cultures of the Delta and lower Sacramento Valley region, Wedel's earliest date would fall within our Late horizon. Martin, Quimby, and Collier have also suggested a time-scale which is shorter than the one which I propose but somewhat longer than Wedel's. They place Early Sacramento (= Early Central California horizon) beginning at 1 A.D., Transitional Sacramento (= Middle Central California horizon) at 750 A.D. and Late Sacramento (Late horizon) at 1000 A.D.[109] My chronology is still nearly twice as extended as theirs, and this discrepancy is not subject to adjustment of a few centuries added or subtracted to harmonize them, but is of the order of magnitude which requires acceptance of one or the other.

The Oak Grove culture of Santa Barbara has not been subjected to anything more than its discoverer's intuitive "dating,"[110] and we are completely in the dark as to its actual antiquity. The Oak Grove culture is, nevertheless, the oldest horizon known from the Santa Barbara region, and it was succeeded by two cultures, the last of which represents the archaeological manifestations of the Chumash tribe.[111]

During the summer of 1947 A. E. Treganza and C. G. Malamud recovered 6 fully extended burials from the Tank Site in Topanga Canyon. One of these burials was ventral, 5 were dorsal. The material culture, however, is of the San Dieguito--Lake Mohave type which has been dated by long and short chronologies by the Campbells[112] and M. J. Rogers.[113] Whatever its actual dating, the Topanga culture is relatively old,[114] and the recurrence of the extended burial position is, I believe, the clearest evidence thus far produced of real antiquity, in California, for this mortuary trait. Thus the Topanga culture appears to me as offering potential support to what otherwise may seem the excessively long chronology which is proposed below.[115]

Just as this report is being put into final form there appears M. R. Harrington's monograph on the Borax Lake site in Lake County.[116] Harrington proposes a date of about 8000 B.C. for this site, the date being arrived at through the assumption that the flaked points which might be called "Borax Folsom" are contemporaneous with the true Folsom type points found elsewhere under conditions which permit their geological dating. The channel flaking of the surface of the Borax Lake points is cer-

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[106]Wedel, 1941, p. 88.

[107]Ibid., p. 147.

[108]Ibid., p. 145. Schenck and Dawson (1929, p. 320) suggest a minimum of 1500 years occupation to account for the number and size of sites in the Lodi region.

[109]Martin, Quimby, and Collier, 1947, Chart XV.

[110]D. B. Rogers, 1929, pp. 257-259, 353.

[111]Heizer, 1939, 1941.

[112]Campbell, et al., 1937, pp. 40-48.

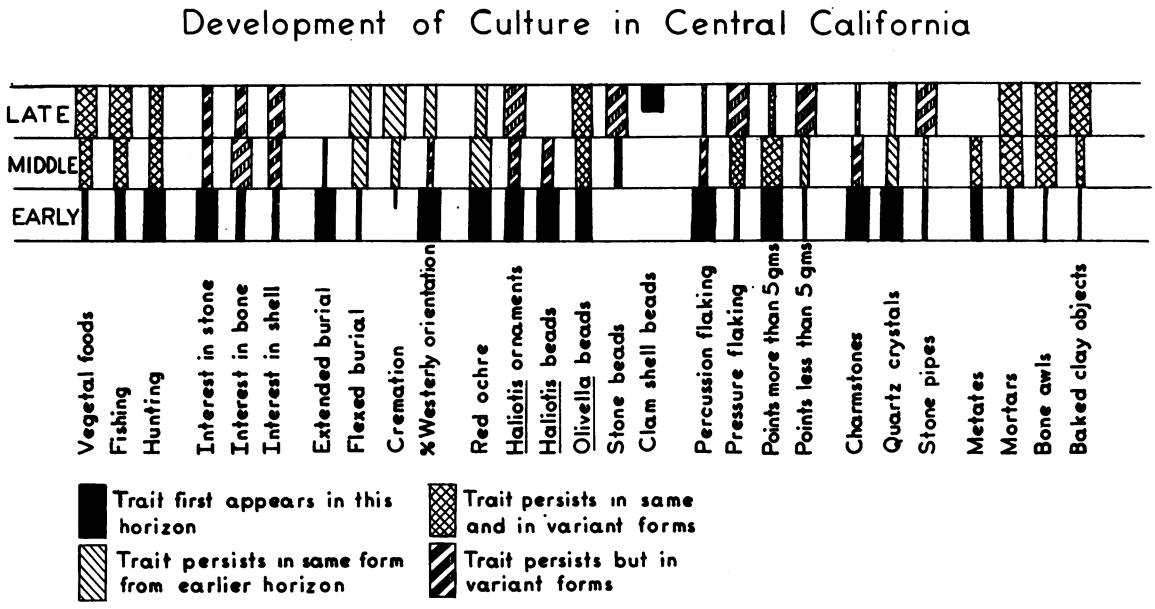
[113]M. J. Rogers, 1939, chart at end.

[114]Heizer and Lemert, 1947, pp. 251-252.

[115]Kroeber (1923, pp. 139-142) takes up the problem of chronology. His discussion is as pertinent today as it was 25 years ago, when written. Kroeber's "First Period," which begins 2000-1500 B.C., is of interest because it does not seem unreasonably old to the foremost student of Californian anthropology. This First Period date is based on the Nelson-Gifford computation of the shellmound accumulation rate.

[116]Harrington, 1948.

While this paper is in proof, I have a letter from E. Antevs (Jan.10, 1949) in which he states that he would now date the occupation of the Borax Lake site "from the Altithermal [period], about 7000-4500 B.P. [5000-2500 B.C.]." This dating seems much more reasonable in the light of what we know about Central California prehistory.



tainly reminiscent of the true Folsom technique, though so poorly executed than any flaker of the Folsom culture group would have been reluctant to admit having produced them. If the purely geological arguments advanced for the antiquity of the Borax Lake site could be interpreted as indicating the site as somewhat later in time, then there may be reasonable grounds for proposing the Borax Lake site as old, but not so ancient as 8000 B.C. I see no reason to believe that Harrington's evidence and deductions are so strong as to point inevitably to the single conclusion of late Great (Provo) Pluvial age. The attenuated Folsom flaking technique at Borax Lake may be evidence of the post-Pleistocene survival of the true Folsom flaking method. A. D. Krieger,[117] in discussing the Plainview, Texas, finds, has presented considerable evidence of the persistence in time of the Folsom technique, and it is possible that the Borax Lake Folsom points may fall in this category. If we examine the artifact assemblage from the Borax Lake site, it has an indubitable Central Californian "flavor." Charmstones, stone mortars, metates, and forms of projectile points are decidedly reminiscent of the Early and Middle Central California cultures. The residue of forms distinctive of Borax Lake and not present in the Early and Middle horizon sites of the Interior Valley includes gravers (?); snubnose, round, pointed, and keeled scrapers; crescents; and the channel-flaked projectile points. However, the Borax Lake site produced "Folsom-like" points[118] which can be almost exactly duplicated from our site C.68 (cf. fig. 11,v,w). Since the UCMA collections from the Napa-Sonoma-Lake Mendocino county region contain large numbers of gravers (rejects or incidental forms?) and scrapers (snubnose, round, pointed, and keeled forms), these may perhaps be eliminated from consideration as "diagnostic," in the sense Harrington employs the word, of the Borax Lake culture complex. I should hesitate to affirm that the Borax Lake site is either older or more recent than the four Early horizon sites discussed in this report. All look ancient because their present situations are explainable in terms of physiographic change since or during the time they were occupied, but none has yielded bones of extinct animals. Moreover, because the Borax Lake and Interior Valley sites, though rather similar, show, each one of them, distinctive traits, a final decision as to their relative ages does not seem at present possible. Some tertium quid in the form of an ancient site geographically intermediate between the two areas may settle this problem.

Another publication[119] contains what is still considered an adequate summary of the three Central California culture horizons, the details of which are presented in the accompanying chart. A few general observations are, however, necessary as an introduction to the problem of age of the Early culture horizon. Recorded sites of the Middle culture horizon number at least 20; of these 10 are pure-culture occupation sites and 8 are known to be stratified multi-settlement sites which were also occupied by peoples of the Late horizon culture group. Middle horizon settlements are known in the Interior Valley from Knights Landing in the north to Stockton in the south, and culture levels attributable to this complex are characteristic of certain San Francisco Bay and Marin County (Tomales-Drakes Bay) shellmound sites.[120] The recently discovered Monument site near Concord, where an occupation stratum (from which were recovered 9 flexed burials) was overlaid by four feet of stratified silt, appears attributable to the Middle culture horizon. The San Francisco Bay shellmounds and the buried Monument site habitation level

[117]Sellards et al., 1947, pp. 938-954.

[118]Harrington, 1948, fig. 26. These pieces, found at depths of 89.5 in. and 58 in., are not channel-flaked. Rather, they exhibit the characteristic base-thinning trait to which I called attention some years ago. See Heizer, 1938. Cf. Scoggin, 1940, pp. 294-296; Heizer, 1940; Fenenga, 1940.

[119]Lillard, Heizer, and Fenenga, 1939. See also Beardsley, 1947.

[120]This fitting of the San Francisco Bay sites into the Sacramento culture column was first suggested by Heizer and Fenenga (1939, p. 396) and has been recently demonstrated by R. K. Beardsley, 1947. See also Gifford, 1947, pp. 57-58.

and burials are of particular significance here because both have been subjected to special analysis directed toward estimating the age of the site deposits. Thus, N. C. Nelson,[121] E. W. Gifford,[122] and S. F. Cook[123] have calculated that the San Francisco Bay sites have a probable age of three to four thousand years. The one dissenting voice is that of W. E. Schenck,[124] whose objections would appear to derive from a negativistic attitude rather than from a desire to offer corrective estimates or revised calculation techniques. Cook's analysis appears to meet, at least in part, some of the variables with which Schenck was concerned. Dr. Earl Storie and Dr. Frank Harradine of the Division of Soils, College of Agriculture, investigated the Monument site soil profile and have written a pedologic report which will be published with the archaeological report now in preparation. They conclude that the habitation level and burials have a probable minimum age of four thousand, and a probable maximum of eight thousand, years. The minimum estimate agrees fairly closely with the calculations of the Bay shellmounds made by Nelson, Gifford, and Cook. The two sets of figures are directly comparable, since the Monument site culture is so similar to that disclosed in the lower (not upper) levels of Bay sites that the two cultures must be looked at as components of a single culture facies. This culture is to be equated on a purely typological basis with the Central California Middle horizon, and the reasonable assumption is made here that such equation implies contemporaneity. This all remains to be proved conclusively by further excavation, but enough is now known of Bay, Delta, and Valley sites to make the broad developmental outlines clear. Mr. Fenenga's analysis of the Middle culture horizon settlements, of which ten have been excavated, should produce evidence for the statements given above.

We have, therefore, several bits of evidence which would suggest that the Ellis Landing facies (Coastal province of the Central California Middle horizon) was in operation by 1000 to 2000 B.C. on the shores of San Francisco Bay. There is some evidence to show that the Bay constituted a local marginal and culturally backward area into which outside influences either failed to spread or spread slowly or half-heartedly.[125] The Bay region shellmounds may, therefore, have been occupied by interior peoples and not vice versa.[126] On this assumption the Interior Valley may have been occupied at a somewhat earlier date than the Bay and the beginnings of the Middle culture horizon may have to be pushed back to 1500 B.C.

Although the Middle horizon culture is in some respects a true transition, since it carries over certain

Time Chart of Central California Culture Horizons

1800 A.D.	Late Horizon, Phase III (Historic)
1700 A.D.	Late Horizon, Phase II
500 A.D.	Late Horizon, Phase I
1500 B.C.	Middle Horizon
2500 B.C.	Early Horizon (Windmiller facies)

Early culture forms, there is also some evidence of an appreciable time hiatus between Early and Middle period occupancy of the lower Sacramento Valley. There are hints of a floristic alteration and an increased tempo of alluviation between the two periods. These, plus the differences in site locations and the degree of mineralization of bones, furnish support to the idea of a stratigraphic nonconformity. It is even possible that the Interior Valley floor was abandoned by man during this interim and that on the valley edges the Early and Middle culture groups met, with a cultural blending which resulted in the absorption of the Early group into the more numerous Middle horizon population. This theory is not inconsistent with what little we know of skeletal types.[127] In any event, Early and Middle cultures are distinctive enough so that there is probably a time lacuna between the two. On this assumption it is not unreasonable to propose that the four sites herein discussed may have been occupied a millennium before the Middle horizon cultures blossomed, and a "date" of 2500 B.C. is tentatively advanced for the Early horizon.

An alternative suggestion to a time gap is that the temporally intermediate components have not been discovered. If there was no time gap, the absence of such components may be accounted for by alluvial deposition which has covered living or burial spots. Subsurface finds which suggest that many remains lie deeply buried include: an Early horizon type charmstone, found about 1873 at a depth of 30 feet while a well was being dug near Woodbridge, San Joaquin County, about 11 miles from Stockton;[128] the Strawberry occupational-burial level covered by 18 feet of alluvium just south of the city of Sacramento;[129] a stratum of charcoal and animal bone encountered by a well-drilling crew in 1946 about 400 yards northwest of C.56 at a depth of 30 feet;[130] and a curious drilled object of granite, illustrated first by Schenck and Dawson and again in this account (fig. 9,f), said to have been found near Thornton at a depth of 8 or 10 feet in the course of well-digging operations.[131]

Dr. S. F. Cook and Dr. Hans Jenny, of the University of California, are at present engaged in an intensive

[121]Nelson, 1910.

[122]Gifford, 1916.

[123]Cook, 1946.

[124]Schenck, 1926, pp. 205 ff.

[125]Kroeber, 1936, p. 112.

[126]No Bay site has produced evidence of occupation by the distinctive Early culture horizon group. A few of the specific Early culture elements occur, but not as a well-knit complex.

[127]Lillard, Heizer, and Fenenga, 1939, p. 73. An extensive treatment of Early, Middle, and Late skeletal material by R. W. Newman is now partly completed.

[128]Anonymous, 1873.

[129]Referred to supra, p. 2. A report on the findings has been made by F. and H. Riddell, MS on file in UCMA.

[130]Samples collected by A. E. Treganza and deposited in UCMA.

[131]Schenck and Dawson, 1929, pl. 98b, pp. 385-386.

analysis of earth samples of Central Californian refuse deposits of different time periods with the primary objective of showing quantitative and qualitative chemical differences between sites.[132] Their preliminary results indicate that such differences are present, and the full publication and interpretation of their findings are awaited with interest.[133]

Other approaches to the problem of dating are as yet untried. The most obvious approach is geological or geomorphological: it would take the form of an attempt to determine the time required for alluvial deposition and land subsidence in the Mokelumne bend region. Such a study might also result in some reconstruction of geological events which would provide an explanation for the position of Early culture horizon settlements. The striking degree of difference in mineralization of bone also offers a possible means of arriving at a rough time scale, provided the rate of mineralization can be determined through controlled experiments simulating natural conditions.[134] All these avenues will ultimately be explored if and when sufficient interest in Californian archaeology demands more information.

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[132]For discussion of the pedologic problems concerning occupation deposits see Krieger, 1940, and Roberts and Gardner, 1946.

[133]Cook and Treganza, 1947, have published the first of a series of papers dealing with "chemical archaeology." These contributions are primarily of cultural interest.

[134]Since this was written, a preliminary effort along these lines has been made. Cook and Heizer, 1947, and Heizer and Cook, in press.

