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FIRST SEASON'S EXCAVATION OF THE TANK SITE, 1947

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THE TOPANGA CULTURE
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INTRODUCTION

The discovery in 1946 by Robert F. Heizer and Edwin M. Lemert of the Tank Site in Topanga Canyon, Los Angeles County, California, was fortunate in providing new data bearing on the problem of early man in southern California. Had the possibilities of the Tank Site been overlooked by these two observers, much data so sadly needed for the interpretation of the early phases of California prehistory would still be lacking. It was primarily because of Dr. Heizer's and Dr. Beals's interest and the senior author's familiarity with the early lithic industries of southern California that the excavation of the Tank Site was undertaken in 1947. The conclusions presented by Heizer and Lemert in their preliminary report (1947) were proved essentially correct by the 1947 excavation. What we have done is to fill in the outlines and to raise new questions bearing on the early phases of prehistory, not only of California, but of the western United States.

This work was made possible through a research fund contributed jointly by the departments of anthropology of the University of California at Berkeley and Los Angeles. Dr. Robert F. Heizer and Dr. Ralph L. Beals supervised the work from Berkeley and Los Angeles respectively. Actual field work was directed by A. E. Treganza, of Berkeley, assisted by Consuelo G. Malamud, representing the Los Angeles department.

Our thanks are due the following students, who so willingly donated their time: Agnes Bierman, Alan Beals, Charles Rozaire, from the Los Angeles campus; Albert D. Mohr, William King, Jay Quast, David Fredrickson, William Adams, from the Berkeley campus; Harland Kinsey and Kenneth A. Green from the San Francisco State College.

We are especially indebted to Albert D. Mohr for mapping and surveying the site, as well as for supervising the excavation in our absence. On the Berkeley campus, Jack Nicora, under the direction of Dr. T. D. McCown, has undertaken the difficult job of reconstructing the skeletal material. The excellent field photography was done by Jay Quast.

Published accounts of early man in southern California have concerned themselves to date with surface finds and their subsequent interpretations or have been brief notes of excavations of which, all too often, no final report has appeared. The present status of our knowledge, therefore, is such that valid comparisons are difficult. In the Mohave Desert, for example, cultural terminology and relationships are not clear, and some observers have proposed a marked hiatus of time for what is apparently an interval between related phases of a single cultural complex. The Pacific littoral has fared little better. David Banks Rogers' report (1929) of the Oak Grove culture suggests just enough to be tempting, but little more. The survey by Malcolm J. Rogers of the San Dieguito and La Jolla cultures (1929) provides mere terminologies and opinions without the support of adequate data for analysis or comparison. Baja California[1] may still be classed as "unknown Mexico," but with the promising prospect that it may hold the key to problems farther to the north.

These comments are not meant as criticism but merely state the situation. The obvious fact is that a traditional lithic industry, characterized chiefly by core and flake tools, apparently existed at an early date in southern California, both on the coast and in the desert. Furthermore, this lithic industry was by no means restricted to southern California; material for comparison is found elsewhere in the western United States, in Sonora, and in Baja California. The difficulties of utilizing much of the accumulated data have already been mentioned. The excavation of the Tank Site, therefore, is especially important, for we have here for the first time a true habitation site containing materials that represent this early lithic industry. Burials occur at the site, the deposit is sufficiently deep and the site has been abandoned long enough for definite pedologic change to take place, and there are enough artifacts to permit us to draw some pertinent conclusions. The excavation was carefully planned and executed, its main purpose being to provide data which might be useful for comparative purposes.

This report of our season's work is primarily descriptive. Though a fair sampling of the Tank Site was made this year, the greater part of the deposit still remains unexcavated. There are also other sites in the vicinity, which appear typologically related to the Tank Site. Since there is a slight suggestion of cultural change between the upper and lower levels of the Tank Site, it seems advisable not to attempt extended discussion or far-reaching conclusions until additional excavation expands our knowledge of the Tank Site itself and of these related deposits.

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[1]Treganza, App. in Heizer and Lemert, 1947, pp. 253-255; Massey, 1947.

THE TOPANGA CULTURE AND THE TANK SITE

The term "Topanga Culture" has already appeared in print, in the report of Heizer and Lemert (1947), and this season's work indicates that the introduction of this term is not only justified, but necessary. At present we cannot fully equate the material aspects of this complex and those of any other known California culture. Most of the large core tools and flaked blades are identical with those of the San Dieguito-Playa cultures and other early lithic industries of the desert area, whereas the location of the site, the burial complex, and the mano-metate assemblage suggest strong connections with the Oak Grove peoples of the Santa Barbara coast. There is, however, some material that is apparently restricted to the Tank Site or of sporadic occurrence in various sites throughout the southern California littoral. Since the economic and cultural complex represented by the material from the Tank Site appears to be a composite of other cultures and not itself a basic complex or the outgrowth of any one, we are left with no alternative except to refer to this complex as the Topanga culture. In fact, if we are to account for its various aspects, we shall have to reëxamine all the early phases of southern California prehistory.

The Tank Site, considered as a habitation site of prehistoric man, is unique in many respects. The data leave no doubt that we are dealing with a village location occupied for a considerable period. The amount of deposition and the abundance and association of artifacts support this opinion, giving us the opportunity to gain some insight into the cultural complex as a whole although all of the perishable material is necessarily lost to us.

If the industry of the Topanga culture is to be classed with other early lithic industries already known, what is the evidence of its antiquity? The site contrasts sharply with late culture sites in Topanga Canyon proper as well as along the adjacent southern California coast. The deposits at these late sites are characterized by loose black ashy soil, with varying quantities of mollusk shell, fish and mammal bone. Polished and ground-stone artifacts are frequent, and the presence of steatite, probably from Santa Catalina, may indicate contact with the cultures of the Santa Barbara Channel Islands. Bone work, asphaltum mastic, and shell inlay are dominant techniques. Shell beads and fishhooks are diagnostic of the late to historic phases. A definite shift in the techniques of food production is apparent; for instance, in locally late phases when the mortar and pestle take indisputable precedence over the mano and metate.[2] Chipped implements are well made from a variety of silicates; large core and percussion-flaked tools are almost entirely absent. Typologically, the Topanga culture has parallels in other old California sites, such as those of the Mohave Desert cultures to the east, of Oak Grove and Borax Lake to the north, and of the San Dieguito and La Jolla cultures to the south in San Diego County and Baja California. Indeed, the more distant Cochise[3] culture cannot be considered a total stranger; the typological parallels with Topanga are not only close but numerically impressive. The comparative method, however suggestive, does not offer conclusive proof of coincidence in time. Nevertheless, when this is reinforced by local evidence of a different sort, the case for the antiquity of the Topanga culture is certainly strengthened.

Most of the Tank Site artifacts may be classed as typologically old. Also, their flaked surfaces show a degree of patination which has required a considerable time to develop.[4] Implements from the surface or from the first 6 inches in depth show the greatest amount of alteration, but the fact that material from a depth of 5 feet likewise shows considerable patination, although with somewhat sharper flake scars, is highly significant. Heizer and Lemert remark:[4]

> "Durrell was struck by the high degree of surface alteration and stated that 'a very long period of time' was required. He pointed out that the altered surfaces of the flaked basalt implements have extruding feldspar crystals exposed. These are harder inclusions left after the softer components have decomposed and weathered out."

No chemical or physical analysis of the Tank Site deposit has yet been made, but certain visual observations are important. Except for a slight soil discoloration it has lost all the diagnostic characteristics usually associated with habitation deposits. What was once refuse deposit has in time undergone a complete pedologic change from soft, friable earth to a highly indurated, compact, adobelike soil. When moist, the material has the consistency of sticky clay. When the soil is dry, large fissures open up in it, and a pick either produces a polished dent in the surface or pries loose chunks weighing up to ten pounds. Dr. George F. Carter, of the Department of Geography, Johns Hopkins University, was impressed by the soil profile of the deep area (62 in.) (pl. 13, c). Here he was able to point out the likelihood of a mature soil profile. The topmost 5 inches are, in the main, less compact and more granular than the lower layers. This top 5 inches, constituting our A profile, may have been partly built up by vegetation processes. Directly beneath (6 in. to 18 in.) is a zone of artifact concentration surrounded by a mottled adobelike soil. This second soil type (B) continues to a depth of 48 inches, where it gradually merges into a friable layer containing charcoal and occasional inclusions of shell. This third layer is moundlike and may well constitute a distinct soil horizon, C. Carter made the significant observation that the soil under an inverted deep-basin metate found in the B horizon was comparable to the less altered material from near the base of the mound in the C level. Because of the geological structure of the submound the subsurface alteration has been effected by descending solutions only, and the metate functioned as a protective covering. Directly under and in the

[2] Olson, 1930, pp. 1-21.

[3] Sayles and Antevs, 1941.

[4] P. 251. For degree of patination see pl. 11, p and p′ of this paper. The specimen shown in p is retouched, showing the fresh basalt but leaving a small portion of the patinated surface on the top; p′ illustrates the degree of patination on a specimen from the surface of the Tank Site.

basin of the inverted metate the soil could be troweled, though with some difficulty. As one proceeded downward or outward, the soil merged gradually into the compact adobe characteristic of the rest of the B horizon. It should be pointed out that any final conclusions concerning the age of the soils must await field and laboratory tests by a soil technologist. However, it is of importance to note that it takes considerable time for mature soils to develop their typical characteristics; thus a human habitation site which exhibits a mature soil profile is unusual.

The long trenches cut through the deposit provide data which throw some light on the gradual growth of the site (pl. 13, a). The original occupation must have been on the higher part of the knoll upon which the site proper was located. Just to the west the headward cutting of a small canyon was checked by overflow of refuse from the village. Likewise, our test pits indicate that there was once a shallow saddle on the ridge leading to the western edge of the site, which was gradually filled by the spread of camp refuse. Soil profiles no. 1 and no. 5 (see map) clearly illustrate these accumulations of refuse. The C soil horizon in both profiles approximately indicates the amount of filling which took place in both the canyon and the saddle (pl. 13, c).

The heavy concentration of artifacts, rejects, flakes, and unworked stone in the 6-inch to 18-inch levels (pl. 16, b) is not yet explained. So heavy is the lithic yield in this zone that in many places along the trench walls it constitutes a visible layer. This layer could indicate a period of intensive occupation over the entire site during a definite period of time. If this were so, it would virtually mean a group of people camped on a stone pile, and this seems hardly plausible. Alternatively, it could imply that the deposit was once a great deal thicker but has undergone a long period of degradation. Such a process would bring about a gradual concentration of lithic material at a lower level. Stated in other words, as the deposit was subjected to weathering for a long time, such lighter materials as organic refuse and soils were carried away, with the result that the gross material accumulated at the surface, but at a much lower level than the original height of the deposit. This weathering was then followed by a period of soil building and possibly reoccupation that produced the less compact, more granular soil of the first six inches of the deposit today. The mature soil profile renders this hypothesis not unreasonable, especially when we consider the physiography, and specifically the drainage, of the site.

Physiographically, the Tank Site today is entirely different from anything one would expect as a habitation site. There is now no permanent water supply nor does the vegetation include food plants sufficient for the needs of a population of any size. We cannot, of course, say what conditions were like in an earlier day, but it is significant that the later sites of the protohistoric and historic periods are all either near good springs flowing at the present time or along the wooded creek botton of Topanga Canyon. It is thus obvious that, from the standpoint of human ecology, the Tank Site under present geographical conditions is highly unsuitable for occupation, especially for a population large enough to constitute a village. If we had found more mammal bones, we might have postulated a subsistence economy based on hunting. However, most of the artifacts suggest a seed-gathering economy, and the refuse deposit yields few animal bones. We are at a loss for an explanation of the location except to suggest that factors unknown to us must have been present at an earlier date.

This statement takes into consideration the sharp contrast between the Tank Site location and that of other sites we know to be typical of the late period. Yet the Tank Site is not actually exceptional. When compared to the San Dieguito sites, its location is entirely typical, and the cultures of the two areas, with their lithic industries, suggest a relationship of some sort. When a number of archaeological sites, scattered over a wide geographical area, show not only typological similarities but resemblances in physiographic location, a pattern begins to develop which requires explanation.

The artifact occurrence in the Tank Site is abnormally high, as compared with that, not only of other local sites, but of Far Western sites in general. All the archaeologists who visited the excavation were impressed by the quantity of worked stone found here. The amount of stone would be understandable if the site were a quarry or a workshop. However, the diversity of implements, as well as the variety of the material used, the presence of burials and hearths, and the quantity of refuse accumulation all indicate a village; indeed, the evidence suggests intensive occupation. Approximately four tons of artifacts were recovered from the 5000 cubic feet of earth excavated this season. The average yield was one finished specimen per 1.5 cubic feet of earth. Many of the core tools and mano and metate specimens were not saved, since they were too fragmentary for classification and study. Some attempt was made to get an approximation between the number of artifacts and the amount of unworked stone in the site. From a trench 5 feet wide and 65 feet long, cut along the L1 line, 4,223 objects of unworked stone were counted as opposed to 859 lithic artifacts, a ratio of about 5 to 1. The unworked stone objects included such specimens as burnt hearthstones, basalt flakes, natural cobbles, etc.