APPENDIX I

TABLES

TABLE A

Percentage Occurrence of Main Culture Traits in Burials

(0 = nonoccurrence)

Traits	Site			
	C.68[a] (49)[b]	C.107[c] (54)	C.56 (47)	C.142 (45)
Position				
Extended ventrally	45.4	87.2	100.0	195.5
Extended dorsally	54.5	6.4	0	4.4
Flexed on side or back	0	6.4	0	0
Orientation				
West or westerly[d]	100.0	55.7	100.0	100.0
East	0	3.8	0	0
Southwest	?	38.8	0	0
Associated artifacts				
Olivella shell beads	47.0	31.5	23.4	31.1
Haliotis shell beads	23.5	64.8	30.0	42.2
Haliotis shell ornaments	27.4	31.5	40.4	22.2
Charmstones	11.8	35.1	19.1	4.4
Quartz crystals	23.5	20.4	31.9	30.0
Flaked stone implements	41.2	40.7	25.5	31.1
Objects of ground slate	5.9	14.8	2.1	0
Tubular stone "pipes"	0	0	0	4.4
Perforated biotite ornaments	5.9	3.7	0	0
Baked-clay objects	15.3	1.9	0	0
Bone and antler implements	15.3	29.6	8.5	6.6
Turtle-carapace ornaments	4.0	0	2.1	0
Canid teeth	15.3	3.7	2.1	0
Red ochre in burial pit	11.1	11.0	10.8	11.1

[a]C.68 percentages for position and orientation are on basis of 11 burials with artifacts excavated by the University of California in 1937. Dawson's burials D1-D40 lack information on these points.

[b]Figures in parentheses indicate number of burials.

[c]C.107 percentages for position are on basis of 47 burials. C.107 has 54 burials with artifacts associated, but of these 7 had no recorded or recordable position. See Table E. All C.107 orientation percentages are on basis of 52 burials.

[d]Dawson notes "westerly." Some may have been southwest or northwest.

TABLE B

Burial Associations at Site C.142
(45 burials)

Burial No.	Position			Associated artifacts								
	Extended ventrally	Extended dorsally	Orientation west	*Olivella* shell beads	*Haliotis* shell beads	*Haliotis* shell ornaments	Charmstones	Quartz crystals	Flaked stone implements	Tubular stone "pipes"	Bone implements	Red ochre
13	x		x		x				x			
25	x		x	x	x	x						
26	x		x									
15	x		x	x	x							x
27	x		x			x		x				
41	x		x									
3	x		x	x	x				x			
28	x		x			x			x			x
21	x		x		x							
19	x		x		x			x	x			
8	x		x									
6	x		x	x	x	x						
17	x		x					x				
4	x		x	x					x			
9	x		x	x					x			
7	x		x									
48	x		x		x	x						x
5	x		x	x	x							
20	x		x					x	x			
18	x		x		x				x			
23	x		x									
42	x		x	x	x	x			x			x
45	x		x		x			x				
14	x		x	x		x	x		x		x	
2	x		x									
37	x		x									
11	x		x						x			
38	x		x	x	x	x						
32	x		x		x							
44	x		x	x	x			x				
43	x		x		x			x	x			
1	x		x	x	x			x	x			
47	x		x					x				
46	x		x									
12	x		x	x				x				x
40	x		x									
22	x		x	x								
49	x		x		x			x				
39	x		x			x	x	x				x
36	x		x									
10	x		x			x						
16	x		x					x	x		x	x
50	x		x					x			x	
31		x	x							x		
35		x	x		x			x		x		
Totals												
Occurrence	43	2	45	14	19	10	2	15	14	2	3	5
Percentage occurrence	95.5	4.4	100	31.1	42.2	22.2	4.4	30	31.1	4.4	6.6	11.1

TABLE C

Burial Associations at Site C.56
(47 burials)

Burial No.	Position		Associated artifacts										
	Extended ventrally	Orientation west	*Olivella* shell beads	*Haliotis* shell beads	*Haliotis* shell ornaments	Charmstones	Quartz crystals	Flaked stone implements	Slate rods, perforated	Bone implements	Turtle-carapace pendants	Canid teeth, undrilled	Red ochre
7	x	x		x									
10	x	x	x					x					
18	x	x			x		x						
57	x	x											
2	x	x								x			
23	x	x						x					
40	x	x			x								
47	x	x			x								
19	x	x					x	x					
49	x	x	x										
26	x	x						x					
27	x	x					x						
62	x	x			x			x					
5	x	x											
6	x	x	x	x			x				x		
20	x	x	x	x				x					
48	x	x		x	x								
61	x	x		x			x						
1	x	x											
22	x	x					x						
51	x	x	x	x									
52	x	x											
31	x	x			x		x						
41	x	x	x	x	x								
54	x	x	x		x								
65	x	x						x					
21	x	x		x						x			
29	x	x			x		x						
44	x	x		x	x		x						x
14	x	x					x						
45	x	x								x			x
53	x	x		x	x	x	x						
12	x	x	x		x	x	x	x					
13	x	x	x	x	x	x		x					x
36	x	x			x							x	
58	x	x	x		x								
16	x	x			x			x		x			
46	x	x		x	x	x	x	x					
67	x	x			x	x							
15	x	x				x							x
9	x	x				x							
32	x	x				x	x			x			x
8	x	x		x			x	x					
66	x	x							x				
43	x	x				x							
25	x	x	x		x								
63	x	x		x									
Totals													
Occurrence	47	47	11	14	19	9	15	12	1	5	1	1	5
Percentage occurrence	100	100	23.4	30	40.4	19.1	31.9	25.5	2.1	10.8	2.1	2.1	10.8

TABLE D

Burial Associations at Site C.68
(51 burials)

(C = University of California excavations; D = E. J. Dawson excavations)

Burial No.	Position[a]			Associated artifacts													
	Extended ventrally	Extended dorsally	Orientation westerly	*Olivella* shell beads	*Haliotis* shell beads	*Haliotis* shell ornaments	Charmstones	Quartz crystals	Flaked stone implements	Slate "pencils," rods, pendants	Perforated biotite pendants	Small, grooved baked-clay balls	Bone implements	Turtle-carapace ornaments	Canid teeth, undrilled	Unworked colored stream pebbles	Red ochre
C11	x		x														
C5	x		x										x				
C10	x		x	x		x	x					x					
C8	x		x													x	
C9	x		x												x	x	
C6		x	x				x		x		x		x				
C14	x		x	x	x												x
C13		x	x														x
C12		x	x	x			x	x									
C16		x	x	x					x								x
C17	x		x	x					x								x
D1			x					x									
D2			x										x				
D3			x		x												
D4			x		x							x					
D5			x	x	x	x											
D6			x	x		x			x						x		
D7			x	x		x		x		x	x						
D8			x	x	x	x											
D9			x	x	x	x		x	x								x
D10			x	x													
D11			x		x	x									x		
D12			x						x	x				x			
D13			x						x			x					
D14			x	x		x			x			x	x		x		
D15			x	x			x		x			x					
D16			x				x		x			x					
D17			x						x				x		x		
D18			x		x				x				x	x			
D19			x					x									
D20			x												x		
D21			x	x		x											
D22			x	x				x									
D23			x	x	x	x		x				x					
D24			x	x		x		x									
D25			x						x		x	x					
D26			x						x								

[a]Percentage for position and orientation is based on 11 burials with artifacts excavated by the University of California in 1937.

TABLE D (Concluded)

Burial No.	Position			Associated artifacts														
	Extended ventrally	Extended dorsally	Orientation westerly	*Olivella* shell beads	*Haliotis* shell beads	*Haliotis* shell ornaments	Charmstones	Quartz crystals	Flaked stone implements	Slate "pencils," rods, pendants	Perforated biotite pendants	Small, grooved baked-clay balls	Bone implements	Turtle-carapace ornaments	Canid teeth, undrilled	Unworked colored stream pebbles	Red ochre
D27			x						x						x		
D28			x						x				x				
D29			x						x								
D30			x	x					x								
D31			x	x	x	x		x									
D32			x	x					x								
D33			x	x	x			x									x
D34			x				x	x		x							
D35			x						x								
D36			x						x								
D37			x	x		x											
D38			x	x	x	x											
D39			x										x				
D40			x	x				x							x		
Totals																	
Occurrence	7	4	51	24	12	14	6	12	21	3	3	8	8	2	8	2	6
Percentage occurrence	63.6	36.3	100	47.0	23.5	27.4	11.8	23.5	41.2	5.9	5.9	15.3	15.3	4.0	15.3	4.0	11.8

TABLE E

Burial Associations at Site C.107
(54 burials)

(C = University of California excavations; S = Sacramento Junior College excavations)

Burial No.	Position[a]						Associated artifacts											
	Extended ventrally	Extended dorsally	Flexed on side or back	Orientation west	Orientation east	Orientation southwest	*Olivella* shell beads	*Haliotis* shell beads	*Haliotis* shell ornaments	Charmstones	Quartz crystals	Flaked stone implements	Ground slate "pencils" and perforated pendants	Perforated biotite pendants	Small grooved baked-clay balls	Bone and antler implements	Canid teeth, drilled	Red ochre
S154			x		x			x				x				x		
C4	x			x				x										
S47	x			x						x		x						
S205	x					x										x		
C1	x			x				x	x				x			x		
C17		x				x	x	x	x	x						x		
C23	0[b]	0	0	x				x		x		x						
S46	0	0	0			x		x	x			x				x		
S44	x			x				x	x			x				x	x	
S50	x			x				x				x				x		
S171			x			x	x	x	x	x		x						
S58			x		x			x				x						
S164	x			x			x	x		x	x	x	x			x	x	x
S183	x			x						x		x						
S91	x					x						x						
C10	x					x	x	x			x							
C9	x			x			x	x		x								
C18	x			x			x	x	x		x	x						
C20		x		x			x	x	x	x			x			x		
S155	x			x				x		x				x		x		
S162	x			x				x			x		x					
S210	x			x						x								
S167	x					x	x	x										
S166	x					x	x	x			x	x				x		
S165	x					x		x										
S156	x			x				x		x	x					x		
S60	x			x						x								
S53	x					x				x								
S172	x					x		x										
S177		x				x										x		
S179	x					x	x											
S15	x					x	x	x		x		x						
S27	x			x								x						
S30	x					x		x	x	x	x	x						
S184A	0	0	0	0	0	0		x	x									x
S224	x					x		x	x							x		

[a]Position percentages are on basis of 47 burials; orientation percentages on basis of 52 burials. Discrepancies with Lillard, Heizer, and Fenenga, 1939, are due to re-sorting of data.

[b]0 = not recorded.

TABLE E (Concluded)

Burial No.	Position						Associated artifacts											
	Extended ventrally	Extended dorsally	Flexed on side or back	Orientation west	Orientation east	Orientation southwest	*Olivella* shell beads	*Haliotis* shell beads	*Haliotis* shell ornaments	Charmstones	Quartz crystals	Flaked stone implements	Ground slate "pencils" and perforated pendants	Perforated biotite pendants	Small grooved baked-clay balls	Bone and antler implements	Canid teeth, drilled	Red ochre
S208	x					x		x	x									
S216	0	0	0	x				x	x				x					
S20	x			x			x					x						
S199	x					x				x		x				x		
S181	x					x				x								
S180	x					x		x			x							x
S157	x			x				x						x				
S14	x			x								x						
S19	x			x			x		x		x	x	x					x
S22	0	0	0	x			x											
S48	0	0	0	x				x			x							
S33	x			x			x	x	x			x	x					
C21	x			x									x			x		x
C25	0	0	0	0	0	0	x	x	x									
C8	x			x			x	x	x	x	x	x			x			
S184	x					x		x	x									
S141	x			x														x
S83	x			x						x								
Totals																		
Occurrence	41	3	3	29	2	21	17	35	17	19	11	22	8	2	1	16	2	6
Percentage occurrence	51.2	6.4	6.4	55.7	3.8	38.8	31.5	[c]64.8	[c]31.5	35.1	20.4	40.7	14.8	3.7	1.9	29.6	3.7	11.0

[c]Count disagrees with that in Lillard, et al., 1939, because 2 types occasionally occur in 1 grave.

APPENDIX II

PRELIMINARY REPORT ON THE SKELETAL REMAINS

BY

RUSSELL W. NEWMAN

The following brief summary of selected anthropometric measurements and observations on the Early Sacramento Valley population is presented only as a preliminary report. A comparative study is in progress, utilizing material from the three known archaeological horizons of the area collected since the last general summary by Gifford in 1926.[1] Some of the crania reported upon here were included in measurements given by Fenenga in 1939.[2] Since detailed comparisons of selected series from the three cultural horizons will not be completed for some time, a short description here of the Early population may be of interest.

The series described below consists solely of adult males from four Early horizon sites. Although an effort was made to avoid weighting the series in favor of any site, the material available is unfortunately quite unequal. All available specimens of sufficient completeness to give a reasonable number of measurements and observations were utilized except for those from site C.68 from which has come the largest preserved series. The exclusion of female and poorly preserved or fragmentary material may have influenced the series somewhat towards a higher incidence of masculine traits than was actually present. Specimens, by sites, are as follows:

C.56	11
C.68	19
C.107	3
C.142	15
Total	48

Preservation within the total group varies by site, ranging from good (C.68) to poor (C.142).

A small but conspicuous proportion of the crania shows a degree of size and ruggedness that approaches macrocephaly. Such individual specimens are not uncommon among Western North American cranial series but they are apt to leave an impression of a very large and robust population which may never have existed as an unmixed physical group. Further segregation into morphological groups may isolate the macrocephals as an important minority in the area, but other and less rugged strains were obviously also present during the Early period. The crania suggest a heterogeneous population, the significance of which cannot be ascertained at present.

Poor preservation of the postcranial skeletal material makes it difficult to assess the relative robustness of body type. In general terms the series show only a moderate degree of postcranial ruggedness, somewhat less than would seem appropriate to the often large and prominent cranial remains. Although extremes of gracility and masculinity occur, the bulk of the series is of medium height, with a lateral, but not especially rugged, physique.

A cursory examination shows fewer gross pathological features than appear in later horizons. However, poor postcranial preservation may have somewhat distorted this picture. Medium-to-large ear exostoses are not infrequent with 11 per cent occurrence in C.68, 18 per cent in C.56, and 27 per cent in C.142. Vertebral lipping, moderate to pronounced in degree, is observable only in C.68, where a high proportion of 37 per cent is reached. No evidence of periosteal lesions of the long bones, reported by Stewart[3] from Buena Vista and not uncommon in later horizons from Central California, has been found in any Early horizon material. Dental caries are rare, although this condition may be obscured by the marked dental attrition characteristic of all adults. Alveolar abscesses and the associated loss of teeth are very common.

Consensus of Selected Cranial Morphological Observations

Age: largely "middle-aged adults," very few "old adults"; based on ectocranial suture closure
Cranial muscularity: medium to large
Deformation: none
Skull form: sphenoid or ovoid
Browbridge size: medium to large
"Inca" and "Wormian Bones": very rare
Orbital shape: square or rhomboid
Malars: large and prominent
Nasal root: generally low and narrow
Nasal profile: generally concave
Palate: high but with little torus
Tooth wear: usually pronounced

[1]Gifford, 1926.

[2]Lillard, Heizer, Fenenga, 1939, p. 73.

[3]Stewart, 1941, p. 186.