The implements from the Tank Site represent a heterogeneous mixture of types and techniques. The core tools are characterized by percussion flaking, from the roughest to the finest. Apparently some of the tools served no special function, hence were less carefully made. Some blades and scrapers show more careful workmanship. The smaller projectile points and some flake scrapers from the upper level show pressure flaking and retouching. There was very little grinding of stone, aside from that resulting from natural wear, as in the manos and metates. Some utilitarian and ornamental objects were ground into desired forms; the exterior of a metate might be shaped thus, or crude slate pendants might be formed by abrading. The total assemblage of artifacts from the Tank Site indicates a core-tool, percussion-flaking industry. However, any deviation from this pattern is interesting, since aberrant forms may well be significant when an attempt is made to place the Topanga culture in the California time sequence.

DESCRIPTION OF SITES

The prefixes and numbers used in this paper to designate archaeological deposits will follow the system now being used by the California Archaeological Survey. All data on sites are filed in the central office of the Survey, Department of Anthropology, University of California, Berkeley. In this paper LAn stands for Los Angeles County.

Site LAn-1 (Tank Site).--Our type locality, the Tank Site, occupies a well-drained knoll high up on the eastern side of Topanga Canyon (elevation 1214 ft.), some four miles inland from the Pacific Coast. The tract of land upon which the site lies is known locally as the "92 acres." The Tank Site has been discussed in detail in the preceding section. (Pl. 14, a-c.)

Site LAn-2.--This site lies on the "92 acres," about 350 yards west-southwest of the Tank Site, on the same ridge but at a lower elevation. At this point the ridge narrows almost to a hogback about 75 feet wide, terminating in a small knoll. There were signs of occupation for a distance of 300 feet along the ridge. The exact limits could not be determined, since the vegetation had been bulldozed off earlier and the deposit had been dragged. Though the artifacts here are typologically like those of the more extensive Tank Site, the deposit appears less consolidated, possibly owing to admixture from weathered debris derived from soft sandstone outcrops adjacent to the site. The presence of a fragmentary sandstone mortar and a diamond-shaped projectile point is of interest. The general artifact assemblage here resembles that of the upper levels of the Tank Site. Since the deposit is a little over 2 feet deep, the site warrants future exploration, for it may hold the key to the stratigraphy noted in the Tank Site. (Pl. 14, a, c.)

Site LAn-3.--This site is on the Trippet Ranch just within the city limits of Los Angeles. It lies on the same ridge as the Tank Site but at a higher elevation and some 450 yards to the east. The western edge of the site and the near-by canyon are covered with live oaks, sage, and manzanita. Most of the surface has been disturbed, for the land was formerly planted to grain. The limits of habitation are marked by compact light brown soil, which discolors slightly the yellow surrounding earth. There is no perceptible rise in contour. Artifacts typical of the Tank Site were observed weathered out of the occupation surface. The former living area was estimated at about a hundred square yards. The deposit appeared only a few inches deep; however, this was probably a village site, though occupied for a short time only. An abundance of tarweed, restricted to the deposit area, might be considered a vegetation association. (Pl. 14, a.)

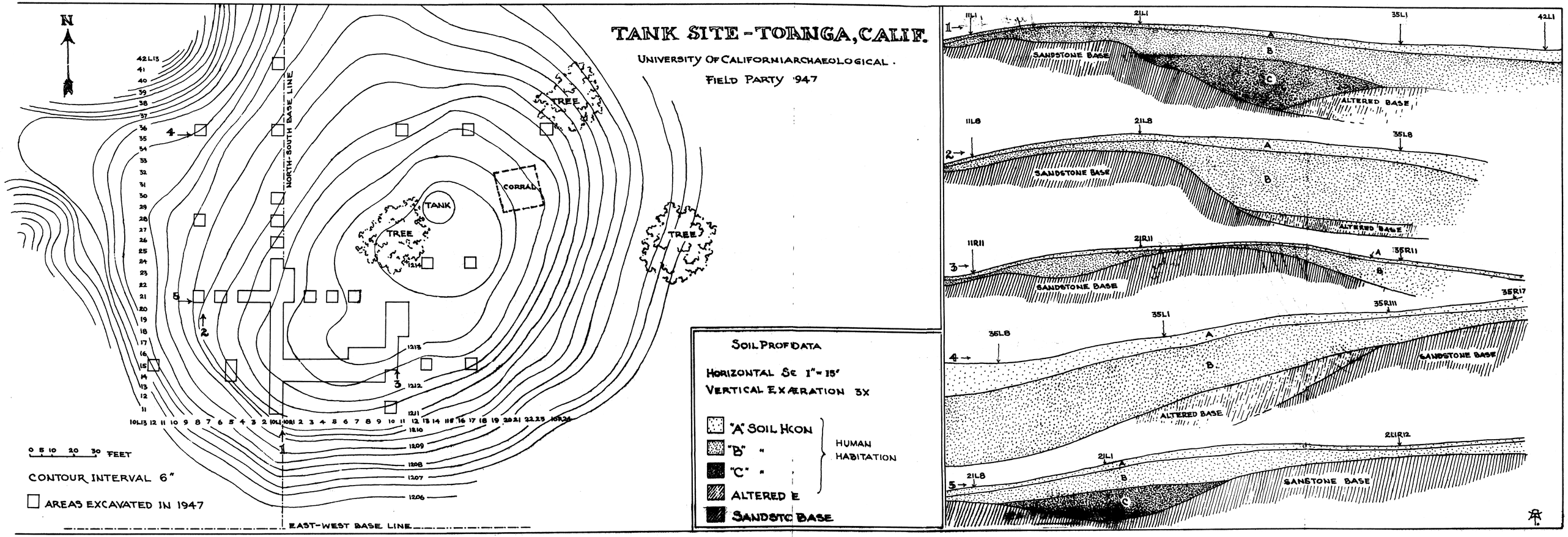
Site LAn-4.--This site is in the saddle of a ridge which separates the Topanga Canyon drainage from that of the Santa Ynez Canyon, about one-half mile east-southeast of the Tank Site. The saddle is well covered with live oaks and manzanita. The habitation deposit is marked by a slight discoloration of the soil and yielded a few manos like those of the Tank Site. At best, the site was probably not more than a temporary camping spot.

Site LAn-5.--As at Site LAn-4, the evidence of occupation, consisting of typical manos, was found in a small saddle of a ridge directly across the ravine from, and about one-half mile south of, the Tank Site. Large live oaks are the predominant vegetation. No extensive habitation area was noted, though the evidence may be hidden under leaf mould. (Pl. 14, a.)

Site LAn-6.--This site is of interest, since it may indicate an occurrence of the Topanga culture in the San Fernando Valley. The deposit is located on the periphery of a citrus grove in the eastern foothills of the valley, near Girard. Cultural associations consisted of Topangalike scrapers and choppers composed of a tough, light-colored rhyolite. There were no signs of occupation. It is not improbable that this was a quarry site; an outcrop of rhyolite is close at hand. However, no quantities of reject refuse were noted; nor did any core or flake tools composed of rhyolite occur in the Tank Site series to suggest trade or contact between the two sites.

The two San Fernando Valley sites, the Big Tujunga and Porter Ranch sites, reported on (1936, 1945) by Mr. Edwin G. Walker of the Southwest Museum, appear to have no relation to Site LAn-6 or bearing on the problem of the Topanga culture.

Our chief concern this summer was the Tank Site. Observations beyond the site proper were fairly well confined to the vicinity of our excavations. What little survey work was done was sufficient to demonstrate the need for a great deal more work in this area. The total number of Topanga culture sites in this valley should be known, as well as the number of late culture sites. Above all, we should attempt to ascertain whether there is a true physiographic difference in the location of these two distinct cultural patterns. The suggestion that there is a third or intermediate culture here also requires investigation. From what little we know at present it is obvious that excavation of additional Topanga Canyon sites is necessary before the culture of the Tank Site can be seen in its true perspective. There is apparently ample room for a long-range program of archaeological work in this area.



Tank Site,ga Canyon

EXCAVATION METHOD

Beyond surface conditions indicating an old deposit, nothing appeared unique about the Tank Site, and therefore a standard grid technique was employed throughout the excavation. The site was first surveyed with a transit, and a contour map was made (see site map). An east-west base line was then established just off the southern periphery of the deposit. From this line we laid out a north-south zero datum line which dissected the site. Using these two lines as reference points, we then proceeded to mark off the site in a five-foot grid system. As the observer faced north, all those squares to the west of the north-south zero datum line were given "L" numbers, designating left; those to the east were given "R" numbers for right. For example, section 10R5 would mean 10 sections (50 ft.) north of the east-west datum line and 5 sections (25 ft.) east of the north-south datum line.

Since this first summer's work was largely exploratory, its purpose being to determine the limits and nature of the deposit, we merely cut long trenches, 5 feet wide, and dug test pits, expanding only in areas where there were burials or where the artifact yield was heavy. This procedure enabled us to obtain two good profiles which dissected the site in cardinal directions. By a strategic location of test pits we were able to procure a few additional interrupted profiles. (For profiles see site map.)

The large number of artifacts found made field recording and cataloguing a major undertaking. We devised a special technique for keeping the daily records clear and up to date. A printed sheet was prepared with a scaled drawing of a 5-foot section which was further divided into 1-foot squares. Every section was stripped off at 6-inch intervals, and the location data of artifacts were recorded. For each 6-inch layer a separate sheet was filled out. In this way the horizontal position of each artifact was recorded exactly and its vertical position established to the nearest 6 inches. When the submound was reached, a final tabulation sheet was made, indicating the greatest depth reached and the total number of artifacts in the entire pit as well as by 6-inch levels; any unusual observations were also noted.

For recording burials and special features, the standard University of California record sheet was employed. During excavation, artifacts were sacked according to excavation unit and level, each item being marked with a soft lead pencil giving the section and a hyphenated number which corresponded to a number on the appropriate 6-inch level sheet. At camp the artifacts were washed, and the penciled number was replaced in India ink. This inked notation served as the official field catalogue number.

SOURCES OF LITHIC MATERIAL

What materials besides stone were used by the Topanga people for making implements is practically unknown to us. The locality, however, provided abundant and varied lithic resources. There is some evidence of utilization of distant sources, but more frequently local supplies were drawn upon. A wide range of sedimentaries and metamorphics coupled with igneous intrusives left little to be desired in the types of rocks available; quality might also influence the selection when suitable material for flaking was required.

By far the greater number of our chipped artifacts were made from even, fine-grained basaltic materials that were available in unlimited quantity within a hundred yards of the site.[5] Although the Tank Site rests upon an exposure of massive Topanga sandstone of early Miocene age, it is virtually surrounded by these middle Miocene to Pliocene intrusives. The small intermittent creek to the northeast of the site was well filled with float material, and the adjacent hillside consisted of a virtually continuous outcrop. Nowhere did we find any evidence of quarrying that suggested large-scale operations. Excessive patination and weathered surfaces on the unworked areas of some of the artifacts indicate that float material was brought to the site and worked; other pieces appear to have been made from fresher material.

Quartz, quartzite, porphyry, chalcedony, and chert for chipped artifacts could be obtained from conglomerate exposures which occur in outcrops above and below the Tank Site.

Material suitable for metates was everywhere available. Massive outcrops of fine and coarse-grained sandstones are to be found directly west of the site along an eroded stream cut. Granite, schist, and sandstone cobbles, used in mano manufacture, could also be procured in the near-by conglomerates.

The only possible imports from outside Topanga Canyon are a single opaque obsidian point and a sample of asphaltum. The obsidian resembles that described by Walker (1936) from an aboriginal quarry near Fillmore, Ventura County. The asphaltum probably came from bituminous seeps either along the coast or in the interior. The nearest known sources[6] are at the Foot of Conejo Grande, Ventura County, and the La Brea tar pits and Mission San Gabriel, Los Angeles County.

Though not strictly artifacts, the fossil shell, fish bone, and mammal bone occurring in the site were probably obtained from vertebrate and invertebrate localities that abound in the canyon. A variety of lithic materials occurring in the habitation deposit cannot be explained in the light of our present knowledge. The physiography of the Tank Site implies that all the lithic material must have been transported to the village and therefore must have, at one time or another, served some function in the daily pattern of living. Examples are the massive rocks and cobbles, weighing ten pounds or more, which show no signs of having been worked.

[5]Hoots, 1931, map, pl. K, pp. 92-97.

[6]Heizer and Treganza, 1944, localities 6, 7, 8, p. 335.

BURIALS

Dissociated fragments of long bones were encountered throughout the excavation. All showed old breaks and a few bore the tooth marks of rodents. This sporadic occurrence of isolated bone probably indicates burial disturbance, although the cause of disturbance could not be determined. In addition to fragmental bone, eight burials were excavated. The bones themselves are in a very fragile state. Decalcification has been carried to the point where fragments give only a mild reaction in hydrochloric acid. Mineralization, if present, is slight, being due primarily to the physiography of the site and the excellent drainage which provided little opportunity for the accumulation of ground water. Nearly all of the long bones and skulls had been repeatedly fractured while in the ground; some of the skulls were crushed flat. Ribs, vertebrae, and smaller body bones were present, but often only as mere suggestions. In the main, it was impossible to expose and preserve them. The nature of the adobe soil matrix has not been conducive to good preservation. In the shallow portions of the site, where most of our burials occurred, the summer aridity caused the opening of large fissures, which extended some distance laterally, as well as vertically, from the present surface to the bottom of the deposit. This phenomenon, plus the fact that the surrounding soils were harder than the bone material, made exposure of the skeletal remains extremely difficult. Burials were first isolated on a base, then gradually worked out. This took from four to six days, a soft brush and dental tools being used.