TABLE A

Selected Measurements (mm.) and Indices

	No.	Range	Mean	S.E.	S.D.	S.E.	V.	S.E.
Glab.-occipital length . .	43	174-203	190.45	0.98	6.38	0.70	3.35	0.36
Max. breadth	43	134-154	144.08	0.81	5.23	0.57	3.63	0.39
Basion-Bregma height . .	30	135-156	145.90	1.01	5.44	0.71	3.73	0.48
Auricular height	31	115-133	124.05	0.83	4.57	0.59	3.68	0.47
Min. frontal diam.	41	88-105	96.99	0.64	4.02	0.45	4.15	0,46
Max. bizygomatic diam.	20	134-153	143.40	1.33	5.78	0.94	4.03	0.64
Gnathion-nasion height[a]	22	109-140	126.04	1.60	7.33	1.13	5.82	0.88
Prosthion-nasion height	26	62-85	76.35	1.06	5.31	0.75	6.96	0.97
Nasal height	31	48-63	53.03	0.56	3.09	0.40	5.82	0.74
Nasal breadth	30	21-29	26.47	0.32	1.71	0.22	6.45	0.83
Bigonial breadth	36	96-124	110.56	1.06	6.26	0.75	5.66	0.67
Nasion-prosthion angle .	28	83-93	88.11	0.48	2.46	0.34	2.79	0.37
Cranial index	41	66.5-85.6	75.78	0.55	3.48	0.39	4.59	0.51
Height-length index . . .	30	71.4-83.9	76.83	0.53	2.88	0.38	3.75	0.48
Height-breadth index . .	30	95.4-108.1	101.20	0.59	3.19	0.42	3.15	0.41
Facial index	14	81.9-98.5	88.64	1.12	4.05	0.79	4.57	0.86
Gnathic index	24	87.4-103.8	97.12	0.70	3.34	0.49	3.44	0.50
Nasal index	29	39.6-56.9	50.05	0.74	3.90	0.52	7.69	1.01
Left orbital index	28	82.0-100.0	89.86	0.93	4.82	0.66	5.36	0.72
Mandibular index	27	69.9-95.2	86.26	1.17	5.96	0.83	6.91	0.94
Cranial module	30	149.3-166.6	160.23	0.77	4.16	0.55	2.59	0.33
Cranial capacity (cc.)[b] . .	34	1374-1793	1588.47	17.90	102.90	12.66	6.48	0.78
Stature (cm.)[c]	43	162.0-175.1	169.01	0.57	3.69	0.40	2.18	0.22

[a]No allowance for tooth wear included.

[b]Calculated by Pearson interracial formulae.

[c]Calculated by Lee-Pearson formulae, utilizing all relevant long bones.

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ABBREVIATIONS

AA	American Anthropologist
A Ant	American Antiquity
AJPA	American Journal of Physical Anthropology
AMNH-AP	American Museum of Natural History, Anthropological Papers
BAE-B	Bureau of American Ethnology, Bulletin
BAE-R	Bureau of American Ethnology, Annual Reports
PM-P	Peabody Museum, Papers
SI-AR	Smithsonian Institution, Contributions to Knowledge
SI-CK	Smithsonian Institution, Annual Reports
SM-M	Southwest Museum, Masterkey
SM-P	Southwest Museum, Papers
UC-PAAE	University of California Publications in American Archaeology and Ethnology
UC-AR	University of California Publications: Anthropological Records

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EXPLANATION OF ARCHAEOLOGICAL SPECIMENS

Figures 5-19

Fig. 5. a. Typology of shell beads of Olivella and Haliotis (a′, Olivella type 1a; b′, Olivella 1b; c′, Olivella type 1c; d′, Olivella type 2b; e′, Olivella type 3b; f′, g′, Haliotis type 1a; h′-j′, Haliotis type 2; k′, Haliotis type 3). b. Turtle-carapace pendant with type 1a Haliotis beads, site C.56, L-19206. c. Turtle-carapace pendant with type 2b Olivella beads affixed with asphaltum, site C.56, L-19206. d. Turtle-carapace pendant, site C.68, 1-55173. e. Turtle-carapace ornament, site C.68, 1-55170. f. Baked-clay object with twined basketry impression, site C.68, 1-62455. All nat. size.

Fig. 6. a. Typology of Early horizon Haliotis shell ornaments. b. Type C.(2).1 ornament, site C.56, L-19078. c. Type H.2.a ornament, site C.56, L-19068. d. Type C.(2) ornament, site C.56, L-19288. e. Type A.1 ornament, site C.56, L-19073. f. Type A.1 ornament, site C.56, L-19063. g. Type C.(3) ornament, site C.56, L-19221. All nat. size.

Key to full typology in Lillard, Heizer, and Fenenga, 1939, pp. 14-17. Capital letters refer to shape (A, claw shape made of shell rim; B, rectangular; C, circular; H, rectangular with concave edges); numbers refer to number of perforations (plain numbers indicate edge holes and parenthetical numbers indicate central perforations); lower case letters show presence and style of ornamentation (a, surface incising at edge, not milled edges).

Fig. 7. a. Typology of Early horizon charmstones. b. Type A.1 charmstone of amphibolite schist, site C.107, L-12450A. c. Type A.2 charmstone of amphibolite schist, broken at burial into 3 pieces, with shell beads of Olivella 2b and Haliotis 1a attached with asphaltum, site C.107, L-16949. d. Type A.2 charmstone of amphibolite schist, site C.107, L-12465. e. Type A.3 charmstone of amphibolite schist, site C.107, L-12526. f. Type B.1 charmstone of diorite, site C.68, 1-55326. g. Type B.1 charmstone of mottled granite, site C.107, L-12535A. All ⅔ nat. size.

Fig. 8. a. Type B.1.a charmstone of translucent alabaster, site C.56, L-19161. b. Charmstone of alabaster, like a, site C.56, L-19274. c. Charmstone of alabaster, like a, site C.56, L-19269. d. Type B.1.b charmstone of green andesite, site C.107, L-16656. e. Type B.2 charmstone of blue amphibolite schist with type 1a Olivella beads attached with asphaltum, site C.107, 1-46535. f. Imperforate type B.3 charmstone, site C.107, L-16280. g. Type B.3 charmstone of serpentine, site C.68, 1-55324. h. Type B.4 charmstone of translucent alabaster or travertine, site C.68, 1-49063. i. Type C.2 charmstone of translucent alabaster, site C.68, 1-46462. j. Type C.4 charmstone of granite, site C.107, L-16128. k. Small type B.4 charmstone of translucent alabaster, site C.56, L-19169. All ⅔ nat. size.

Fig. 9. a. Type C.1 charmstone of translucent alabaster, site C.107, 1-46223. b. Type C.3 charmstone of translucent alabaster, site C.142, 1-45281. c. Type C.4 charmstone of granite, site C.107, L-12550. d. Type D.3 charmstone of blue amphibolite schist, site C.107, L-16303. e. Type F.2 charmstone of translucent alabaster, site C.56, L-19168. f. Charmstone (?) of dark granite found near Woodbridge, 1-56150. g. Type F.1 charmstone of steatite, site C.56, L-19228. h. Unfinished charmstone (?) of white quartzite, site C.68, 1-55341. i. Type B.1 charmstone of limestone, site C.107, L-12534A. j. Type B.1 charmstone of andesite, site C.68, 1-49089. k. Type A.1 charmstone of blue amphibolite schist, site C.107, L-12551A. l. Miniature type B.1 charmstone of mottled steatite, site C.56, L-19254. All ⅔ nat. size.

Fig. 10. a. Charmstone, type E.2, of amphibolite schist, site C.107, L-16302. b. Charmstone, type E.1, of rhyolite tuff, site C.107, 1-46529. c. Charmstone, type E.2, of amphibolite schist, from "near Rio Vista," specimen on exhibit in State Indian Museum, Sacramento. d. Charmstone fragment, type E.1, of amphibolite schist, site C.107, 1-46489 (an identical fragment, not shown, is from site C.142, 1-48808). e. Charmstone, type E.3, of translucent alabaster, site C.56, L-19226. f. Charmstone, type E.2, of amphibolite schist, site C.107 (from same burial as a), L-11734. All nat. size.

Fig. 11. a. Typology of flaked stone implements. b-l. Type NAa. m-o. Type NAb1. p-u. Type NAb2. v-w. Type NAb3. All ⅔ nat. size.

Fig. 12. a-z, a′, b′. Flaked stone implements, type SAa. All ⅔ nat. size.

Fig. 13. Flaked stone implements. a-e. Type SAa. f. Type SAa2. g. Type SAc. h-y, a′-c′. Type SBa. z. Type SBc. All ⅔ nat. size.

Fig. 14. Flaked stone implements. a-e. Type SCa1. f-m. Type SCa2. n. Type SCa3. o. Type SCa4. p. Type SCa6. q, r, Type SCb2. s. Type SCb3. t. Small obsidian bangle, site C.56, L-19281. u, v. Large obsidian bangles, site C.107, L-16643, L-16643a. w. Large obsidian blade, site C.107, L-16992. All ⅔ nat. size.

Fig. 15. a-k. Ground-slate objects. a. Site C.107, L-16655. b. Site C.68, 1-55342. c. Site C.56, L-19047. d. Site C.68, 1-55334. e. Site C.68, 1-55303. f. Site C.68, 1-55305. g. Site C.107, L-16352. h. Site C.68, 1-55301. i. Site C.68, 1-55310. j. Site C.107, L-16226. k. Site C.56, L-19048. l-n. Quartz crystals. l. Site C.107, 1-46326. m. Site C.142, 1-49022. n. Site C.68, 1-55465. All nat. size.

Fig. 16. a. Flat, side-notched slate piece with scratched grooves, site C.107, L-16330. b. Biotite mica pendant, site C.107, L-16658. c. Rhyolite tuff "pipe," site C.142, 1-49007. d. Pebble with shallow, wide, pecked groove, site C.56, L-19043. e. Pipe, like c, of steatite, site C.142, 1-49001. f. Steatite bead, site C.107, L-16660. g. Pecan-shaped, grooved, baked-clay object, site C.68, 1-49062. h. Grooved baked-clay object, like g, site C.68, 1-49062a. i. Biconical, simple, baked-clay object, site C.107, L-16017. j. Hammerstone, site C.144, 1-49000a. All nat. size.

Fig. 17. a-d. Objects of animal bone. a. Site C.142, 1-48791. b. Site C.142, 1-48789. c. Site C.142, 1-48793. d. Site C.107, L-16300. e, f. Antler objects. e. Site C.56, L-19272. f. Site C.107, L-16300a. g. Dagger of human bone, site C.56, L-19273. All ⅔ nat. size.

Fig. 18. a. Antler wedge, site C.68, 1-55161. b-m. Objects of animal bone. b. Site C.56, L-19218. c. Site C.68, 1-49088. d. Site C.68, 1-49087. e. Site C.56, 1-19224. f. Site C.68, 1-49056. g. Site C.107, L-16652. h. Site C.68, 1-49043. i. Site C.68, 1-55209. j. Site C.56, L-19238. k. Site C.68, 1-55163. l. Site C.68, 1-55222. m. Site C.68, 1-55221. All nat. size.

Fig. 19. Objects of animal bone. a. Site C.107, L-16301. b. Site C.56, L-19219. c. Site C.107, L-16389. d. Site C.56, L-19290. e. Site C.56, L-19227. f. Site C.142, 1-48794. g. Site C.107, L-16388. h. Site C.56, L-19291. All nat. size.