The abundance of artifacts in the deposit was so great that it was difficult to determine burial offerings. However, six metates were definitely in association with burials. Burial 3 contained, in addition to a large metate, a small quartz crystal in the upper pectoral region and a rough pressure-flaked chert knife or blade in the pelvic cavity (pl. 15, f). Burial 4 contained a metate, a pressure-flaked chalcedony point near the right humerus, a pocket of ground limonite pigment in the pelvic cavity, and a deposit of asphaltum over the distal end of the right femur. This bituminous residue shows what we consider to be textile impressions.

At present the skeletal material is being reconstructed. Because of the fragile condition of the specimens, it will be some time before observations and measurements can be presented.

It was observed in every instance that granules of hematite pigment were markedly abundant within the localized burial area. However, the occurrence was not in such quantity as to constitute a "red ochre" burial. All metates, regardless of their position in reference to the skeletons, were inverted.

BURIAL TYPES

There were eight burials. Of these, six were extended with the heads oriented in a southerly direction. (Pl. 13, a, b.) In two instances, the faces were turned east; in another, the face was turned west; and the orientation of three was indeterminate. Four of these six burials lay in the dorsal (supine) position, one in the ventral (prone) position, and the position of one was indeterminate.

The other two burials were partial reburials under inverted metates. Of these, a bundle of fractured long bones was all that remained. We have no explanation of this burial procedure. It is possible that the bodies were disturbed anciently during excavation of pits and that some of the bones were then reburied under metates. It may be that reburials represent a method of ultimate disposal of human remains alternative to primary inhumation in the flesh. Our evidence at this point seems inconclusive, because of the scant comparative material on burial practice available for our area. Additional excavation of the Tank Site is needed before any definite statement on this point can be made.

Burial 1
(Pl. 15, a)

Location: section 14R3.
Depth: 12 in.
Type: primary inhumation in the flesh.
Condition: incomplete, possibly disturbed.
Orientation: undetermined.
Position: undetermined.
Sex: undetermined.
Remarks: Two tibiae and one fibula were still in position; the remainder of the skeleton was missing.
Artifacts in association: Though many flaked artifacts were found within the grave area, none can be held with assurance as definite associations.

Burial 2
(Pl. 15, d)

Location: sections 14R7-15R7.
Depth: 19 in. to skull.
Type: primary inhumation in the flesh.
Condition: poor, long bones present but badly fractured; skull crushed.
Orientation: head S.
Position: extended on back (supine).
Sex: undetermined.
Remarks: Lower extremities may have been disturbed. What was taken to be a hearth lay near the feet, though the bones showed no burning.
Artifacts in association: metate, abundant granules of hematite in burial area.
Artifacts in possible association: chopper, two scrapers, mano.

Burial 3
(Pl. 15, f)

Location: sections 14R7-15R7.
Depth: 18 in. to skull.
Type: primary inhumation in the flesh.
Condition: poor.
Orientation: head SSW.
Position: extended on dorsal (supine) side.
Sex: undetermined.
Remarks: Femora and tibiae were in fair condition, skull badly crushed. Somewhat platycenemic tibiae.
Artifacts in association: metate, three manos, small quartz crystal, flaked, brown chert blade (pl. 21, i), granules of hematite.

Artifacts in possible association: six scraper planes, fragment of stone cog (pl. 24, k), hammerstone, chopper, mano, metate fragment.

Burial 4
(Pl. 15, e)

Location: sections 14R7-15R7.
Depth: 19 in. to skull.
Type: primary inhumation in the flesh.
Condition: poor.
Orientation: head S.
Position: extended on ventral side (prone).
Sex: undetermined.
Remarks: Burial lay on base of mound; bones in poor condition due to soil compaction and cracking.
Artifacts in association: metate, mano, chalcedony point, limonite pigment, granules of hematite. Deposit of asphaltum on femur strongly suggests a textile imprint.
Artifacts in possible association: three scraper planes, flake scraper, chopper.

Burial 5
(Pl. 15, b)

Location: sections 14R8-15R8.
Depth: 13 in. to skull.
Type: primary inhumation in the flesh.
Condition: poor.
Orientation: head S.
Position: extended on dorsal side (supine), knees slightly flexed.
Remarks: only burial with no associated metate. Hearth near feet.
Artifacts in possible association: six scraper planes, fragment of possible stone cog, hammerstone, chopper, mano, metate fragment.

Burial 6
(Pl. 15, c)

Location: section 19R10.
Depth: 7 in. to skull.
Type: primary inhumation in the flesh.
Condition: poor.
Position: fully extended on the dorsal side (supine).
Orientation: head S.
Sex: undetermined.
Remarks: Burial apparently had been subjected either to disturbance or chemical dissolution, probably the former. The skull was badly smashed and the pectoral region could be detected only in outline. One humerus, radius, and ulna were still in an extended articulated position. Frgments of leg bones were present, but all showed old breaks and were disturbed. The presence of five metates, numerous artifacts, and quantities of reject stone were in such a position as to suggest a lithic cairn surrounding the burial, though not over it. A partial reburial (burial 7) was found under one of the associated metates.
Artifacts in association: five metates.
Artifacts in possible association: one scraper plane, nine scrapers, one chopper, two core hammerstones, three manos, and one point fragment.

Burial 7
(Pl. 16, f)

Location: section 19R10.
Depth: 6 in. to top of metate.
Type: incomplete secondary inhumation (reburial).
Condition: fragmentary long bones.
Position: none.
Sex: undetermined.
Remarks: Selection was made of some of the fragmentary long bones and a fragment of the scapula. All bones present showed old breaks. In close association with extended burial 6.
Artifacts in association: killed metate placed over bones. This metate was one of the five which formed a cairn around burial 6.

Burial 8

Location: section 21L2.
Depth: 30 in. to 36 in.
Type: incomplete secondary inhumation (reburial).
Condition: fragmentary long bones.
Position: none.
Sex: undetermined.
Remarks: This is a partial reburial containing a few fragments of long bones. Bones present were in a fair state of preservation, perhaps owing to the depth and the protection of the overlying metate. Soil around the burial was more like a real refuse deposit than like the altered surrounding soil; small fragments of shell were present as well as a fragment of bird bone.
Artifacts in association: killed metate.
Artifacts in possible association: scraper, hammerstone, mano.

FEATURES

The term "feature" is here used to denote those objects which we considered atypical of the general run of the deposit material: it would include, for instance, unusual aggregations of stones, possible hearths, etc. The term "hearth" is used only tentatively for unusual clusters of stones which appear to show evidence of carbon smudge and fire fractures. Ash or charcoal lenses were not themselves present; however, charcoal in highly disintegrated form appeared more frequently in association with these stones than in the surrounding areas. An objection to the use of "hearth" may be raised because the implements which occur frequently in association with fire-fractured material themselves show little or no evidence of contact with heat. (Pl. 16, a, d; pl. 15, d.)

We have also used the term "feature" to illustrate specific aspects of artifact concentrations as well as

data we wish to emphasize which have a direct bearing on the antiquity of the site.

In order not to overlook important observations, full photographic records were made. Upon conclusion of the excavation, some things which, in the early stages of work, appeared unusual proved to be commonplace items which could be included in the general description; hence, we have omitted some of these in the list of features given below. For instance, the first mammal bones excavated with artifact association were completely fossilized. Later, as additional human and other mammal bone was recovered, we found the difference in degree of mineralization too great to support the hypothesis of contemporaneity of the bones and associated artifacts. It then became obvious that the inhabitants of the Tank Site must have obtained fossil bones from some near-by place and transported them to the site. The first four features, as well as numbers 7 and 9, apparently had such an origin; hence they do not appear in the description below. In the following paragraphs we have retained our original numbering system, since these numbers occur in illustrative photographs here.

Feature 5 (pl. 15, c).--Unusual concentration of artifacts, showing partly exposed metates, scrapers, manos. A drilled crescent-shaped chlorite-schist object (pl. 23, a), which does not show in illustration, was found on top of this concentration, and fragments of human long bone occurred under it. This feature may represent a much disturbed burial or possibly a definite type of reburial.

Feature 6.--A badly weathered, inverted sandstone metate exposed in the south sidewall of section 14R9.

Feature 8 (pl. 16, d).--Sections 18R10-17R10, demonstrate artifact concentration at levels of 0 in.-6 in. and 6 in.-12 in. In the illustration a possible hearth may be seen in the foreground.

Feature 10 (pl. 16, e).--Badly weathered, inverted metate, manos, and core hammerstones. Fragments of human leg bones may indicate a reburial, though none of the bones occurred directly under the inverted metate.

Feature 11 (pl. 16, b).--An association of three core hammerstones, a scraper, a mano, a weathered, killed metate, a small mortar, and a possible white pigment slab.

Feature 12 (pl. 16, a).--An inverted, weathered metate, associated with possible hearth and artifacts.

DESCRIPTION OF ARTIFACTS

FLAKED TOOLS

Scraper Planes

These constitute the largest single class of percussion chipped stone artifacts from the Tank Site. Our series is based upon 930 selected specimens. By "selected" we mean that fragmentary or dubious pieces, although saved, were not included in our types. One of our aims in this project was to frame a typology into which specimens would fall without being forced. A classification of artifacts of unknown use is purely an artificial one devised by its creator as a convenience in describing implements. The descriptive terms used in such a classification may not necessarily have any bearing on the function of the artifacts from the point of view of the original user. For this reason, caution should be exercised in carrying the comparative method between cultures too far. Typologies, however, when not overemphasized, may serve as useful tools in archaeological interpretation.

The magnitude of our series, when considered as coming from the partial excavation of a single site, presented certain problems normally not encountered in a small lot of specimens. It is granted that the fewer specimens one has to deal with, the more apt one is to consider the extremes and to set them up as types. It is unfortunate that the literature of the early Californian lithic industries has so far failed to provide us with adequate data about the numbers of artifacts or of sites from which the existing classifications of lithic material have been derived. The difficulty we have encountered at the Tank Site in classifying lithic artifacts may well prove a warning to future workers in the same field. What we have to say about scraper planes holds true for most of our chipped stone artifacts.

The attempt to set up for scraper planes a purely objective classification based upon exterior form and manufacturing technique immediately confronted us with the question how we might honestly equate our findings with those reported in previous publications. When one is dealing with a large series of crudely made tools, the question arises where to draw the line in segregating types. The classification of Tank Site chipped forms set up by Heizer and Lemert (1947) would appear to be composed of distinct types, when only a small series of implements is considered. The results, however, were unsatisfactory when an attempt was made to apply this classification to our large series. For example, it was found that the gradation from the flat oval specimens to the angular beaked or keeled ones was so gradual that no valid line could be drawn placing the two extremes in two distinct types.

The desired aim in the manufacture of scraper planes was apparently to obtain a flat or semiflat planing surface, regardless of the form of the rest of the exterior. It appeared to matter little whether this exterior form was round, keeled, turtleback, or beaked. Our specimens of scraper planes would seem to indicate that the forms of this class of artifact were either accidental or determined by the way the particular surface lent itself to flaking. At the same time, some of the better examples suggest that the individual desires of the maker may also have been a factor. It should not surprise us to find that among the aborigines there were some craftsmen who were by nature artists. In the main, however, it would appear, as Heizer and Lemert suggest, that the Topanga toolmakers had only some generalized goal in mind. Or, it might be added, the function of these tools may not have demanded any specific degree of perfection in manufacture.

On the basis of the general form, the form of the base, and the chipping technique employed, the following six

Table 1

Scraper Plane Types

Type	Occurrence by depth (in in.)									Total
	0-6	6-12	12-18	18-24	24-30	30-36	36-42	42-48	48-54	
IA	14	19	8	7	5	4	1	1	...	59
IB	3	2	3	...	...	1	1	...	...	10
IC	18	35	20	10	11	7	1	...	...	102
IIA.	154	202	151	87	47	27	8	5	2	683
IIB	11	7	9	...	1	...	...	2	...	30
III	8	11	4	11	4	5	2	1	...	46
Total . .	208	276	195	115	68	44	13	9	2	930

types of scraper planes are recognized, though it should be emphasized that no sharp line separates our types. For this reason we have attempted to illustrate the range in types rather than to create an illusion of differentiation by showing only the better made specimens and the extremes.

Type IA
(Pl. 17, a-d)

Method of manufacture: formed by striking vertical or steeply sloping flakes off the entire perimeter of a flat platform core or percussion bulb.

Form: outline round to ovoid.

Remarks: Top surface generally shows considerable flaking, probably an attempt to produce a symmetrical implement or to take off sharp edges so that the tool might be more easily held in the hand. Sizes range from 10 cm. diameter by 5 cm. height to 5 cm. diameter by 2.5 cm. height. Of all the scraper plane specimens, these exhibit the most perfection in form and chipping technique.

Type IB
(Pl. 17, e, f)

Method of manufacture: This type differs from type IA only in the angle of flaking. Flakes are struck off the base at an angle of almost 90 degrees at one point, the angle becoming less acute in both directions from that point. Thus a form is produced having a degree of slope from about 90 degrees in the back (?) to 45 degrees in the front (?).

Form: The base ranges from circular through ovoid, the top surface rising to a peak or ridge which is somewhat off center.

Remarks: Sizes range from 9 cm. diameter by 9 cm. height to 5 cm. diameter by 3.5 cm. height.

Type IC
(Pl. 19, a-c)

Method of manufacture: This type is likewise a variant of type IA. The edge flakes are struck off all the way around the perimeter at a steep, nearly vertical angle, producing specimens in most of which the height exceeds the diameter. Flaking technique appears cruder than in the preceding forms. At times only the periphery is flaked, leaving the upper surface of natural patinated stone. (Pl. 19, a.)

Form: circular through ovoid to rectangular. Some specimens show keeling on top, others are flat.

Remarks: Sizes range from 6 cm. diameter by 6.5 cm. height to 1.5 cm. diameter by 2 cm. height.

Type IIA
(Pl. 18, a-c)

Method of manufacture: These differ from all the type I forms, which show working on the entire periphery of the base. The type II pieces have the base worked from only half to three-quarters around. The unworked area is generally a straight edge resulting from the removal of a large primary flake or is the old patinated edge of a natural fracture.

Form: As a type this group expresses the greatest range in variability of all the scraper planes. The base is always characterized by an unworked area generally constituting a straight margin. Were it not for this last feature, most forms would be variants of circular to oval, though some might be classed as approximating a rectangular form. The top surfaces range from a sharp beak to a long keeled crest; from rounded to undifferentiated forms.

Remarks: It is obvious that the treatment or appearance of the surface was of little concern to the maker. A flat planing base was the prerequisite; the working edge was shaped by striking off vertical flakes from a portion of the periphery. The removal of these flakes largely determined the external appearance of the specimen. Class IIA includes the largest of our specimens, many of which approach and even exceed in size the massive scraper planes from the San Dieguito culture which Malcolm J. Rogers[7] has termed "pulping planes." Sizes range from 12 cm. di-

[7]M. J. Rogers (1939, pl. 2, c) illustrates a scraper plane from the Pinto-Gypsum culture. In the past comparable specimens have been on display in the San Diego Museum of Man as representative of the coastal phase of the San Dieguito culture.

ameter by 7 cm. height to 4 cm. diameter by 2 cm. height.

Type IIB
(Pl. 19, d-f)

Method of manufacture: This type differs from type IIA only in the technique used for the periphery of the base. Type IIB specimens show secondary percussion chipping, whereas the IIA type exhibits only the removal of primary flakes. Whether this secondary work was for the purpose of resharpening the IIA specimens or whether it constitutes a distinct technique cannot be determined. Since we have some thirty similar specimens, we feel justified in giving them a separate type designation. The small flakes removed are struck from the base at about the same angle as the primary ones, thus producing an undercut or shelf-apron effect about 2 to 4 cm. up from the base.

Form: same as type IIA except for the apron effect around part of the base.

Remarks: Sizes range from 10 cm. diameter by 6 cm. height to 5 cm. diameter by 4 cm. height.

Type III

Method of manufacture: This type is distinguished from all other scraper planes by its possession of two distinct working faces. The basaltic rock often fractures so that two flat surfaces are formed; these surfaces meet at an angle of about 45 degrees. The margins of these faces are flaked back as in the other types. Either face by itself would give the specimen the general appearance of a type IIA specimen.

Form: Specimens tend to assume a subrectangular shape with a rough triangular cross section.

Remarks: Specimens average about 7 cm. length by 5 cm. height. Since it is impossible to show both faces in a single photograph, this type has not been illustrated.

Scrapers and Choppers

Side scrapers (pl. 23, n, o, s).--These are somewhat like the scraper planes, one surface being a flat cleavage plane or percussion bulb surface. Primary flakes are struck from the periphery at low angles, producing thin, flattened surfaces in contrast to the high scraper planes. The shapes are ovoid to angular; some pieces have curved margins.

Usually the primary flaking is emphasized on one side, producing a curved scalloped working edge, which may extend three-quarters of the way around the specimen. Some show a little secondary pressure flaking or trimming along the working edge. One almond-shaped piece, made from opaque quartz (pl. 23, r), shows primary flaking on the entire periphery. It is possible that this piece may prove, when additional excavation is done, to be a distinct type. At present it is atypical of the group as defined here.

Straight-edge knives or scrapers (pl. 20, m, n).--The manufacture of this type apparently did not involve much preliminary thought. It is more likely that any rock with a natural straight or slightly curved sharp edge was merely flaked back and put to use. The fact of random selection, however, does not preclude the assumption that these specimens, varied as their forms are, constitute actual artifacts.

The implements in this group are so varied that they cannot be classified as to shape. Their distinguishing feature is a single straight or slightly curved edge, which often shows use or secondary retouching. They might equally well be used as knives or scrapers.

Ovate or discoidal scrapers (pl. 20, o, p).--Normally, a large percussion bulb with a flat base was selected. The base was generally trimmed around the periphery and the top surface was worked down in varying degrees.

The artifacts in this group vary considerably in size. Typical specimens are roughly circular in outline. Top surfaces are turtleback in form, varying in finish from the removal of a few flakes to an over-all surface retouching. Specimens which do not have the flat percussion bulb base are worked on both sides, producing a lenticular cross section. It may be these last will prove to be a distinct type.

Table 2

Scrapers, Choppers, and Hammerstones

Artifacts	Occurrence by depth (in in.)								Total
	0-6	6-12	12-18	18-24	24-30	30-36	36-42	42-48	
Scrapers									
Side	42	31	16	12	4	1	3	2	111
Straight-edge side	21	17	8	3	8	1	...	2	60
Ovate	8	10	5	7	1	1	1	..	33
End	5	7	4	1	...	2	...	..	19
Snub-nose	6	9	4	1	1	...	...	..	21
Flake	9	13	2	3	1	...	1	..	20
Choppers									
Unifaced	13	14	9	10	7	1	...	..	54
Bifaced	19	22	19	10	3	3	1	2	79
Core hammerstones	55	91	93	37	20	9	4	3	312
Total	178	214	160	84	45	18	10	9	718

End scrapers (pl. 20, k, l).--Generally a rectangular stone was selected so that one of the narrow ends might be shaped up. The working margin was produced by striking off flakes at a low angle. Some specimens show only primary flaking, whereas others exhibit secondary pressure work, possibly the result of resharpening. Bases are, in the main, smooth, since they consist of flat percussion bulbs. When flat surfaces were lacking on the original stone, attempts were made to produce a prepared flat base by striking off thin flakes.

The exterior form of these implements shows considerable variation. These scrapers are lighter in weight than most scraper planes and they tend to be somewhat flattened and inclined toward rectangular forms. The working margin is restricted to one of the narrow ends.

Snub-nose scrapers (pl. 20, f, g).--This type is essentially like the end scraper; the distinguishing feature is the abrupt angle at which the flakes are removed from the working edge. The majority are characterized by the removal of small secondary flakes, emphasizing the snubbed feature. In form; these implements are irregular, though tending toward the rectangular.

Cobble scrapers (pl. 20, c).--This type consists merely of split cobbles which show evidence of wear along the rounded edge of the fractured surface. In shape, they are ovoid, resembling M. J. Rogers'[8] "Teshoa flake" type from the Mohave Desert region.

Flake scraper or knife (pl. 20, h-j).--These are large flat flakes, many of which, struck from a core, contain portions of the percussion bulb. The thin margins all show pressure retouching or wear from use.[9] The flakes are irregular to ovoid in shape; the cutting edge follows the naturally curved contour of the flake.

Unifaced choppers or heavy duty scrapers (pl. 20, d, e).--This type ranges from fragments of heavy cores to large sections struck from cobbles. One face is generally a natural stone surface, the other shows varied degrees of working. The working or cutting edge is sharp, since the flakes are struck off at low angles. None show a fine degree of retouching on the working edge, though the edge of most specimens is battered from use. These implements, whether scrapers or choppers, must have been used for fairly heavy work. They range from ovoid to rectangular in form.

Bifaced choppers (pl. 20, a, b).--Typologically, these specimens are essentially cores with two faces worked down by rough percussion flaking. The technique was to strike off alternate flakes, producing a scalloped cutting edge partly or completely around the margin of the specimen. Most of these tools, regardless of their size, are shaped to fit comfortably in the palm of the hand. The cutting margins of some specimens are badly battered; this is best illustrated in the quartzite pieces. These artifacts are roughly circular in outline and lenticular in cross section.

Projectile Points

There are few projectile points, as compared with other stone artifacts. This low frequency, plus the rarity of mammal bone, suggests strongly that the hunting of the larger game animals was of little importance to the inhabitants of the Tank Site. Of our 31 points, only 11 are complete enough to show diagnostic characteristics; the remainder are either midsections or tip ends. In general, these specimens demonstrate an unrefined pressure flaking technique. This crudeness is partly due to the material selected. Basalts and quartzites are not naturally adapted to pressure flaking nor do they exhibit the well-defined conchoidal fracture of chert, obsidian, chalcedony, quartz, etc. However, even the better-made pieces composed of these silicates do not compare typologically or technologically with examples of the refined workmanship of the later coastal peoples. The basalt points all show a considerable degree of surface patination, the silicates little or none. Only one specimen was found accompanying a burial; this is either a large projectile point or a knife. (Pl. 21, i.) So few projectile points were recovered that we have made no attempt to classify them in a symbolic typology but will refer to them in descriptive terms.

Side-notched points (pl. 21, o, p).--There are no complete specimens of this form. The side notches are irregular and the basal portion somewhat rounded. Good chipping technique is absent. The reconstructed lengths of two of the specimens are respectively 4.5 cm. and 3.5 cm.

Contracting-stem points (pl. 21, f-h).--Three specimens were found, two of which were complete. The sides are straight to slightly convex. The basal portion of one specimen ends in a well-defined contracting stem; in the others this stem is not so apparent. Lengths range from 3.5 cm. to 4.2 cm. The materials are basalt and chert.

Lozenge points (pl. 21, k, l, m, n).--These include a wide range of forms, and a large series will no doubt justify further segregation. The shapes of our four specimens range from almost symmetrical lozenges to not so well-defined forms. Lengths range from 3.7 cm. to 3 cm. The materials include basalt, chert, and obsidian.[10]

Concave-base points (pl. 21, i, j).--Of the two specimens obtained, one was associated with burial 3. The other, found not far away, may also once have been in the same burial complex. The two specimens are almost identical in form and are made of the same dark brown chert. Though the chipping technique is rough, the specimens show skill in manufacture and are by far the best examples of chipped stone thus far removed from the deposit. The outlines are triangular, the sides slightly convex, and the concave bases are well defined. Cross sections are lenticular and very thin. In both specimens the basal tangs are missing, but there seems little doubt as to their original form. If hafted, these points might equally well have served as knives. The lengths are respectively 6.5 cm. and 6.6 cm.

Point fragments.--Because of the scarcity of points in the deposit, we have illustrated, in addition to the well-defined forms, several of the better incomplete specimens. One (pl. 21, t) is made of a poor grade of white quartz. It seems odd that, with better lithic material available, this quartz should have been chosen for flaking. A second specimen (pl. 21, s) is likewise of quartz and has a concave fluted base. We by no means imply, however, that we have

[8]Ibid., p. 12, and pl. 3.

[9]Heizer and Lemert (1947, p. 240) report no retouching on the margins but conclude that these implements represent a functional type. The nature of our specimens justifies their assumption.

[10]Heizer and Treganza, 1944, locality 21, p. 315. This unusually poor grade of obsidian probably came from a known aboriginal quarry in Ventura County.

Table 3

Projectile Points

Points	Occurrence by depth (in in.)										Total
	0-6	6-12	12-18	18-24	24-30	30-36	36-42	42-48	48-54	54-60	
Side-notched	...	2	...	...	...	...	...	...	...	...	2
Contracting-stem	...	2	1	...	...	...	...	...	...	...	3
Lozenge	2	1	1	...	...	...	...	...	...	...	4
Concave-base	...	1	1	...	...	...	...	...	...	...	2
Fragments	11	7	1	1	...	...	...	...	...	...	20
Total	13	13	4	1	...	...	...	...	...	...	31
Heavy blades	...	1	5	...	1	1	...	2	...	1	11

Folsom affinities represented here. The flute is probably the result of the accidental removal of a channel flake during the process of making the concave base. Comparable examples have been observed elsewhere.[11] The remaining two fragments (pl. 21, q, r) are of chert and a poor-grade obsidian, respectively. Their forms suggest points found elsewhere, but since the bases are missing, no definite inferences can be drawn.

Heavy leaf-shaped blades.--Heavy chipped blades of basalt are of special interest, for they differ considerably from the projectile points thus far considered, especially in the crudity of their manufacture and the degree of surface patination on the old flake scars. Since these implements may be of importance for future comparative work, the specimens are described separately as follows.