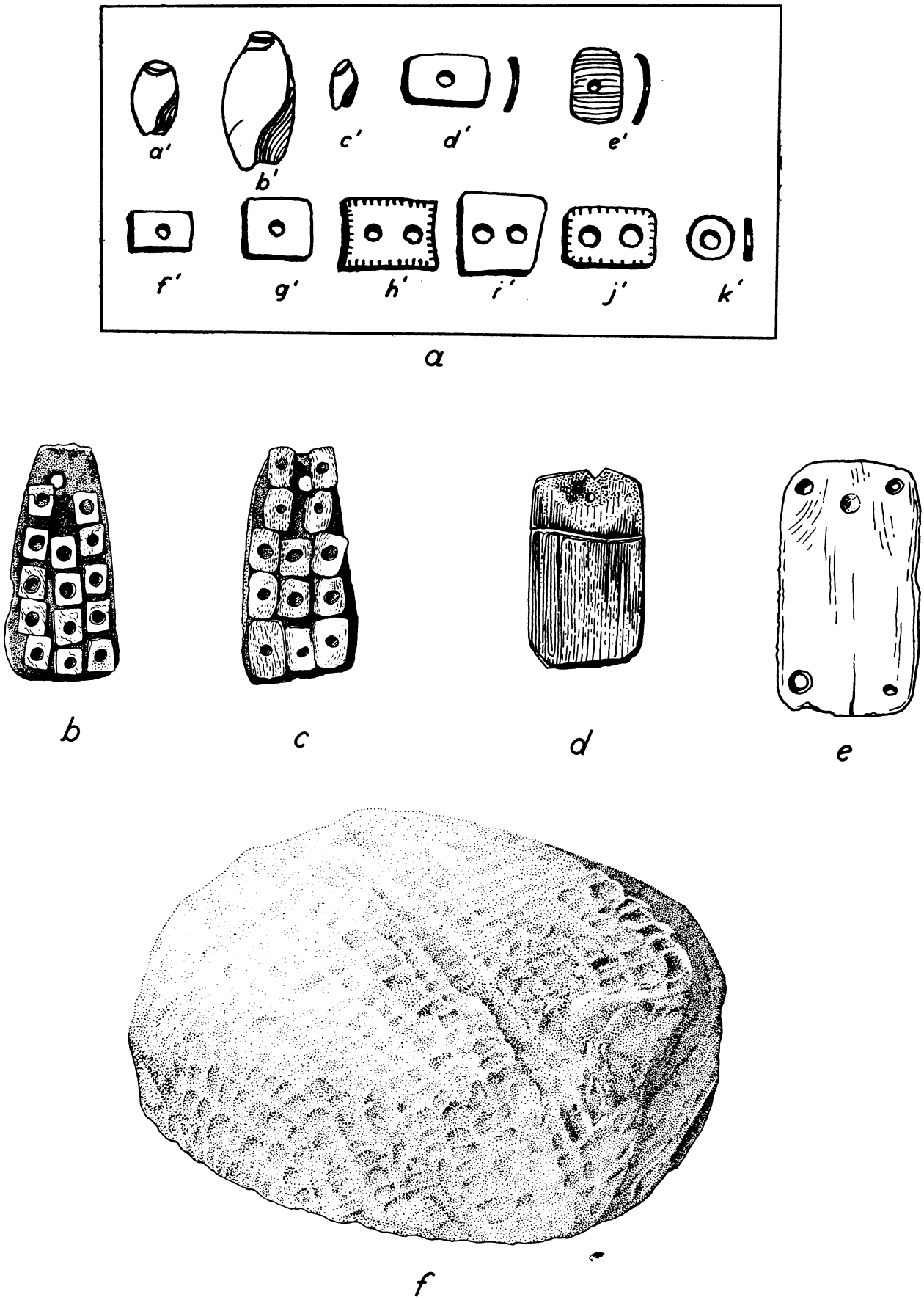


Fig. 5. Shell bead typology; turtle-carapace ornaments; and baked-clay object

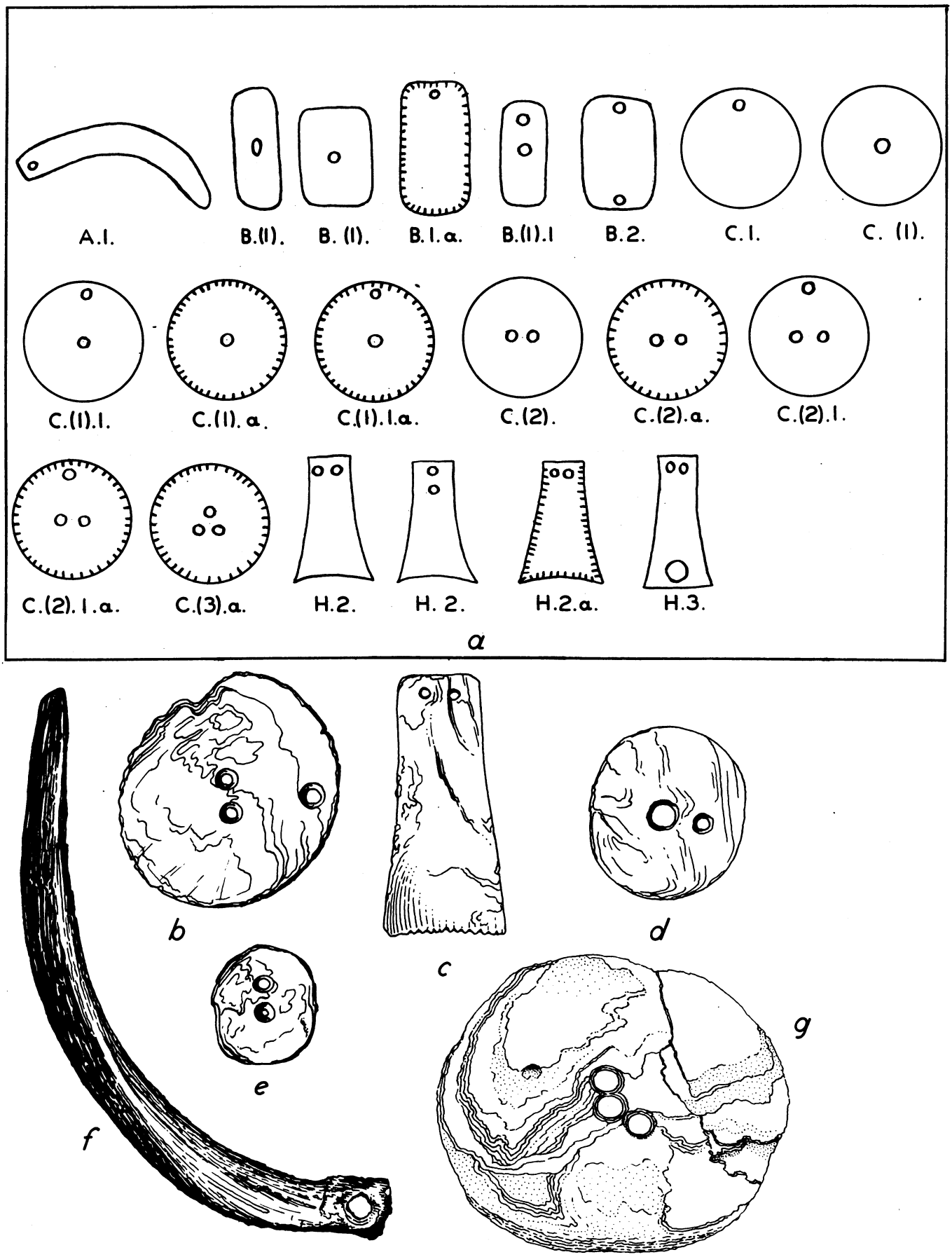


Fig. 6. Haliotis ornaments, typology and specimens

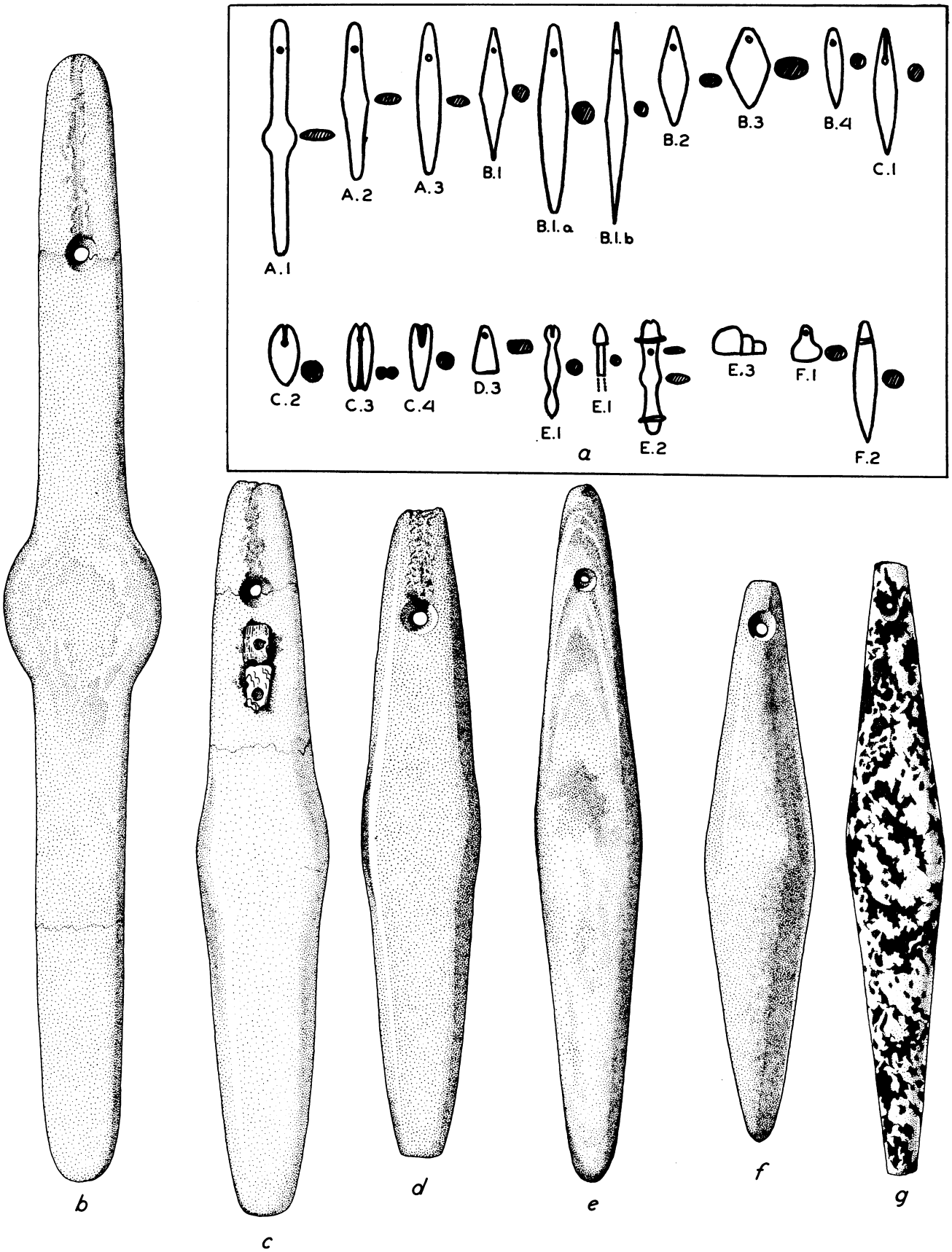


Fig. 7. Early horizon charmstones, typology and specimens

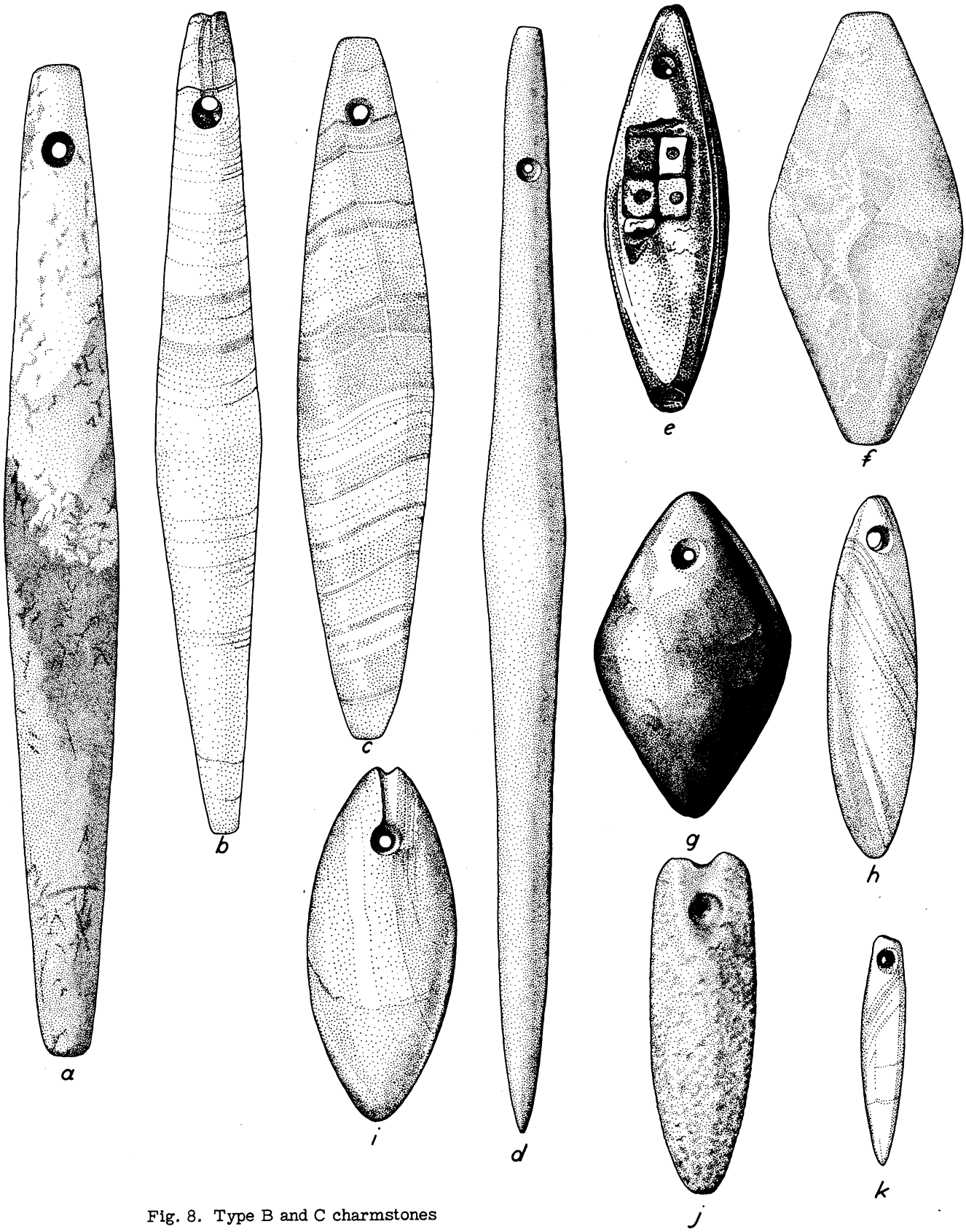


Fig. 8. Type B and C charmstones

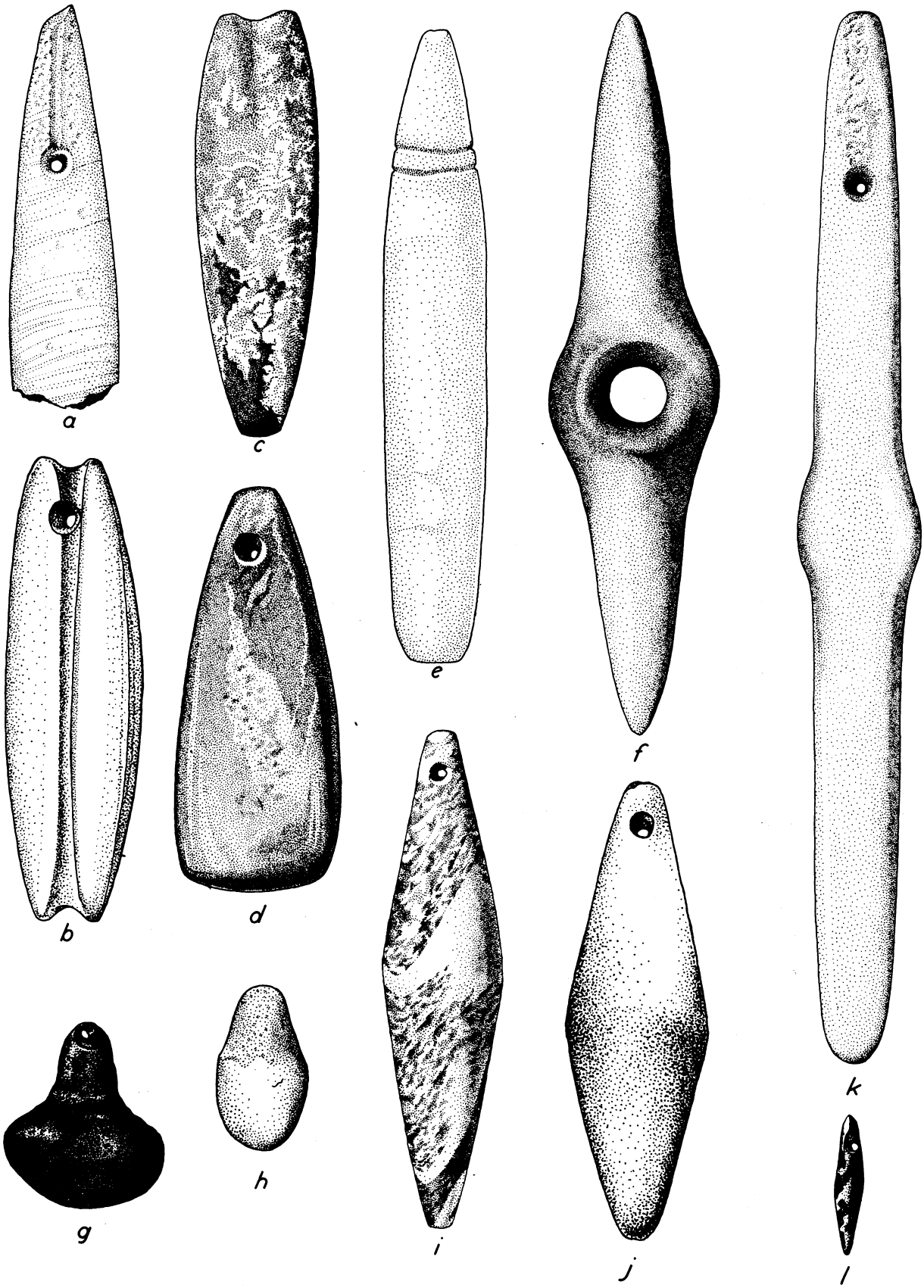


Fig. 9. Charmstones of various types

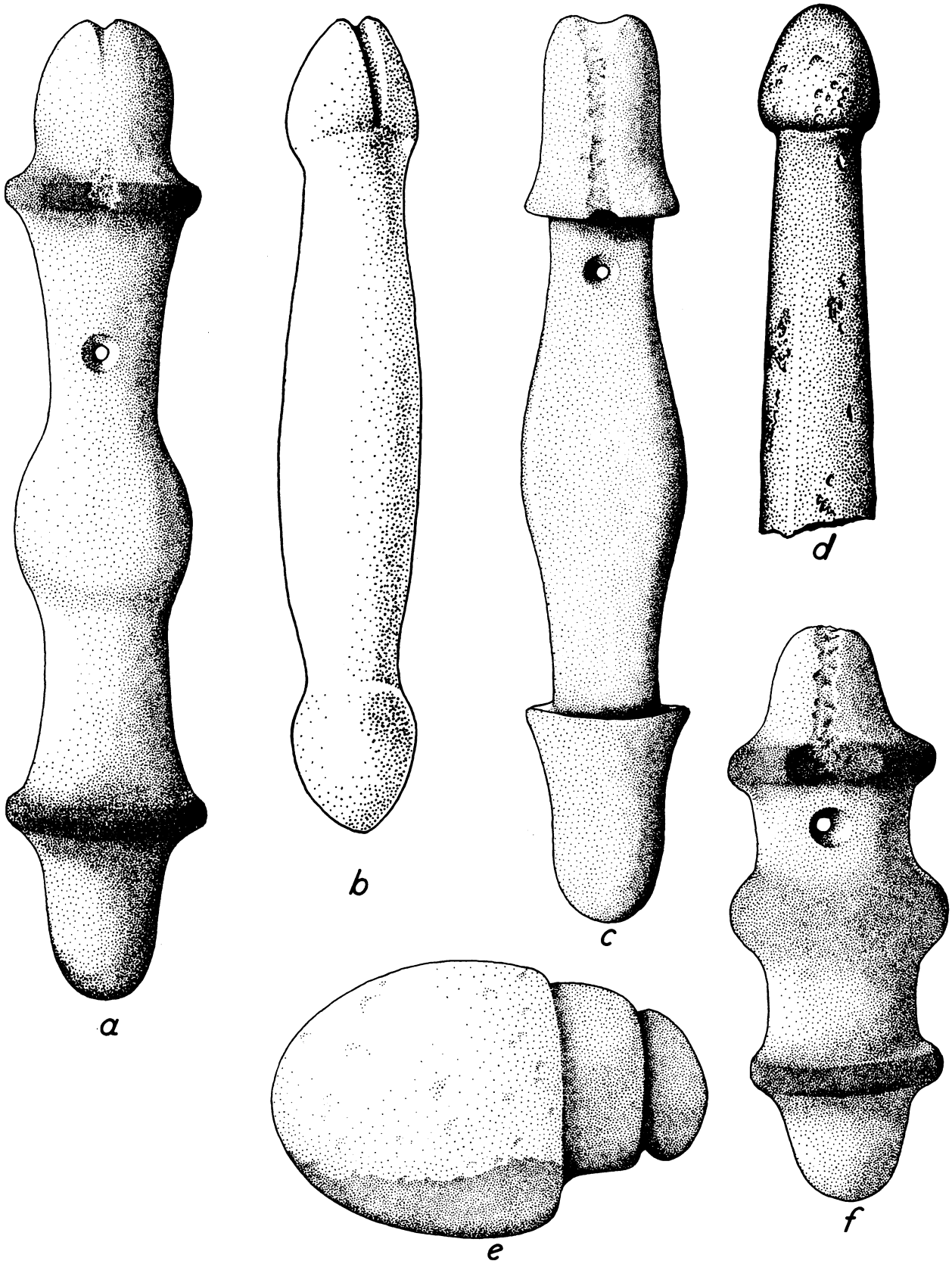


Fig. 10. Charmstones of phallic form

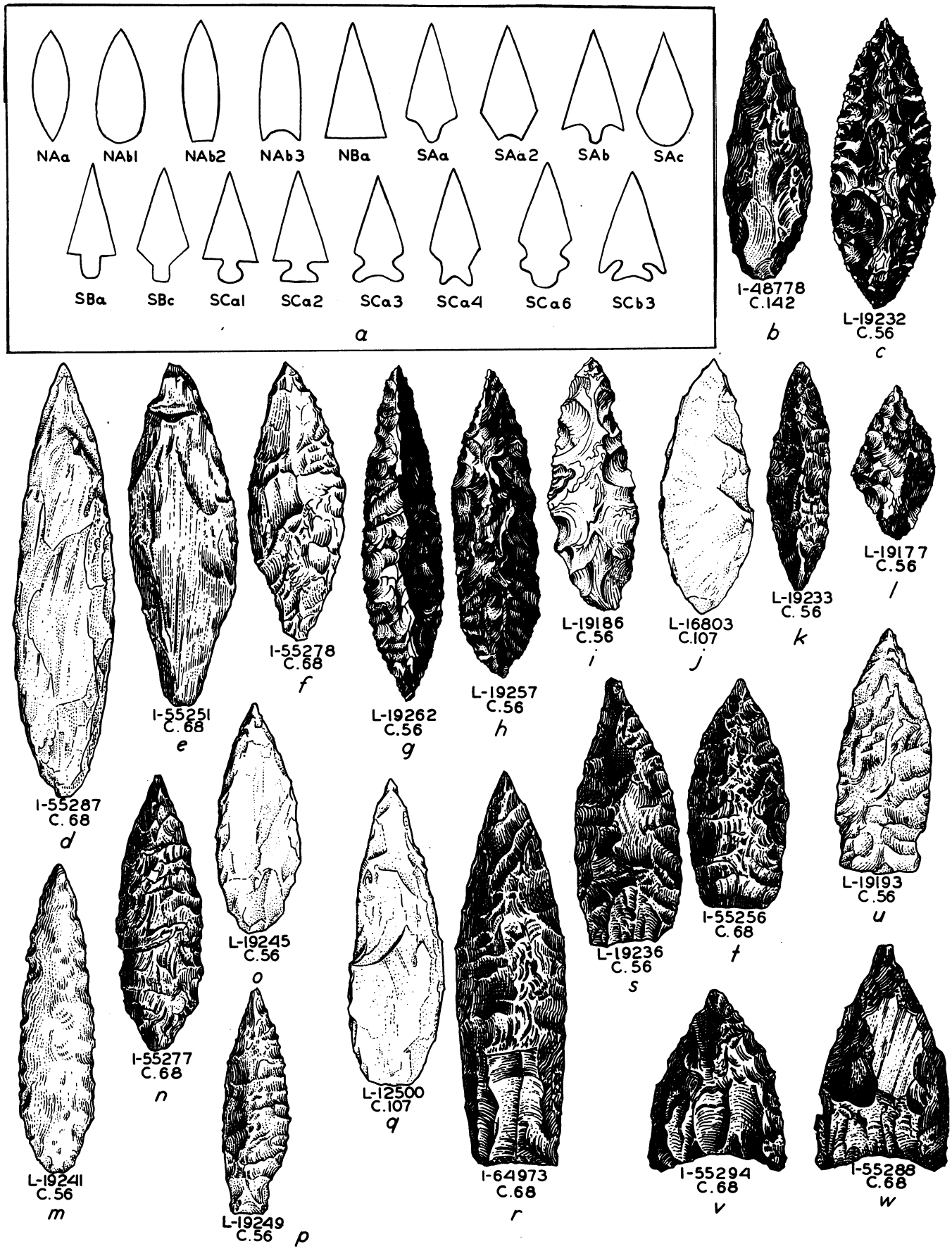


Fig. 11. Flaked stone implements, typology and specimens

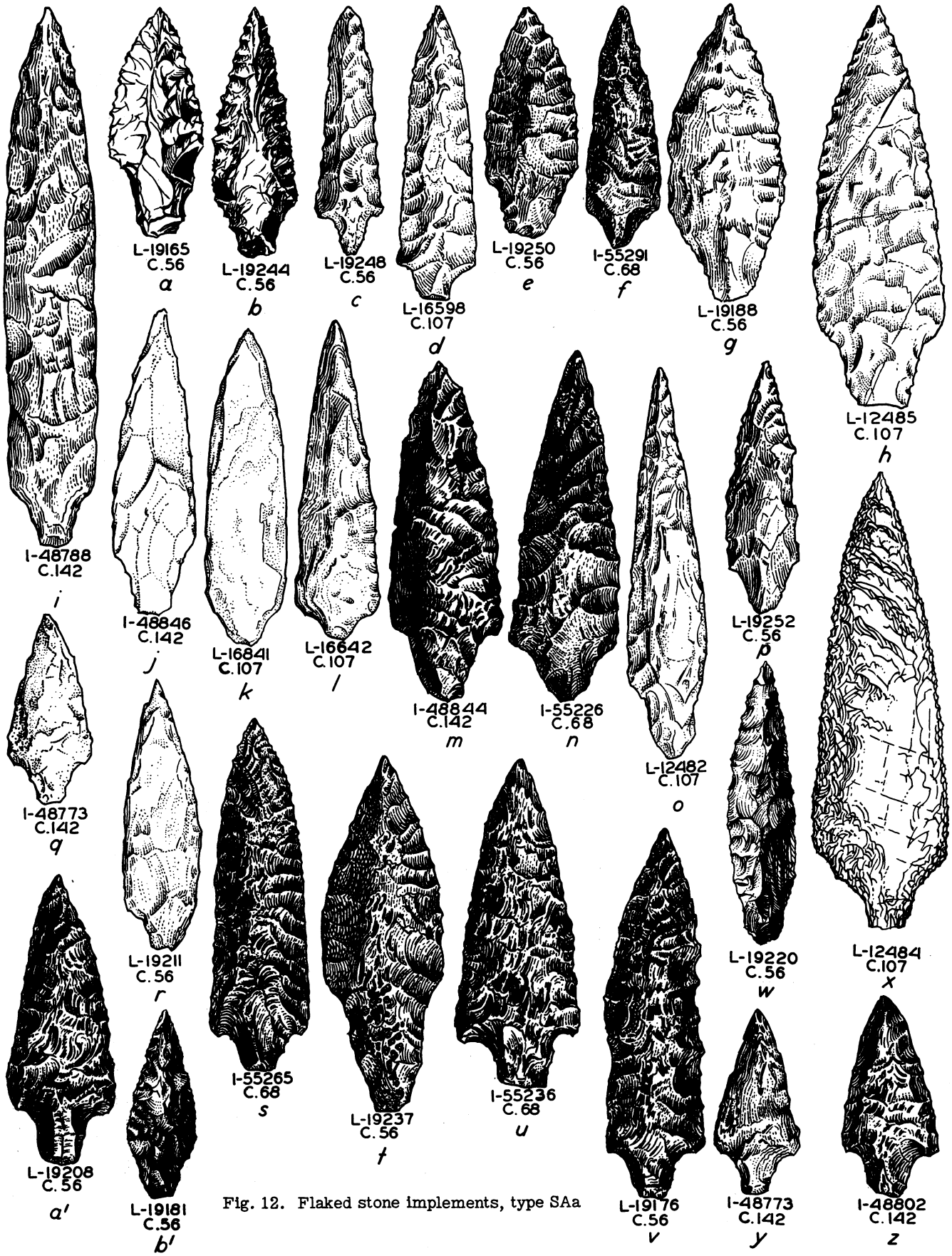


Fig. 12. Flaked stone implements, type SAa

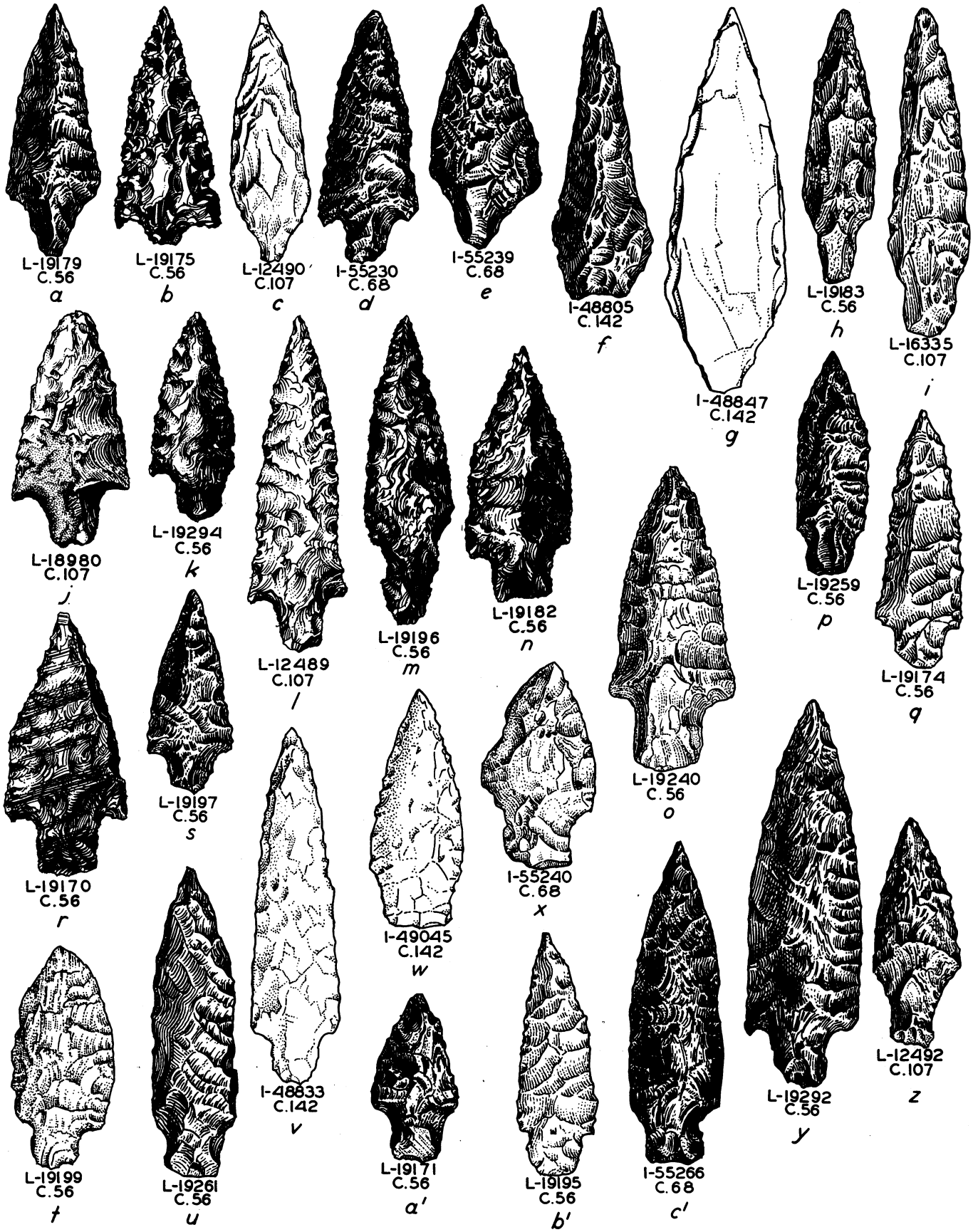


Fig. 13. Flaked stone implements, types SAa and SB

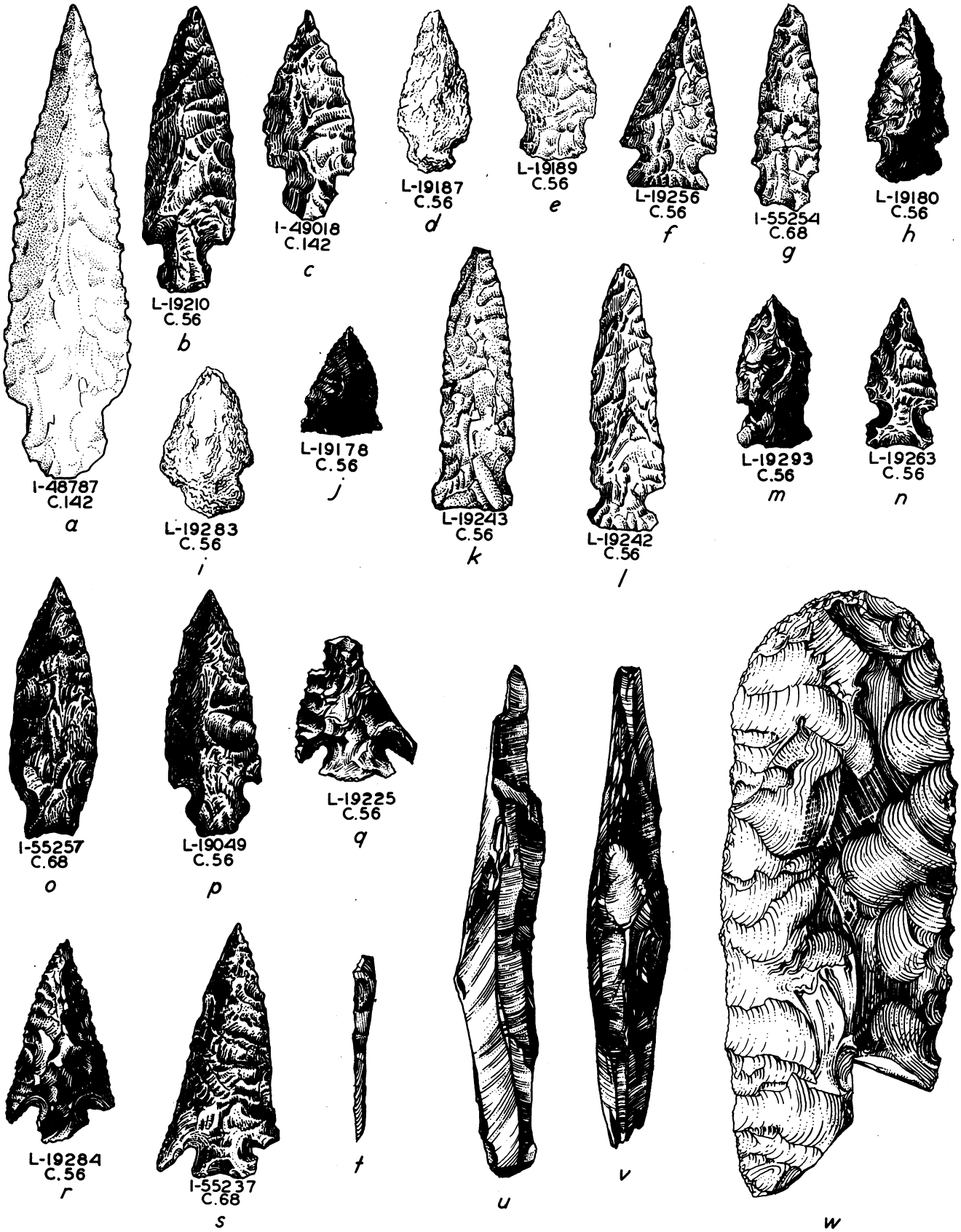


Fig. 14. Flaked stone implements, type SC; bangles; and large blade