1. One specimen, already described by Heizer and Lemert,[12] comes from the surface a short distance below the site. It was either originally dropped there or, more likely, it has in the course of time weathered out of the deposit. The form is leaf-shaped, somewhat more pointed at one end. The blade is 7.3 cm. long by 3 cm. wide by 1 cm. thick. (Pl, 21, c.)
2. This specimen was found lying on top of the back-dirt pile at the end of the excavation. Presumably it originally came from the last dirt removed from the base of the mound, that is, from a depth of about 18 in. It is slender and leaf-shaped, pointed at one end, gradually expanding toward a blunt but somewhat rounded-off base.[13] It is 7.5 cm. long by 2.5 cm. wide and 1.2 cm. thick. (Pl. 21, b.)
3. This specimen was found in situ in the 36 in.-42 in. level. Though the tip is missing, an accurate reconstruction is possible. The form suggests a willow-leaf type, though the base is blunt. Reconstructed measurements are: length, 9.5 cm.; width, 4 cm.; thickness, 1.1 cm. (Pl. 21, a.)

[11]Heizer, 1938, p. 180.

[12]Heizer and Lemert, 1947, fig. 1, c, p. 240.

[13]Typologically, this specimen resembles one illustrated for the Playa-San Dieguito culture by M. J. Rogers, 1939, pl. 9, i.

In addition to the specimens described above, the end sections of two more large, leaf-shaped blades were recovered. Their size and form suggest possible knives. If complete, they would be too heavy for any projectile point except a thrust spear. M. J. Rogers[14] and Campbell et al.[15] illustrate complete specimens from the Lake Mohave region. (Pl. 21, d, e.)

Drill or Reamer

Though we have found direct evidence of biconical drilling on several artifacts, we have only three specimens which were probably actually used as drilling tools. The flaking is rather crude and the cross sections triangular. These specimens were probably all used as hand reamers, for the basal ends appear too cumbersome for hafting. Nothing has been recovered thus far that would approach the refined hafted drill of later times.

Two of these reamers were made of chalcedony, one of obsidian. Lengths range from 6.5 cm. to 3.4 cm. (Pl. 23, l, m.)

Hand Pick

A single large specimen of a hand pick offered the only direct evidence of a stone digging tool. This implement, though its surface is flaked all over, is so constructed that the expanded end fits comfortably into the palm of the hand. The digging end is roughly flaked and tapers rapidly to a triangular point. The material is basalt. The dimensions are: length, 8.5 cm., width at hand end, 8.2 cm. (Pl. 23, q.)

GROUND OR PECKED STONE

Problems Related to Metates and Manos

The contrast in numbers and variety of types between manos and metates in our collection requires an explanation. We found a great many manos of a variety of types, whereas the metates were few and limited typologically. There is always the possibility that so far we have failed to excavate in the locality where metates are concentrated, though this seems improbable considering our

[14]Ibid., pl. 6, g.

[15]Pl. 40.

widespread sampling of the site. If there is an actual disproportion, as there appears to be, then it may be that these milling slabs were community property and several families, each with its own manos, used the same metate. Excavations yielded no data suggesting that metates were associated with house sites, nor are any of the metates of the type which would be set in a permanent location like, for example, the mealing bins of the Hopi. In fact, the way in which, in all types, the sides tend to curve under toward the base may well have been specifically designed to enable a person to get a firm grip on the slab when picking it up and moving it from place to place. It can probably be assumed that the Tank Site metates were portable implements. The average weight is about 25 pounds; a few weigh up to 75 pounds.

The variety of mano types may possibly be explained by the different materials of which metates and manos are made. That is, the evolution (wearing down) of the metate and the mano may not necessarily be the same. The source material for metates was local massive sandstone deposits which were not too highly consolidated. The cobbles used for manos were derived from the local conglomerates, among them sandstone cobbles which are highly consolidated and considerably harder than the massive sandstone used for the metates. Some of the granitic cobbles have an even higher hardness index. Unless a user manipulated the mano with a motion of mechanical precision, the wear surface on the metate, in time, would deviate from that of the mano, especially since the two implements are of materials of different hardness. Add to this the possibility of several users of the metate, no two of whom would grind the same way or with the same mano. What we suggest is that, in the lifetime of a metate, the mano would have to be changed from time to time in order to correspond with progressive changes in the contours of the metate basin. Everyone who engaged in milling activities might have had to possess a series of manos. If this were so, the greater frequency of manos as compared with metates would be easily understood.

The ratio is about eight and one-half manos to every one metate; 358 classifiable manos plus 875 fragments give us a total of 1,233 manos. Of the 150 metates recovered, 29 could be typed and 121 were fragments. The possibility should not be overlooked, however, that, since metates appear to be a burial association, they may still exist in quantity in a cemetery of concentrated burials. Further excavation may settle this point.

Metates

Metates are of three types, called here deep basin, shallow basin, and flat slab. With the exception of a single granite fragment, all are of sandstone.

Type I, deep basin (fig. 1, a-f; fig. 2, a-c).--These are the most abundant. Eleven complete specimens and three fragments were recovered. All were of medium to fine, equigrained, light yellow sandstone. In outline, they vary from irregular ovoid to subrectangular. Grinding basins are ovoid to amygdaloid. In the narrow cross section, the depressions are steep-sided and fairly symmetrical. In the longitudinal cross section the cavity tends toward a gentle slope at one end, gradually developing into a deep concavity at the other. The grinding depressions are, as a rule, off center, often being so close to one edge of the metate as to form a sharp lip. A lateral rim segment might easily be confused with a mortar fragment. Numerous yoke-shaped fragments indicate that many metates were worn completely through. Two whole metates appear to have had their bottoms punched out (killed); both were associated with secondary reburials. Normally, the mealing basin was ground into a flat-surfaced, flat-bottomed, unshaped sandstone block. In a few, the sides and bottoms show some evidence of shaping by pecking and grinding. The entire exterior of a single large rectangular metate was abraded to a symmetrical form. The grinding surfaces, like those of the manos, were resharpened with some sort of stone-pecking tool, probably the core hammerstone; this would account for the great quantity of these implements found.

There is evidence to suggest that some metates of the deep-basin type may have been derived from implements of one of the other two types. In some specimens the edge of the deep depression is encircled by an old wear surface which is probably the peripheral remnant of a worn surface typical of the slab or shallow-basin type. It is probable that in some well-worn, deep-basin specimens the old working surfaces of a metate of the slab or shallow-basin type have been practically obliterated. If this is so, then, instead of the three types we have designated, we have actually only one type, showing evolutionary variation. If there were actually only one type of metate, it would largely account for the quantity of mano types and the constant gradation within the types.

Type II, shallow basin (fig. 2, d, e).--These are known to us only from three complete specimens and fragments of four others. They are composed of the same material as type I. This form is distinguished from the deep-basin type by the fact that the grinding surface is not restricted but tends to extend to the margins of the metate. Grinding was done in a broad sweeping arc, producing a shallow, circular depression. One specimen, made from a thin slab of fine-grained sandstone, would have been light enough for easy transport about the village.

Type II, slab (fig. 2, f).--Like type II, the slab metate is not common. It is represented in our collection by four complete and four fragmentary specimens. One of the smaller specimens approximates the metatelike grinding stone described by Martin and Rinaaldo (1947) for the SU site. Materials selected for manufacture were angular blocks of flat sandstone which required little further shaping; however, the whole exterior of a sandstone specimen from burial 4

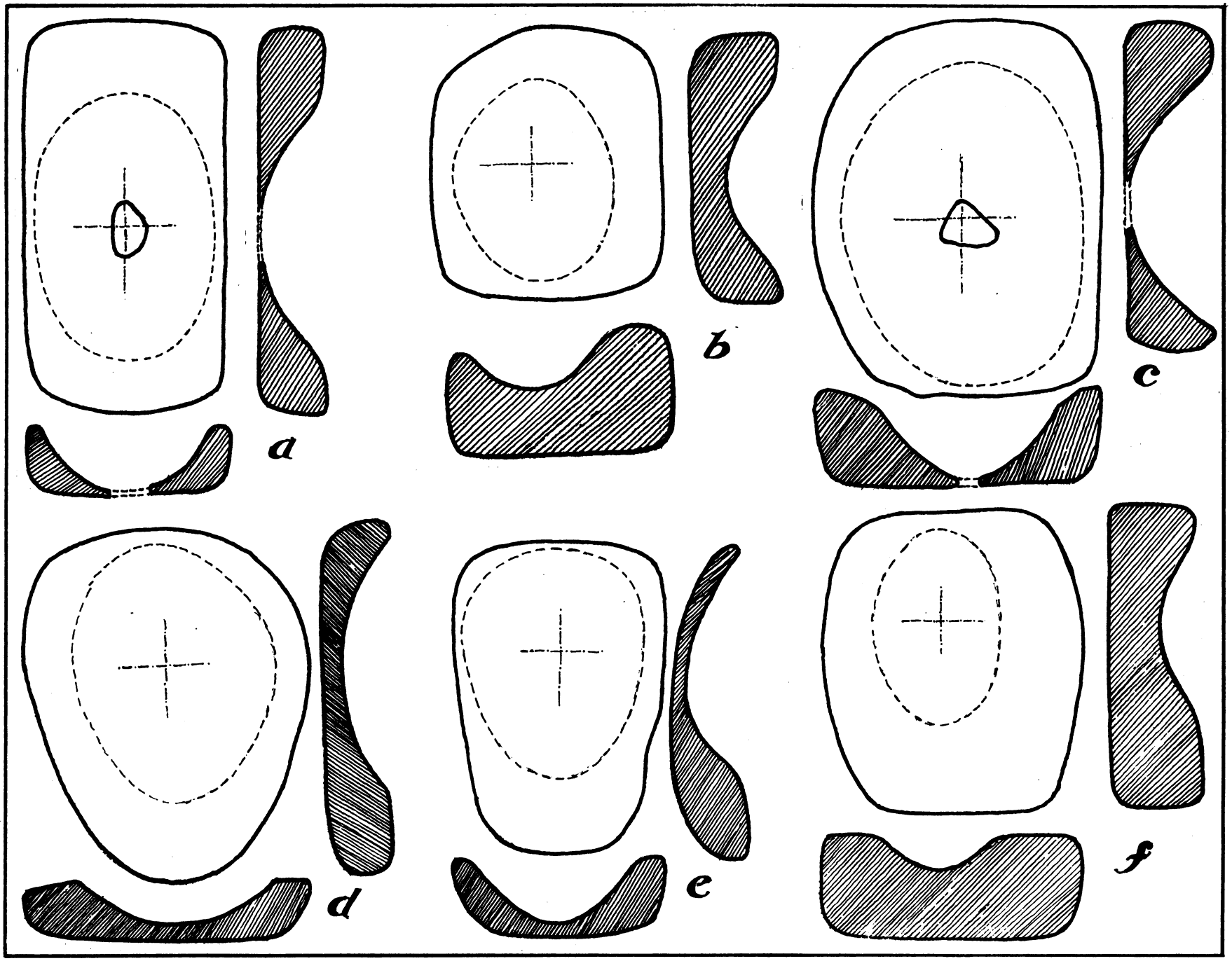


Fig. 1. Metates, type I.

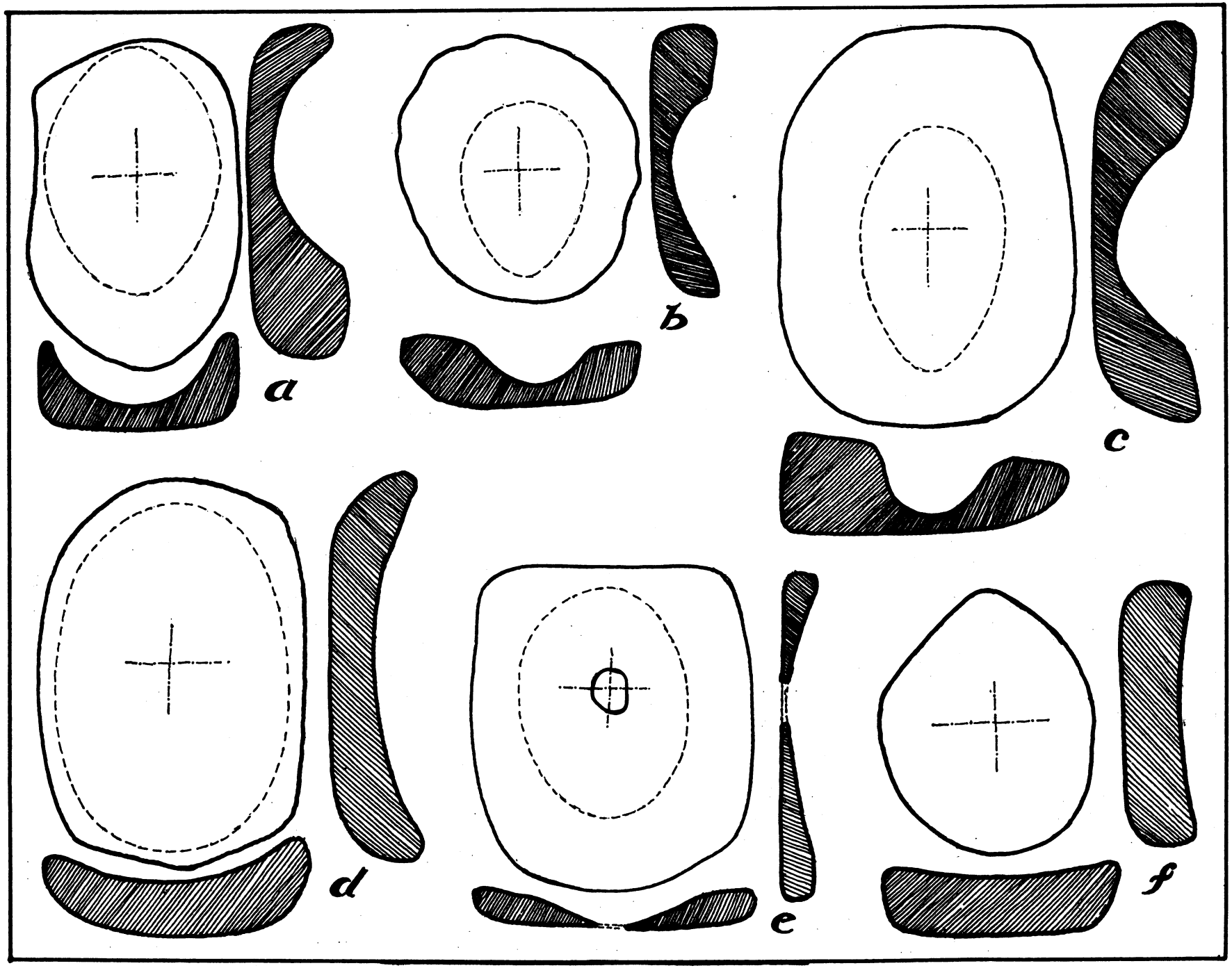


Fig. 2. Metates, types I, II, and III.

was worked down, producing a symmetrical curved underside. A single granite fragment was also thus shaped by abrasion.