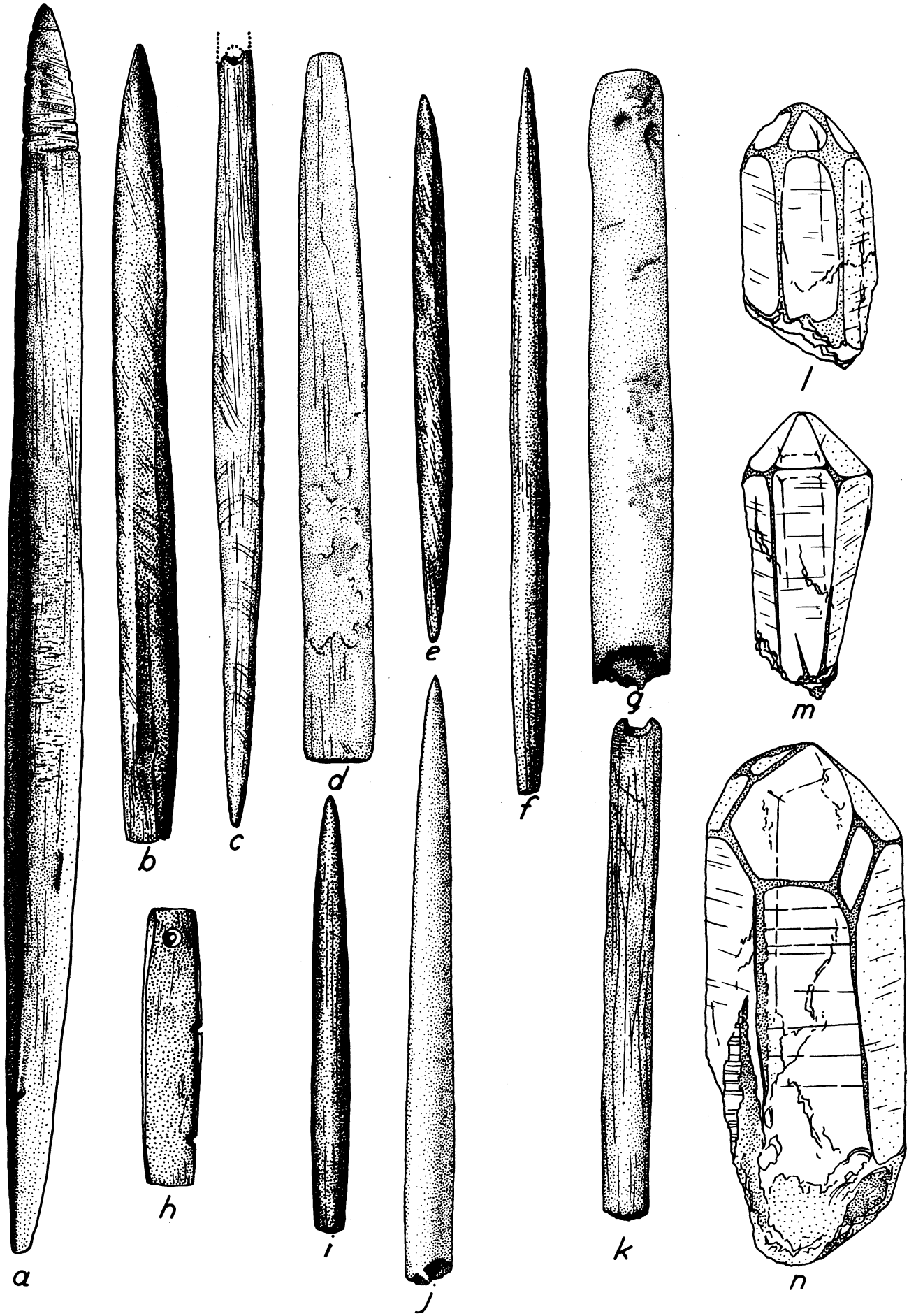


Fig. 15. Objects of ground slate and quartz crystals

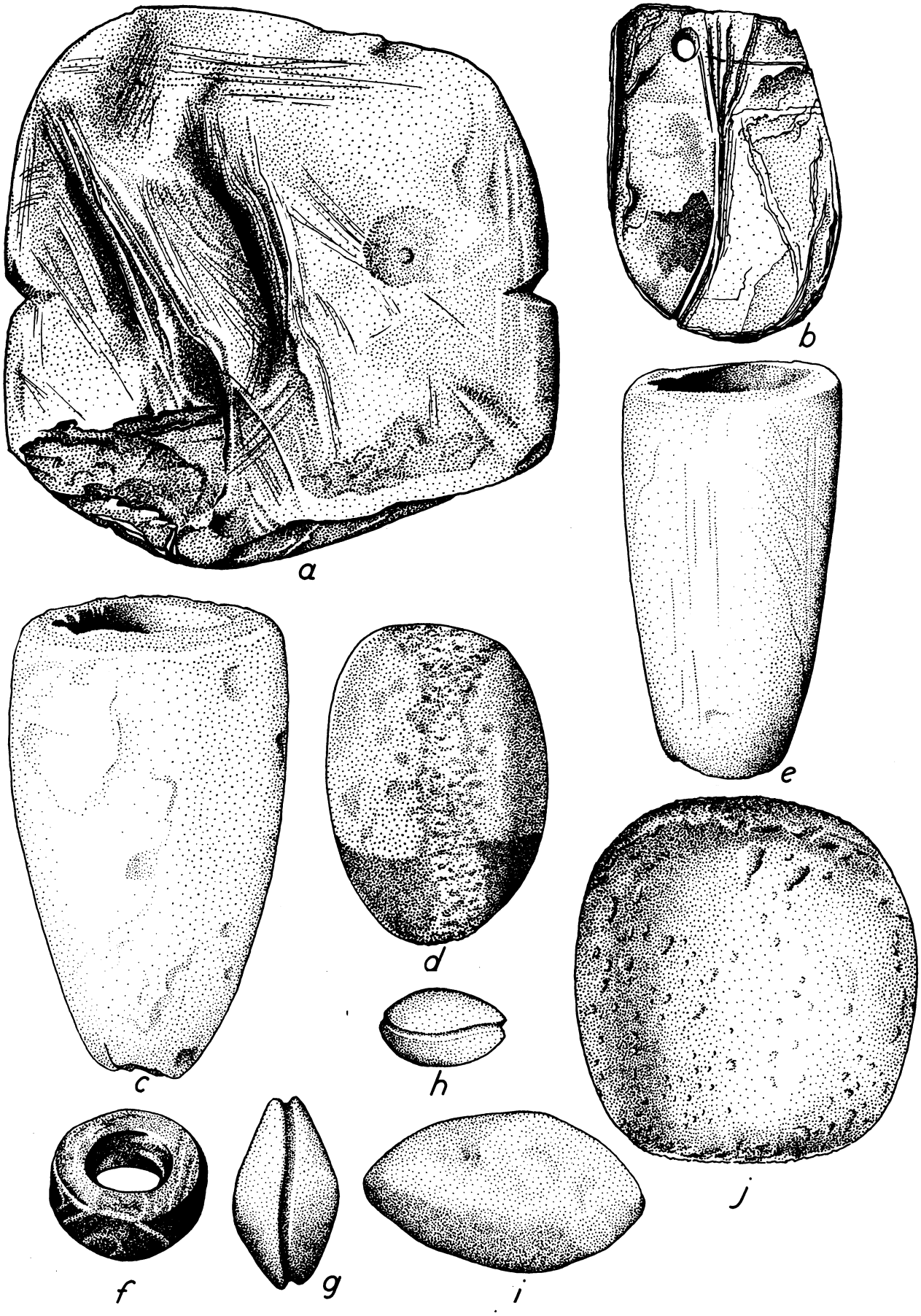


Fig. 16. Ground-stone, baked-clay, and biotite objects

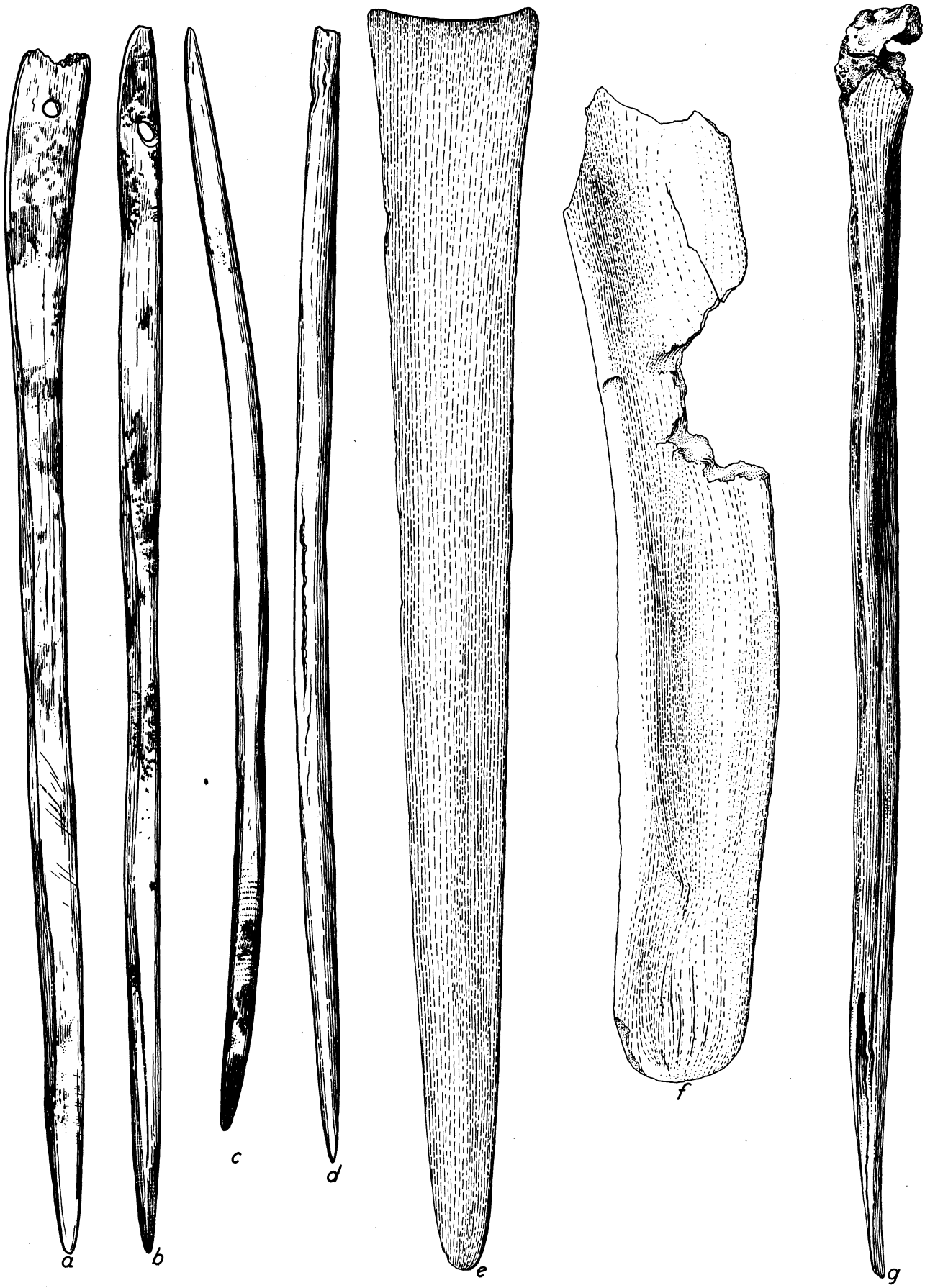


Fig. 17. Bone and antler artifacts

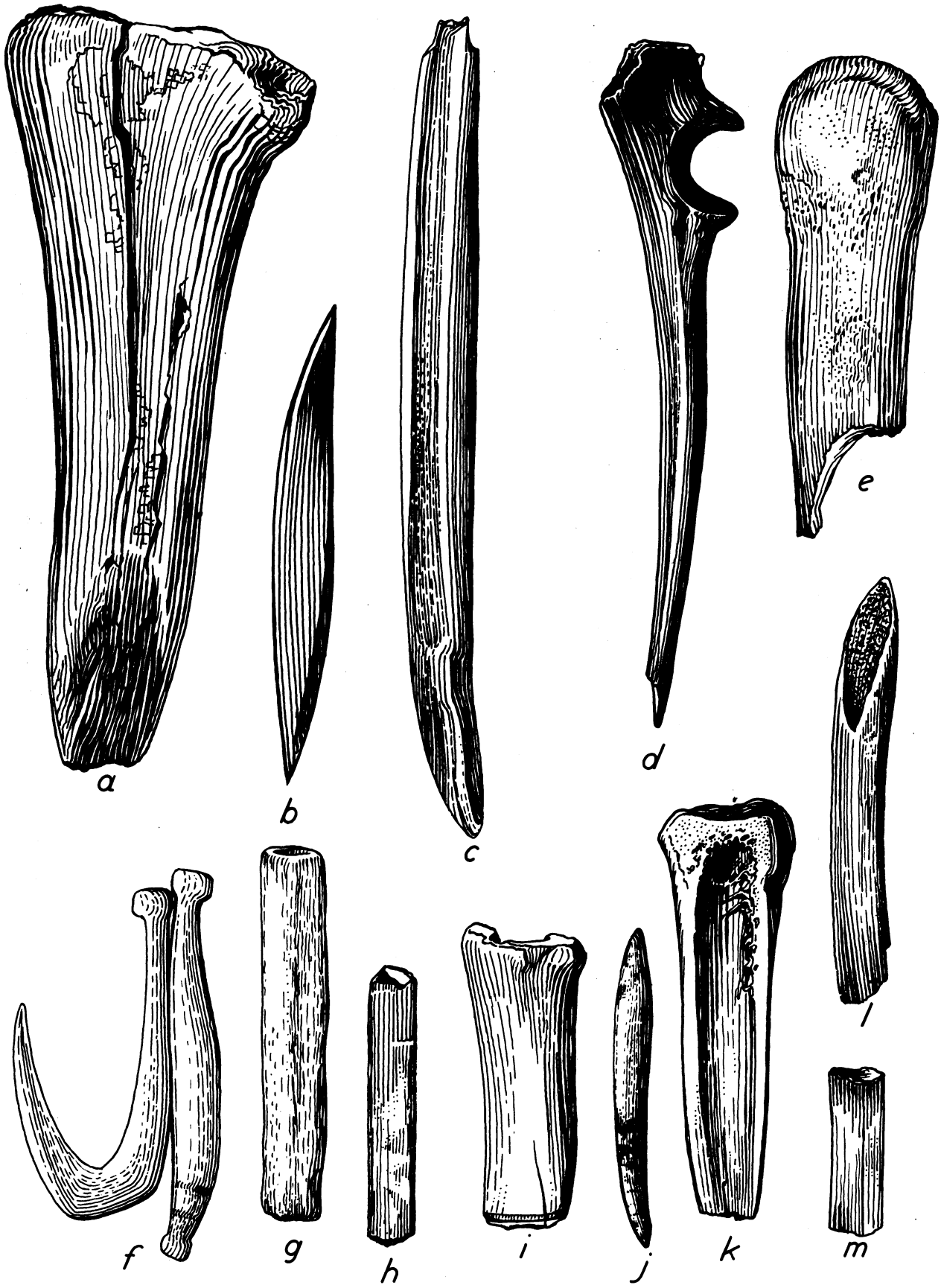


Fig. 18. Objects of antler and bone

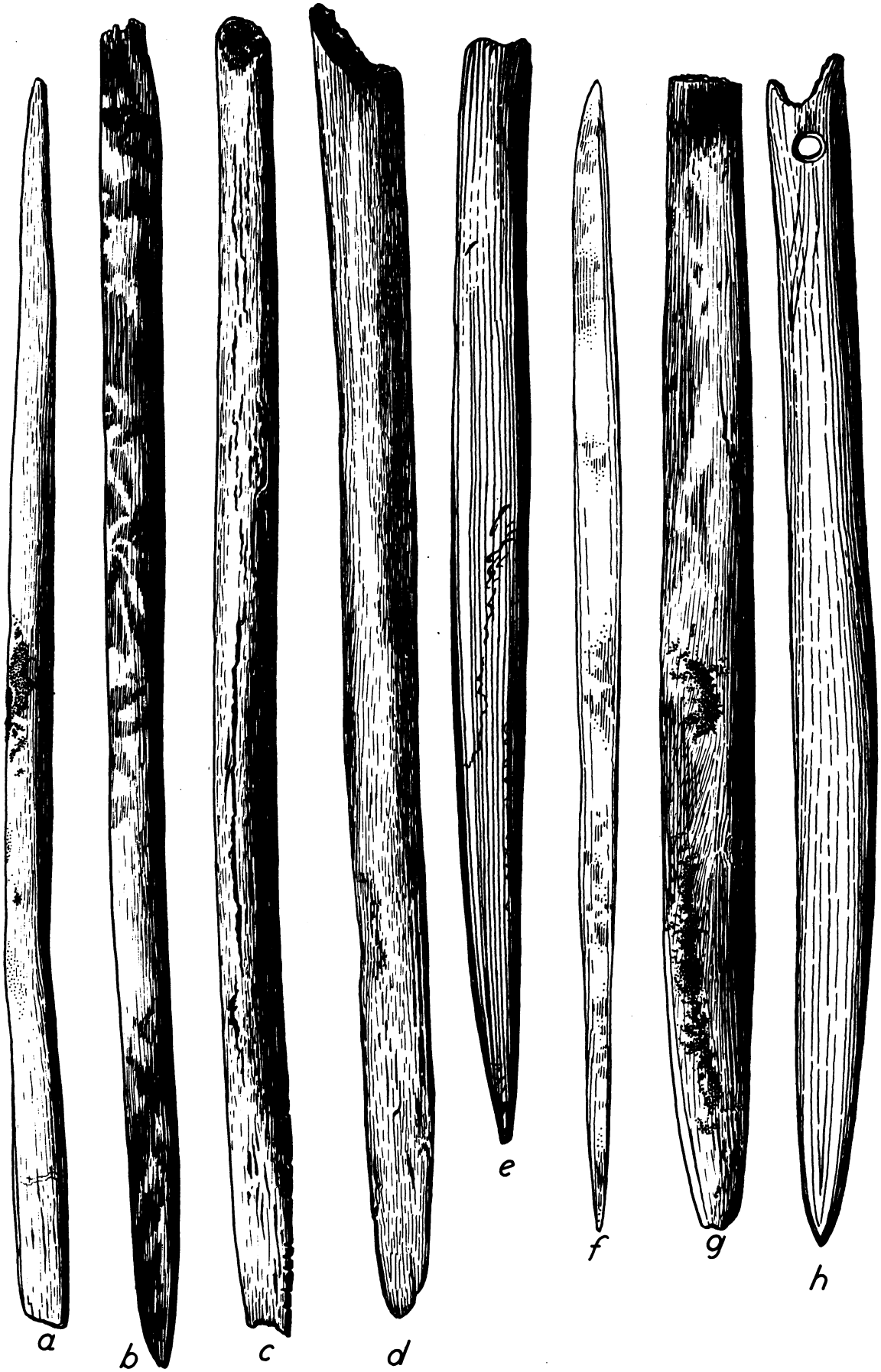


Fig. 19. Pointed bone objects

PLATES

EXPLANATION OF PLATES

PLATE 1

a. Burials 9 and 14. b, e. Burial 15, c. Burials 18, 19. d. Burial 17. Note legs cut off by intrusive pit (cf. fig. 3 in text).

PLATE 2

a. Burial C.21, site C.107. Note unworked colored pebbles and slate "pencils" as burial accompaniments. b. Burial C.22, site C.107. Note type E.1 charmstone at neck and type 2 Haliotis bead as burial offerings. c. Broken type A charmstones accompanying fragmentary burial, site C.107. d. C.107 Early horizon burial. Note type C.2 Haliotis ornament on skull and bone implements at face. e. Burial C.20, site C.107. Note proximal end of type A charmstone at right femur.

PLATE 3

a. Burial 10, site C.68, showing prone extended position. b. Burial 6, Site C.68, showing supine extended position. Note artifacts in grave. c. Burial 53, site C.56. Note charmstone at neck and human fibula "dagger" at right side. d. C.107 Early horizon burial accompanied by charmstones and bone implement.

PLATE 4

a. Calvarium imbedded in surface hardpan layer, site C.68. b. Stratification of site C.107 showing Early horizon burial in compacted red clay subsoil and soft dark refuse deposit above in vertical exposure. c. Cache of cut bear (Ursus) bones, site C.68. d. C.68 extended burial taken out imbedded in hardpan matrix. e. Excavating site C.142. Note swampy depression in background and house and trees at river edge. f. Site C.68 with piers whose lighter colored caps show depth of surficial hardpan. g. View of site C.107 showing mound elevation.

PLATE 5

a. Early horizon charmstones, site C.107. b. "Mortar" with long narrow cavity, site C.107. c. Sandstone paint palette with shallow rectangular cavity in surface, site C.107. d. Cobble mortar, site C.107. e. Early horizon basin metates, site C.107. f. Skull, photographed at time of excavation, showing position of type C.(2).a Haliotis ornament over ear, probably used as facing disk for wooden earplug. g. Cache of fire-broken cooking stones in subsoil, site C.107. h. Receptacle made from human skull.

PLATE 6

Skull of burial No. 51, site C.56, 12-7294.

PLATE 7

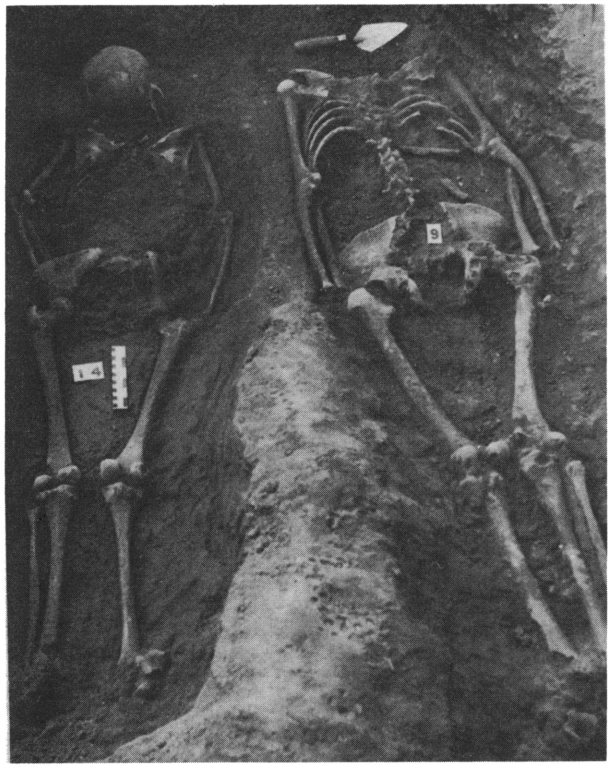
Skull of burial No. 51, site C.68, 12-7603.

PLATE 8

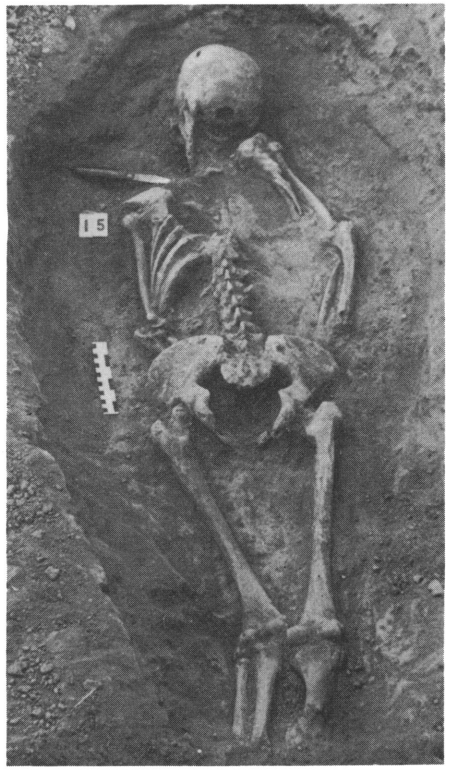
Skull of burial No. 91, site C.68, 12-7646.

PLATE 9

Skull of burial No. 16, site C.142, 12-5677.



a



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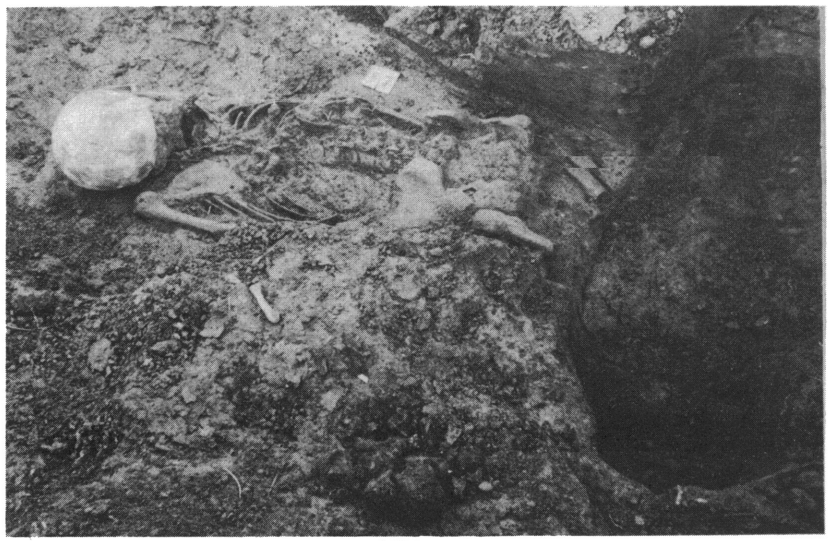