In this type the grinding surface has only a slight curvature, though with continued use these slabs might evolve into the shallow- or deep-basin types. However, in specimens which were freshly sharpened (pecked), the pitting on the surface was carried all the way out to the margins, indicating a desire to maintain a flat surface or to make full use of all the available surface. It could be that the slab metate was used for the preparation of some vegetable material other than seeds and that an even surface was desirable.

Table 4

Mano Types

Types	Occurrence by depth (in in.)						Total
	0-6	6-12	12-17	17-24	24-30	30-	
IA . . .	12	12	11	5	...	...	40
IB . . .	2	7	4	...	...	...	13
IC . . .	6	12	5	3	1	...	27
IIA . .	19	32	11	8	3	2	75
IIB . .	16	27	14	6	...	...	63
IIC . .	30	39	28	12	2	1	112
IID . .	8	5	4	3	...	...	20
III . . .	2	4	2	...	...	...	8
Total .	95	138	79	37	6	3	358

Sandstone Slabs

There are two specimens in this category. One, a thin slab 1.5 cm. thick and 30 cm. long, shows evidence of abrasion on one surface. The other, a small fragment, is abraded on both sides.

Manos

The great number of manos in the site presented a problem of classification. Possible reasons for their abundance have been discussed earlier.

The typology presented below was arrived at as follows. The major divisions--unifaced, bifaced, or trifaced--were made on the basis of the number of surfaces that had been subjected to use. The subdivisions were based on form, that is, relationship of lengths and breadths, as well as the types of cross section (i.e., wedged-shaped) and the degree of wear. The description of mano types gives fuller details.

The distribution of types throughout the site seems fairly uniform and no vertical stratigraphy could be observed. In eight instances, pairs of manos of the same type were found together. Three of these pairs were associated with metates. This pairing of manos is of some interest, since it is a feature noted by D. B. Rogers for the Oak Grove culture of Santa Barbara.

Materials chosen for manos are, in general, limited to sandstone and granite. Of these, the sandstone predominates, perhaps because of its abundance in the local conglomerates. Occasionally quartzite, breccia, schist, gabbro, and basalt occur.

There is no significant difference between types in average measurements of length, width, and thickness. There may be a wide variation between individual specimens, a variation which does not hold for the group as a whole.

Type IA (pl. 22, a; fig. 3).--Type IA represents the crudest example of grinding implements. Essentially, the manos of this type are nothing more than cobbles showing evidence of slight wear on one surface. Probably some attempt was made to obtain symmetrical cobbles but this was not always done, as is evidenced by numerous irregular specimens. Continued use of such crude manos might lead to the development of some of the more refined types. As a group, they appear to represent the beginning stages of mano manufacture.

Three specimens appear to be worked over the entire surface, as evidenced from pecking. Rather than form a new type on the basis of three examples, we have included them in this group. Future finds may justify the setting up a separate type for them. In form these are "football-shaped."

Table 5

Mano Measurements

Measurements (in cm.)	Mano types							
	IA (40)	IB (13)	IC (27)	IIA (75)	IIB (63)	IIC (112)	IID (20)	III (8)
Width								
Maximum	13.2	11.6	8.0	13.2	11.8	12.4	11.4	7.7
Minimum	7.3	9.0	5.8	3.8	4.5	5.8	8.0	6.0
Average	9.7	10.1	7.2	9.8	9.4	9.5	9.4	6.9
Length								
Maximum	15.9	15.5	17.5	14.1	16.8	16.6	17.3	13.8
Minimum	10.7	11.9	11.7	9.4	11.1	10.1	12.0	11.5
Average	12.9	12.8	14.2	11.6	13.9	16.4	15.0	12.6
Thickness								
Maximum	8.1	7.7	6.9	7.8	7.3	6.8	6.7	7.6
Minimum	4.6	4.8	5.1	3.3	3.2	3.8	4.5	6.0
Average	6.8	6.8	5.9	5.5	4.7	5.3	5.3	6.3

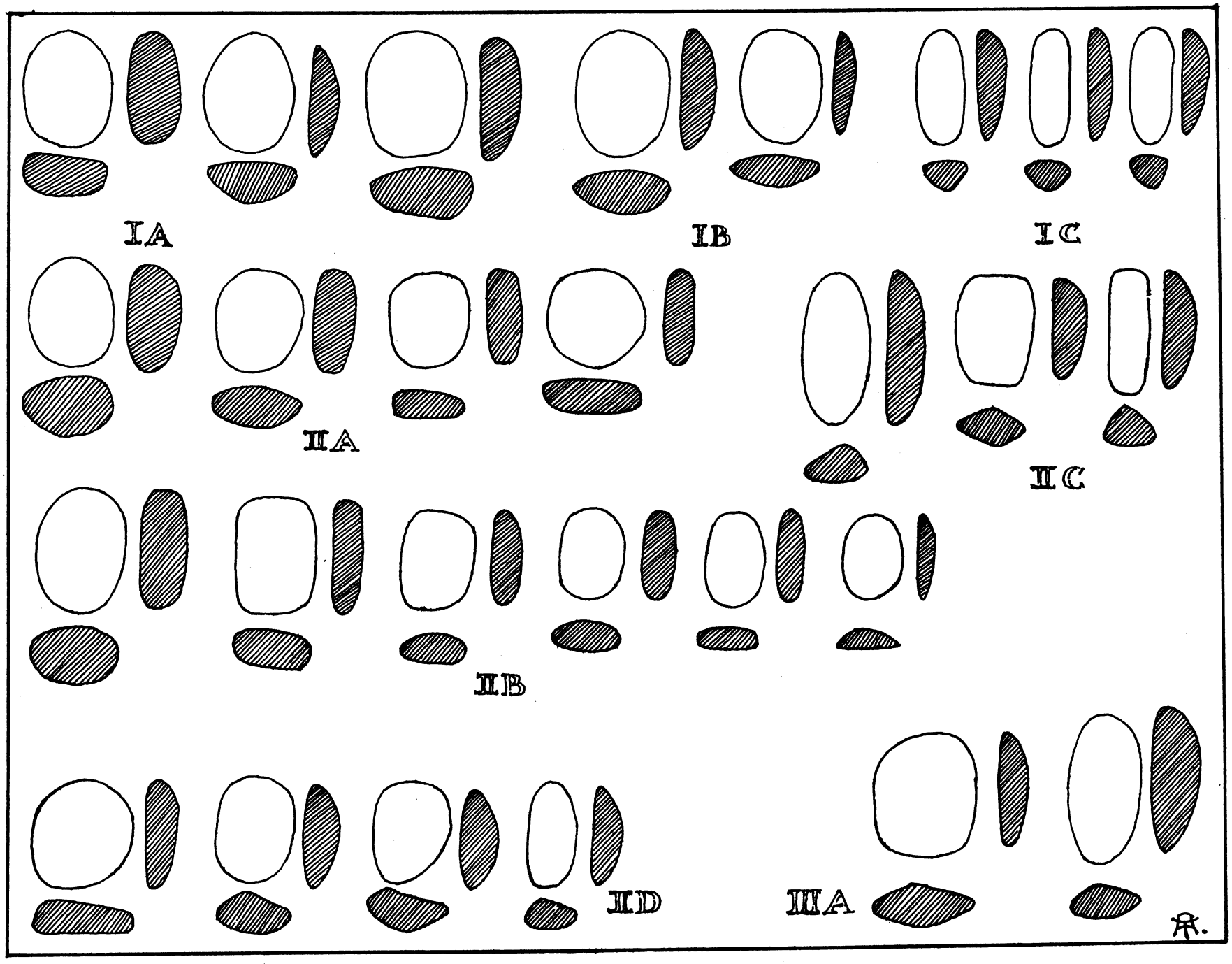


Fig. 3. Mano types.

Type IB (pl. 22, b; fig. 3).--This type is the direct outgrowth of type IA. It illustrates the results of the persistent use of one face. The specimens recovered show such a marked degree of abrasion that well-defined shoulders have been built up where the nearly flat grinding surface comes in contact with the natural curved surface of the cobble. Whether by chance or not, all of this type closely approximate a symmetrical form.

Type IC (pl. 20, d; fig. 3).--Type IC represents the most refined unifaced type. Considerable care was taken in shaping the nongrinding surface so that the mano generally tapered toward the ends, with a "turtleback" or "sugar-loaf" cross section. The form is very elongated, with only a slightly curved wear surface. The sides rise abruptly, forming a rather sharp angle with the base. Genetically, this type seems more closely allied to type III, both in longitudinal form and cross section, though type III exhibits three well-defined wear surfaces and type IC a single one.

Type IIA (pl. 22, c; fig. 3).--These are bifaced forms, ranging from almost symmetrical spherical cobbles to circular ovoid disks. Some of the forms, like those of type IA, are very irregular in outline. The wear surfaces are virtually parallel to one another, though they show some degree of curvature from use in a shallow-basin metate. Specimens range from those exhibiting a slight degree of wear to thin, well-worn disks. A few have shaped or pecked ends. There is no sharp distinction between this type and type IIB.

Type IIB (pl. 22, g; fig. 3).--As a group, this type differs from IIA in one of two respects; they are quite elongated and the cross sections are more curved, tending toward the lenticular. In this type it is not infrequent to find the ends battered or pecked back, which results in an angular rather than oval form. As a rule, one surface shows more wear than the other. Four specimens are practically flat on one surface and well rounded on the other, suggesting a dual use on either a slab or a basin metate.

Type IIC (pl. 22, e, f; fig. 3).--Type IIC specimens are bifaced, and wedge-shaped in cross section. In form they range from ovoid to elongate. The angles formed at the peak of the wedge vary from 5 degrees to 45 degrees. Rarely are both surfaces equally worn. This type has apparently developed from IIA or, perhaps more frequently, the original cobble has acquired two beveled surfaces.

Type IID (pl. 22, h; fig. 3).--Type IID is derived directly from type IIA. The forms are identical except that in type IID one side shows evidence of keeling because of a prolonged change in the way the user applied the mano to the surface of the metate. A new wear surface was thus created, superimposed on an older one. At times the keeling appears as a central midrib. However, as use continued, this keel gradually migrated toward the periphery, finally resulting in a thin worn band along the edge of the mano. Two specimens show keeling on both sides.

Type III (pl. 22, i; fig. 3).--Type III specimens are long, narrow, and triangular in cross section. In most of them, the faces show about equal wear. As a type, this trifaced group is more carefully and skillfully manufactured than the other forms.

Key to Mano Types

I. Unifaced
- IA. Natural cobbles with wear on one surface. Cobbles range from symmetrical to irregular in shape: circular to ovoid in outline. Pl. 22, a; fig. 3.
- IB. Extended form of type IA, showing excessive wear. Forms all tend toward symmetry. Pl. 22, b; fig. 3.
- IC. Elongated, "sugar-loaf" in cross section. Entire back surface completely smoothed. Pl. 22, d; fig. 3.

II. Bifaced
- IIA. Natural cobbles with wear on two surfaces. Symmetrical forms range from oblate spheroids to ovoid disks, others are symmetrical. In cross section, wear surfaces are parallel to lenticular. Gradually grades into type IIB. Pl. 22, c; fig. 3.
- IIB. Same as IIA, but forms are elongated (length always much greater than breadth). Pl. 22, g; fig. 3.
- IIC. Wedge-shaped, ovoid to elongate cobbles. Angle between wear surfaces ranges from 5 degrees to 45 degrees. Pl. 22, e, f; fig. 3.
- IID. Same as type IIC, but one surface is keeled. Pl. 22, h; fig. 3.