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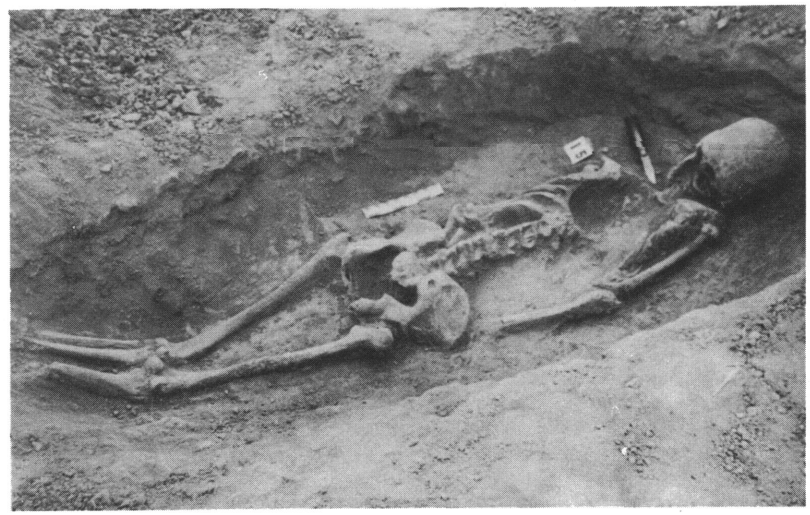
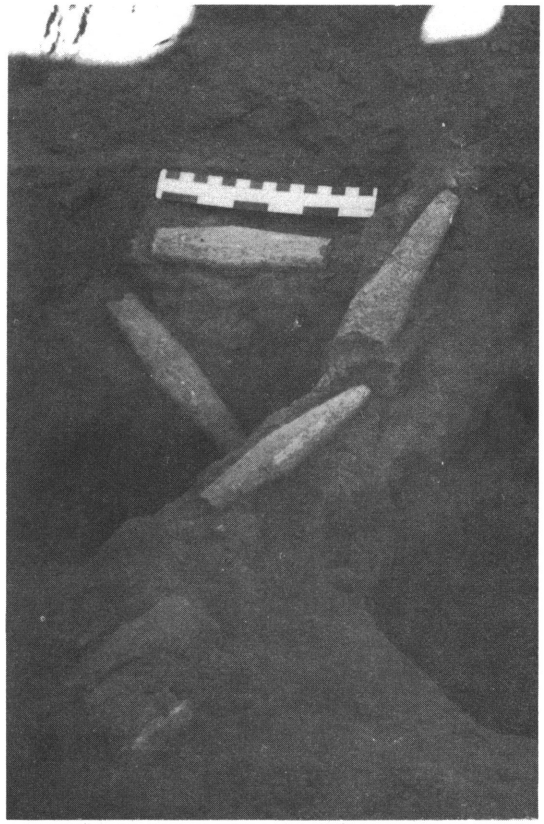


e

Plate 1. Burials, site C.142

a

b



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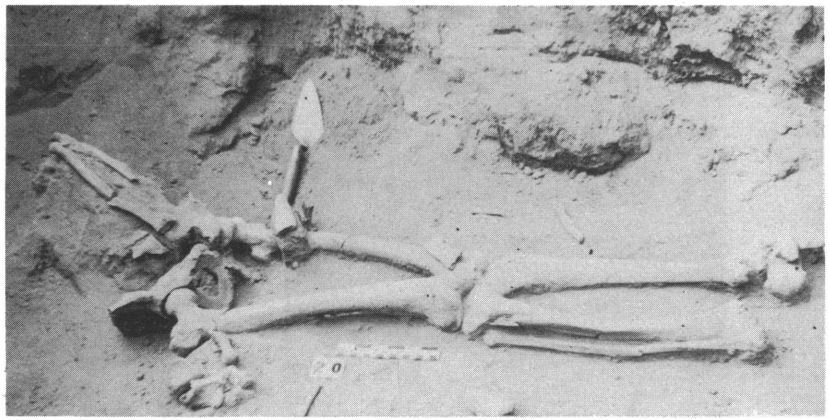
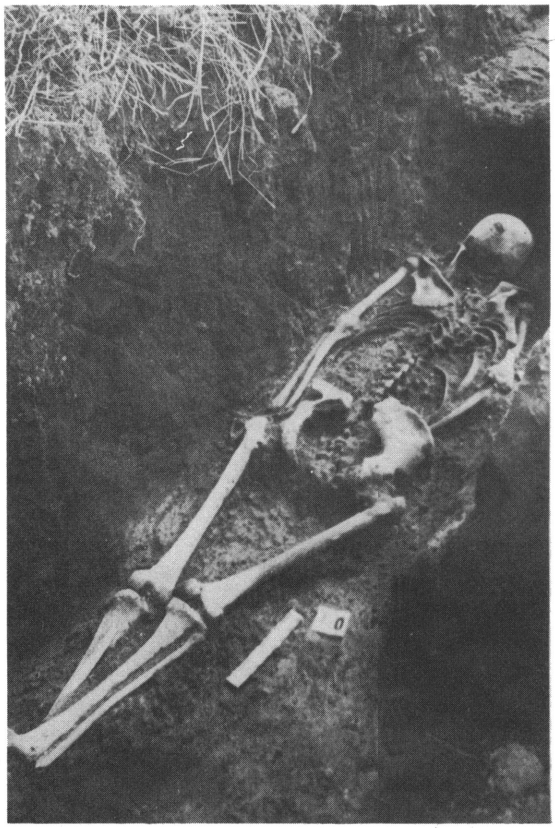


e

Plate 2. Burials and artifacts, site C.107



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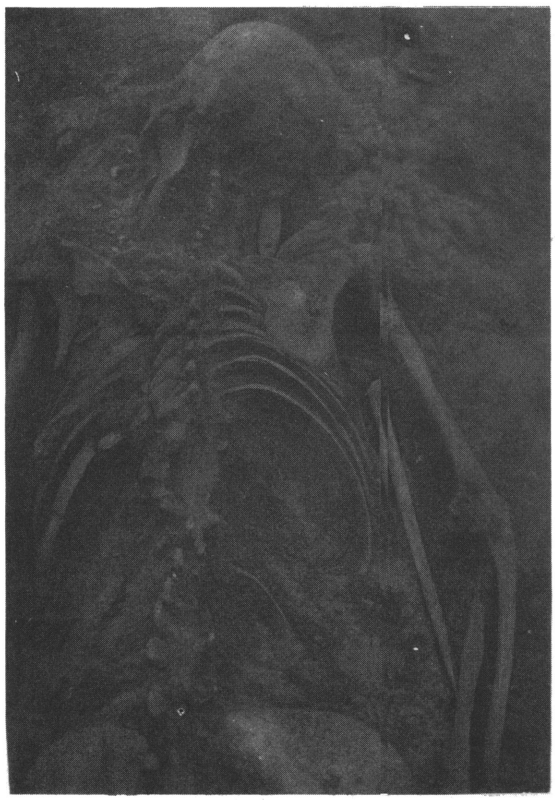
b



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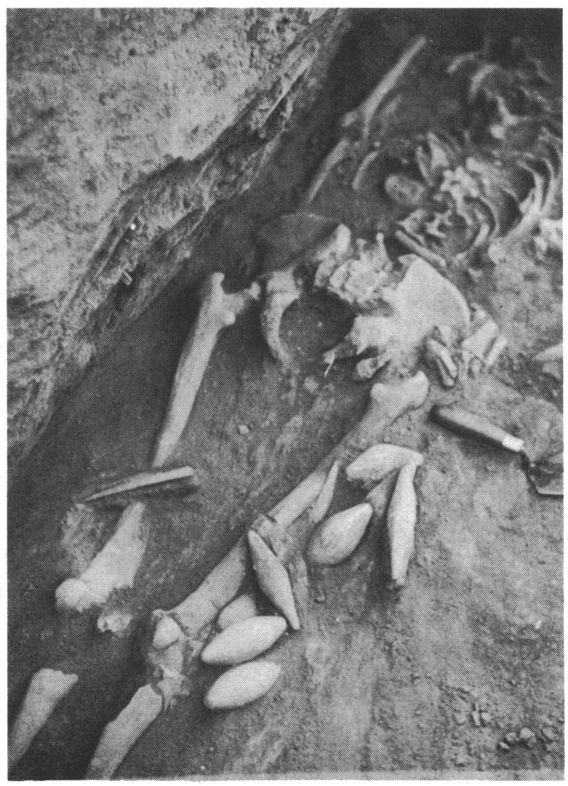
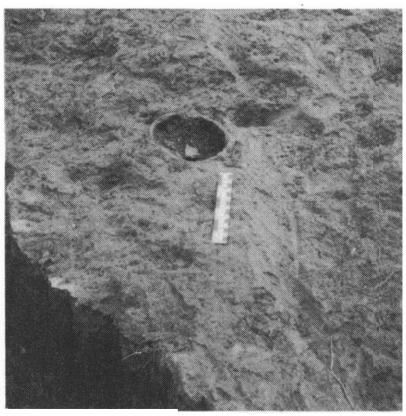


d

Plate 3. Burials, sites C.68, C.56, and C.107



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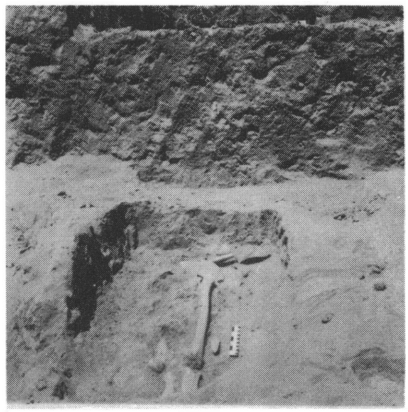

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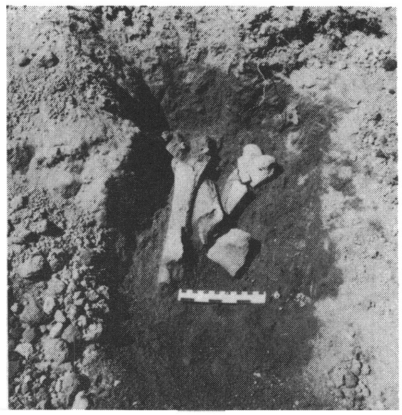

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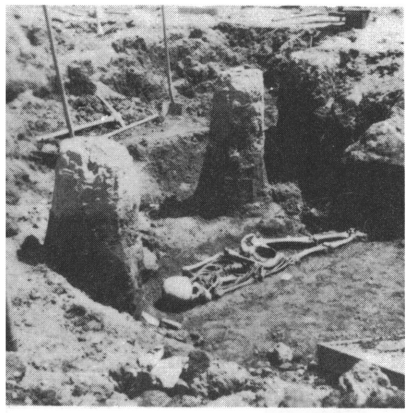


f

g

Plate 4. Excavation views, sites C.56, C.68, C.107, C.142

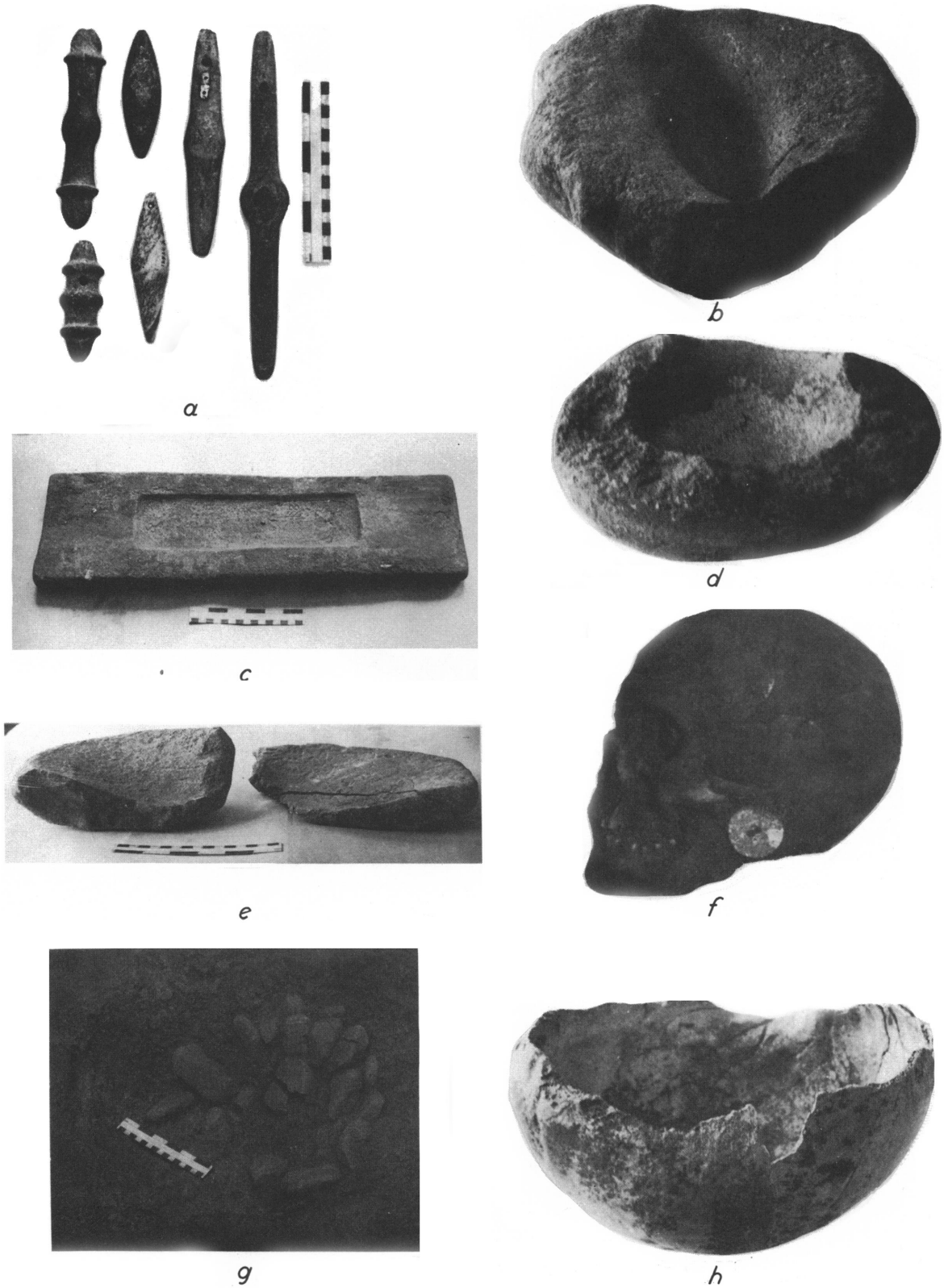
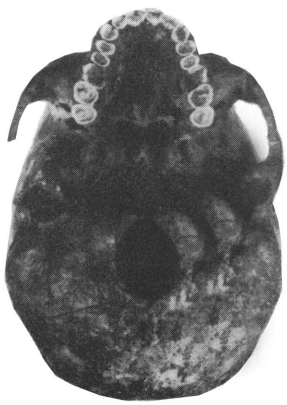


Plate 5. Artifacts from site C.107

Height-Breadth Index, 98.67

Facial Index, 96.83

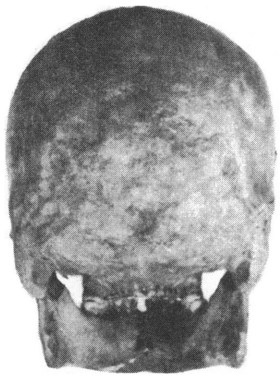
Height-Length Index, 73.63



External Palatal Index, 114.75

Cranial Index, 74.63

Plate 6. Skull of Burial No. 51, site C.56



Height-Breadth Index, 97.28

Facial Index, 82.78

Height-Length Index, 76.88

External Palatal Index, 126.32

Cranial Index, 79.03

Plate 7. Skull of Burial No. 49, site C.68

Height-Breadth Index, 100.72

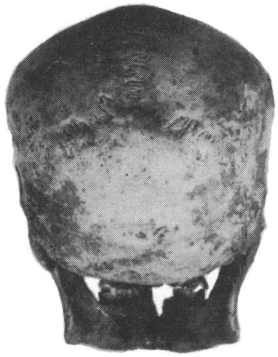
Facial Index, 91.37

Height-Length Index, 75.14

External Palatal Index, 108.33

Cranial Index, 74.59

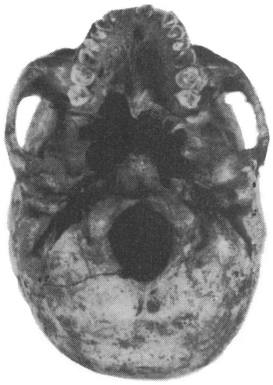
Plate 8. Skull of Burial No. 91, site C.68



Height-Breadth Index, 99.32

Facial Index, 82.01

Height-Length Index, 77.13



External Palatal Index, 120.37

Cranial Index, 77.66

Plate 9. Skull of Burial No. 16, site C.142