III. Trifaced
- III. Long, narrow, triangular cross section. Pl. 22, i; fig. 3.

Mortars

Mortars appear to be rare. Heizer and Lemert[16] report one fragment, and we were able to add two more fragments and one complete specimen. Considering the small size and the few examples represented, it would appear that mortars played a small role, if any, in the food economy. Their function was probably that of grinding pigment or they served some ceremonial purpose. It is not until much later that the mortar replaces the metate in this general region. Their occurrence in the Tank Site may therefore mark the earliest known appearance of mortars on the southern California coast.

In addition to real mortars, there is a large natural cobble with a symmetrical concave cup on one surface (diameter of cup, 8 cm.). This may represent the beginning stage of mortar manufacture for, if the depression had been deepened and expanded, the piece would resemble our complete specimen.

[16]Heizer and Lemert, 1947, pp. 244-245, fig. 5, b.

Two sandstone balls, 8 cm. in diameter, show evidence of pecking. One, associated with burial 3, is somewhat flattened on the bottom; the top shows the beginning of a depression. In the other specimen a small depression has apparently just been started. Both these specimens, if completed, could have served as small, cupped pigment mortars.

1. A complete mortar made from an irregularly shaped sandstone cobble, with only a slight amount of shaping on the external surface by pecking (pl. 24, a). The cavity is conical, with the rim showing a slight degree of bevel toward the basin. Average diameter 16 cm.; height 10 cm.; depth of cavity 7 cm.
2. A fragment of granitic mortar with the exterior shaped by pecking. Cavity shows a more rounded bottom than does the complete specimen. Approximate diameter 16 cm.; height 12 cm.; depth of cavity 8 cm.
3. A rim fragment of a sandstone mortar, the exterior showing a small amount of pecking. In form and size it probably resembled the complete specimen.

Pestles

The pestles roughly correspond, both in number and size, to the mortars. Of the four specimens, three are complete and one fragmentary. In addition, two elongated pestlelike stones were recovered, neither of which shows evidence of abrasion.

1. Complete pestle, made from a natural elongated sandstone cobble, flattened somewhat dorsoventrally, showing some evidence of shaping by pecking (pl. 24, b). The distal end is somewhat bulbous and rounded, possibly indicating use in a round-bottomed mortar. Length 15.5 cm.; greatest diameter at bulbous end 6.5 cm.
2. Complete sandstone pestle, resembling specimen 1 but lacking the bulbous end and a little more flattened. Length 16.5 cm.; greatest diameter near distal end, 8 cm.
3. Complete pestle made from a small, elongated sandstone cobble. There is no evidence of shaping by pecking, though both ends of the cobble exhibit abrasion through use. This could have served as a small pigment pestle or possibly as an elongated hammerstone. Length 11 cm.; greatest diameter 4.2 cm.
4. Pestle fragment made of sandstone with rounded wear surface at distal end. Diameter, 5 cm.

Abrading Stones

Such abrading stones as were used for working down other lithic materials, wood, etc., are here grouped into two classes roughly according to their forms: type I, those with a broad concave or convex surface resembling somewhat our modern whetstones; type II, those with a definite longitudinal groove or grooves such as might be used for shaping a projectile shaft or for sharpening a bone or wooden awl. In both types, some of the specimens are made from fragments of former manos.

Type I

1. Sandstone: made from fragment of wedge-shaped mano. Concave wear surface. Length 9 cm.; width 10 cm.
2. Sandstone; possibly made from a former bifaced mano. Convex-sided, with a lenticular cross section. Length 7.5 cm.; width 7 cm. Pl. 23, i.
3. Sandstone; with two concave working surfaces separated by a dividing midrib on one side. Other side not worked. Length 8 cm.; width 8.5 cm.
4. Sandstone; thin rectangular slab, worked on one side only. Length 13.5 cm.; width 8.5 cm.
5. Sandstone; fragments of a former mano, one convex work surface. Length 9 cm.; width 7 cm.
6. Sandstone; thin flat disk with excessive wear on one side. Diameter 8 cm. Pl. 23, k.

Type II

1. Fine-grained slate; surface shows numerous small striations with two well-defined grooves on one side and one on the other. This specimen is identical to the awl sharpener known in California for the later periods up to historic times. Length 17.5 cm.; width 5 cm. Pl. 23, h.
2. Sandstone; single groove, fragment of a former mano. Length 6.5 cm.; width 8 cm. Pl. 23, g.
3. Sandstone; single groove. Length 4.5 cm.; width 5 cm.
4. Sandstone; single groove, fragment of a former mano. Length 7 cm.; width 6 cm.
5. Sandstone; single groove, fragment of former mano. Length 6.5 cm.; width 6 cm.
6. Sandstone; groove on both sides. Length 7.5 cm.; width 6.5 cm.
7. Mudstone; groove on two sides. Length 6.5 cm.; width 4 cm.

Stone Cogs

The presence of stone cogs in the same site as core tools is of interest. Our specimens resemble closely the ones that have been collected from time to time along the southern California coast from San Diego County to the Channel Islands. The center of distribution appears to be somewhat inland in Orange and Riverside counties. Unfortunately, these specimens are largely without data and we know little about the sites from which they came or the type of artifacts with which they might have been associated. Since the distribution of cogs appears somewhat restricted and since these artifacts are unique, more intensive study of them is well worth while. The four specimens from the Tank Site are as follows:

1. A flat disk, 3 cm. thick by 7 cm. diameter. The periphery is grooved at even intervals, producing a cog effect. Both the flat surfaces are slightly pitted at the center of the disk. Material: siliceous sinter or pumice? Pl. 24, e.
2. Beveled disk, biconically drilled. The specimen is notched at even intervals, resembling

somewhat the form of a perforated metal tapered gear. Height 4 cm.; greatest diameter 7.9 cm.; small diameter (top?) 3.8 cm.; largest diameter of drilled holes 2 cm. Drilling is rough, possibly indicating use as a hand reamer. Material: volcanic tuff or siliceous sinter. Pl. 24, g.

3. Specimen is rectangular with rounded corners, flat top, and convex sides. Sides are incised with narrow lines. The base contains a small central pit. The base is 4.5 cm. by 3.2 cm.; top 2.5 cm. by 2 cm.; height 3.5 cm. Material: soft, pink mudstone. This specimen must be considered atypical, since it resembles no other stone cog known. Pl. 24, k.

4. A granitic stone object with four shallow grooves running down the sides. When viewed from the top, it resembles a modified four-leaf clover. Like specimen 3 it appears somewhat atypical. Greatest breadth 5 cm.; height 3.5 cm. Pl. 24, j.

Stone Disks

Like the stone cogs, these disks should be further investigated; they may turn out to be associated. A few disks have been found on the same sites as cogs.

Of the ten specimens recovered, no two are exactly the same, though they fall roughly into two classes: type I, circular disks with flat to convex surfaces and sides either straight or beveled; type II, circular disks in which one or both surfaces are concave and the sides either straight or beveled. The function of these specimens cannot be determined. Some resemble very symmetrical manos but, if they are manos, they must have served a ceremonial purpose only, for the wear surfaces are perfect. Some, however, have concave surfaces, which would eliminate them from the category of manos. In historic times, symmetrical stone disks were used in a "bowling" game. Only one of our specimens could be so used; all the rest have beveled edges and would not roll in a straight line.

Type I

1. Granite disk, top and bottom slightly convex, forming a well-defined shoulder at the periphery. Entire surface is smooth, except for a small central pit (diam. 6 cm.), which shows evidence of pecking. Greatest thickness 7.5 cm.; thickness at shoulder 3.5 cm.; diameter 16 cm. Pl. 24, i.

2. Granite disk like No. 1, but with no central pit and only slightly convex sides. Thickness 4.5 cm.; diameter 7.5 cm. Pl. 24, c.

3. Fine-grained sandstone disk. Top and bottom flat; entire surface shows pecking marks. Thickness 3.6 cm.; diameter 8 cm.

4. Fine-grained sandstone disk. Top and bottom flat; curved tapering sides. Thickness 4 cm.; greatest diameter at base 6 cm.; top diameter 4.5 cm.

5. Fine-grained sandstone disk, ground smooth but with evidence of former pecking. Base flat, top slightly convex, curved and slightly tapering sides. Thickness 4 cm.; bottom diameter 9.5 cm.; top diameter 8.2 cm.

6. Fragment of disk composed of finely banded diatomaceous earth, surface pecked. Thickness 3.2 cm.; diameter 7 cm.

Type II

1. Fine-grained sandstone disk, ground smooth, top and bottom slightly concave, sides curved and tapered. Base shows secondary fracture scars. Thickness 4 cm.; base diameter 9 cm.; top diameter 7 cm. Pl. 24, d.

2. Fine-grained sandstone disk, one surface concave, other surface flat. The rounded sides and concavity show evidence of pecking. Thickness 3.5 cm.; diameter 8.5 cm. Pl. 24, f.

3. Fragment of fine-grained sandstone disk, shallow concavity on one side (2.2 cm.). Sides curved and tapered. Thickness 4 cm.; greatest diameter 10.5 cm.; smaller diameter (base?) 8.8 cm. Specimen bears some resemblance to a small paint mortar, though it is a little shallow and contains no pigment stains.

4. Fine-grained sandstone, barrellike object, slight concavity at the top (?). Sides convex. Thickness 3.3 cm.; diameter 4 cm. Pl. 24, h.

Rubbing Stones

Irregularly shaped cobbles, too small to serve as any sort of mano, are here classed as rubbing stones. A rough division may be made between flat cobbles and rounded ones. Of these, the former show a greater degree of wear (pl. 23, k). It may be that the stones in this group were used for working down larger stones; the exterior surfaces of many of the metates show evidence of such wear. Of our specimens, 55 were rounded cobbles and 25 were flat. Materials cover a wide range; sandstone and granite predominate. Source material was probably provided by the Topanga conglomerates. (Pl. 23, k.)

Pitted rubbing stones.--These differ from the rubbing stones above in having a pit, produced by pecking, on both surfaces. All the 8 specimens are sandstone and flat (pl. 23, c). In addition, there are 2 specimens which have double pits on both surfaces (pl. 23, d).

Pebble rubbing stones.--Ten pebbles, all showing a high-luster wear surface, suggest a possible use as skin-dressing tools. Similar specimens were also recently observed in the paraphernalia of a Yokuts "rain-maker" shaman. All our specimens were made of a hard granitic or metamorphosed material. (Pl. 23, i.)

Hammerstones

Core hammerstones.--As a group, these artifacts are numerically second only to scraper planes and manos. They are consistently basalt cores, which show a varying degree of battering back of the edges. There are times when it is difficult to distinguish between a well-worn bifaced chopper or worn scraper plane and a slightly worn core hammerstone. In fact, probably some worn or dulled planes were used subsequently for hammerstones.

It has been observed that both manos and metates show evidence of roughening produced by repeated pecking. A completely smooth surface on either a mano or a metate will not catch and grind seeds, therefore frequent resharp-

ening (pecking) was required. If we assume that the core hammerstones were used for this purpose, it is not difficult to account for their great number in the deposit. (See table 2.) Their number corresponds with the large number of manos also encountered. This percussion method of sharpening implements might also account for the many broken manos which we collected.

Cobble hammerstones.--Many of these specimens show abraded surfaces like the rubbing stones; but the ends, too, all show varying degrees of battering. Some are just natural cobbles with battered ends. Perhaps some had been used first as abraders and later as hammers. Possibly these had served both purposes at the same time; their exact use could not be determined. Thirty specimens were recovered, quartzite and granite being the predominant materials.

Pitted cobble hammerstones.--Seven specimens like the cobble type contained small central pits on one or both surfaces. In later times, such surface pitting is not uncommon on hammerstones and acorn anvils in central and northern California. Presumably, such pits served as fingerholds. However, this would not explain similar pitting on rubbing stones.

INCISED AND DRILLED STONE

Artifacts of incised and drilled stone were rare in the Tank Site, nor were obvious drills or suitable tools for incising found. This is a contrast to the cultures of later times, especially the Chumash culture of the Santa Barbara coast.

Slate Pendants

Three lozenge-shaped pieces of slate, one of which has a faint geometric design scratched upon the surface (pl. 23, b) were found. None of the specimens is perforated, but the margins show evidence of having been ground into the desired form. Average length 6 cm.; width 4.5 cm.

Miscellaneous Incised and Drilled Stone Specimens

1. Fragment of an oval chlorite-schist pendant (?), showing two biconically drilled holes at one end and a large central perforation. Pl. 23, a.
2. Two pieces of thin, irregularly shaped, light-colored shale with incised geometric design on one surface. Pl. 23, f.
3. Irregular sandstone concretion with incised design on one surface. Pl. 23, e.

MISCELLANEOUS ARTIFACTS

Objects of Stone

1. A symmetrically ground piece of stone 1.8 cm. long and 1.7 cm. wide. Possibly a pendant fragment.
2. A bell-shaped sandstone object (4 cm. x 4 cm.), the neck of the bell being formed by pecking. In form this specimen resembles some charmstone types from central California
3. Flat pebble, notched on one side (diam. 5 cm.).
4. Fragment of a spindle-shaped sandstone object. This may be a fragment of a fossil belemnite.

Objects of Bone

Bone implements are rare in the Tank Site, as might be expected, since so few mammal bones occur. The rarity suggests that either the economy of these people required little use of bone implements or wooden tools were used which, being perishable, are lost to us. We recovered one fragment of a bone awl, two antler tine flakers, and a small piece of highly polished calcined bone, with a small drill pit.

Shell Artifacts

Shell in any form was a rarity. Of the few specimens found, only one can be definitely classed as an artifact. This was a large, biconically drilled, clamshell-disk bead; diameter 1.8 cm., thickness 0.7 cm. This specimen was probably made from the hinge of a large Pismo clam. (Pl. 21, v.)

Other possible artifacts were a small musselshell with one edge ground down, resembling in type the historic musselshell scrapers of northwestern California (Pl. 21, u), and two badly weathered fragments of clamshell which might have been ornaments.

Textiles

No direct evidence of textiles was obtained, though it seems impossible that a seed-gathering economy functioned without some kind of textile containers. However, a thin mass of asphaltum[17] associated with burial 3 has yielded clear evidence of some sort of woven material. Plasticine impressions taken from the specimen show definitely what appears to be a textile imprint. The technique could not be determined with any degree of certainty, though it gives one the impression of twining. It seems possible that the asphalt may once have served as a waterproofing agent for a basket. The specimen was found *in situ*, and the asphalt occurred in thin bands, suggesting a collapsed basket. The validity of this specimen as evidence of textiles must await additional supporting finds.

Quartz Crystals

The ends of three small quartz crystals were recovered, one of which was associated with burial 3. The presence here of quartz crystals in burial association is of interest when we consider their more widespread archaeological and ethnological occurrences in later times and the ceremonial power attached to them. We may have here one of the earliest suggestions of what became a rather widespread religious cult in California. This is, of course, pure speculation.

Baked Clay

No actual artifacts of baked clay were recovered. However, one fragment of burned clay, showing a concave impression of a stick, may possibly indicate the use of wattle and daub in house construction.

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[17] Source of this material lies in natural bituminous seeps along the adjacent coast. See Heizer, 1940, and Heizer and Treganza, 1944.

Stone Balls

Excavation of the Tank Site yielded four fairly symmetrical stone balls, three of sandstone and one of granite. The diameter of the largest was 8 cm.; of the smallest, 4.5 cm. None of the specimens show pecking or abrasion and we are unable to suggest any possible use.

OTHER REMAINS

UNWORKED BONE AND SHELL REMAINS

Mammal bones were present in the site, but rare. Most of our specimens consisted of split midsections, or distal and proximal ends of cannon bones, presumably from some sort of herbivores. In addition to these, a few badly decayed fragments of smaller mammal bones were noted, possibly of rodent origin. About half our finds were partially calcined, giving evidence of contact with fire; others were scarred with the tooth marks of rodents or larger mammals, probably so marked long after the time of interment.

Unfortunately, our specimens were in such a poor state of preservation that identification of genus and species would be sheer guesswork. Dr. S. Benson, of the Museum of Vertebrate Zoölogy of the University of California at Berkeley, examined our specimens briefly and reported that any possible identifications would be at best only tentative. Until evidence to the contrary is obtained, it is safe to assume that our larger mammal bones are probably those of deer and antelope. It is hoped that next season's work will bring to light more diagnostic bone and teeth which can be satisfactorily identified. The scarcity of mammal bone and projectile points clearly indicates that the Topanga culture was little oriented toward a hunting economy.

A single specimen of unworked bird bone was recovered in near association with burial 8. It appears to be the humerus or ulna of some large raptor or shore bird.

One unidentifiable vertebra offered the only evidence that these people might have been eating fish. Fish bone, however, may once have been present but not preserved.

Shell, like mammal bone, was rare, making its appearance only here and there in the site deposit. What shell does appear is interesting. Within several inches of the surface we recovered two shell artifacts and a few clam and musselshell fragments, all in a fair state of preservation. Besides these occurrences, shell was found only in a badly crushed or calcined condition either under inverted metates or near the base of the site in the deep area (48 in.-60 in.). These two locations suggest areas protected from leaching. More shell may once have been present, but may have been destroyed during the process of soil alteration. Otherwise, why would it remain only in these two places. The less altered shell in the first few inches may be the result of later occupation on the site. For this hypothesis of later occupation we have other evidence, mainly that of projectile points. However, probably at no time did these people place any great emphasis upon shellfish. Their contact with the coast was probably sporadic, though the ocean was only four miles distant.

FOSSIL REMAINS

The presence of two species of fossil shark's teeth, a quantity of completely replaced mammal bone, and a few extinct mollusca attest the fact that local deposits of fossil fauna were being visited by the inhabitants of the site. At present, curiosity appears to be the only explanation. The shark's teeth could have been hafted or used as ornaments, but there is no evidence of such use.

PIGMENTS AND OTHER ROCK

In addition to the stone worked into implements, we found an abundance of lithic material not used for artifacts. Blocks, flakes, and small cores of chert, jasper, and chalcedony were common. As this material represents chiefly reject or wastage, it seems odd we did not find more implements made from these stones.

"Bars" of a yellow, fine-grained sandstone or siltstone were not infrequent. All of these specimens bore the dual pattern of rodent tooth marks, probably made at an earlier time. In the course of our present excavation we encountered few rodent tunnels;[18] in more recent times the hardness of the debris has discouraged the burrowing mammals. The fine texture of these "bars," plus the fact that some of them show abrasion marks, may indicate their use as a source of pigment.

Hematite granules occurred frequently; they were, indeed, a universal deposit association. All of the burials showed a concentration of these granules in and about the interment area. A single deposit of pure limonite pigment was noted in the pelvic cavity of one of the burials. Several slabs of diatomaceous earth may also have served as a source of white pigment; and a single piece of cinnabar may have provided a vermilion base.

CONCLUSION

The work of the 1947 season was largely exploratory, in an attempt to gain some over-all picture of the Topanga culture as manifested at the Tank Site. It would be premature to draw many conclusions at present, particularly in view of the significance of the site, and the data have therefore been presented in descriptive form with little or no attempt to utilize comparative material. It is our opinion that, in time and with additional information, the Topanga culture will find its proper place, on the basis of material content, in the sequence of the early prehistory of the Far West.

The artifacts of the Tank Site are characterized by quantities of crude, percussion-flaked core tools, a trait which sharply sets off the Topanga culture from the local cultures previously known. Only in the Mohave Desert and

[18] Rodent activity appears in almost all the late culture sites of the area.

from San Diego County south do we find comparable lithic assemblages.

There seems little doubt that the occupants of the Tank Site were strongly inclined toward a seed-gathering economy with hunting and collecting of shellfish only secondary. The large quantity of grinding implements suggests seed-gathering; the few specimens of mammal bone and shell, some hunting and collecting. However, there still remains the problem of explaining, in a society apparently oriented toward the utilization of the plant world, the quantity and possible function of the core tools (mainly scraper planes) that occur. This problem becomes more complex when we consider the other lithic-industry sites to the south and east where, it is claimed, grinding implements are almost absent and only the core tools are encountered.

The Topanga culture as it occurs at the Tank Site cannot be ignored. From all indications, we are dealing with a sizable population presumably well adjusted to local environmental conditions. The extent and depth of the deposit and the obvious familiarity of the occupants of the site with local and distant sources of lithic materials seem to indicate a long period of occupancy. We are sure that additional excavation will greatly expand our knowledge of the Topanga culture.

In summary, the following observations, many of them based on unique occurrences, may be noted for the Tank Site (LAn-1):

1. It is the first large village site containing early lithic remains which has been excavated in the Pacific littoral of southern California.

2. It is one of the few sites, if not the only one, in which we have human burials associated with crude core tools.

3. The amount of site deposition (68 in. at the deepest point) is greater than that of any known early lithic deposit in California.

4. The artifact content is abnormally high, being one finished specimen per 1.5 cubic feet of earth removed.

5. The concentration of artifacts in the 6-inch to 18-inch level is unique and may have some bearing on the antiquity of the site.

6. The range of lithic material selected for implements is wide; basalt predominates, followed by quartzite and sandstone. In the main, local rock sources were drawn upon, the varied geology of the region providing a wide choice.

7. The methods of stone-artifact manufacture were mainly percussion flaking, pecking, and grinding. Pressure chipping was relatively rare.

8. The great range in types of core tools, plus their various degrees of finish, strongly suggests that they served a general function, demanding no great skill on the part of the user, and that their manufacture entailed no specific requirements except the production of generalized form.

9. The lighter projectile points are characterized by pressure flaking. It is of interest that they are confined to the upper levels of the deposit.

10. The mortars and pestles, drilled stone, stone cogs and disks, etc., which occur sporadically in the deposit, are all atypical of the general run of the artifacts found here. They therefore present special problems, the solution of which requires additional information, especially since many of these forms are also found in sites of later periods.

11. The antiquity of the Tank Site deposit can be demonstrated on several counts, whereas there is no evidence suggesting its recent origin. Its physiographic location in relation to present water and food supplies is noteworthy. The high degree of patination on the basalt artifacts implies a considerable lapse of time between their original manufacture and their recovery by us. The almost complete disintegration of many of the once resistant manos and metates is likewise a register of time. Finally, the artifact-bearing, mature soil profile leaves us with little doubt that the age of the Tank Site must be considered in terms of thousands of years.

12. The attribution of antiquity on the basis of typological comparisons alone, like cross-dating, can be overdone. Some attributions in California, for instance, have led to confusion rather than clarification. For the Tank Site, there is sufficient evidence of antiquity, irrespective of other early sites. The typologies of the lithic assemblage of the Tank Site and of other early localities with lithic industries that have been mentioned are so strikingly similar that they cannot be ignored. Not only in terms of a complex of associated specimens, but also on the basis of individual pieces, it seems inconceivable that there can be no relationship between the industry of the Topanga culture and the early lithic industries of the Lake Mohave region and the San Dieguito culture.

Where Topanga fits in a time sequence is another, and important, point. Such a discrepancy in dating as now exists in regard to Lake Mohave precludes any attempt at cross-dating. We are no more justified in accepting Antevs' dating of 15,000 years than in following Rogers' figure of about 3,500 years. In fact, M. J. Rogers' dating seems the more probable for he has presented such crucial evidence that, until he is proved incorrect, any dates earlier than about 3,500 years ago must appear dubious. A reëxamination of the evidence is essential, if we are to make a coherent picture of southern California prehistory.

It is most unfortunate that we possess only scattered and unorganized data on the Oak Grove culture of the Santa Barbara coast, especially since many, if not all, of the major elements of that culture are present in the Tank Site deposit. There is a special problem presented here when we consider the large number of core tools present in the Tank Site and their apparent absence in Oak Grove. It is almost as if the Topanga culture functioned as a common meeting-place of the early lithic industries of southern California and the early cultures along the Santa Barbara coast. The problem is one to be considered in the light of future data.

The geographical gap between the Topanga and the Cochise cultures is far greater than are the typological dissimilarities. Many Topanga core-tool, mano, and metate types could become easily confused if mixed with a Cochise series of the same order. Conceivably the Topanga culture is a Far Western representative of an early seed-gathering complex. Again, a discussion of apparent temporal relationships had best await additional evidence from both the Tank Site and the intervening areas.

13. The slight suggestion of a stratigraphy denoting cultural change in the Tank Site is most important. Several aspects, especially point types, appear to support such a thesis. A great part of the material of the 0-inch to 12-inch level of the Tank Site resembles that found in the

site designated as LAn-2. The general run of the LAn-2 deposit leaves one with the feeling that it is later in time than the lower levels of the Tank Site. More digging will no double settle the point.

Three avenues of approach seem important, and these we should like to emphasize. First, a great part of the Tank Site is still intact and will require more digging before we have an adequate and representative series on which to base cultural comparisons. Second, site LAn-2 should be further examined, since it may show stratigraphic relationships and may be very important to our understanding of the Tank Site. Third, a site survey of Topanga Canyon should be made in order to determine the number and types of archaeological sites, their physiographic locations, and any apparent connections they may have with the Topanga culture as we now know it.

BIBLIOGRAPHY

ABBREVIATIONS

A Ant	American Antiquity
FMNH-PAS	Field Museum of Natural History, Publications, Anthropological Series
GP-MP	Gila Pueblo, Medallion Papers
SDM-P	San Diego Museum, Papers
SM	Southwest Museum
SM-M	Southwest Museum, Memoirs
-P	Papers
SWJA	Southwestern Journal of Archaeology
UC	University of California Publications
-AR	Anthropological Records
-PAAE	American Archaeology and Ethnology

Campbell, E. W. C., W. H. Campbell, E. Antevs, C. A. Amsden, J. B. Barbieri, and F. D. Bode

1937. The Archaeology of Pleistocene Lake Mohave. SM-P No. 11.

Heizer, R. F.

1938. A Folsom-Type Point from the Sacramento Valley. SM-M 12:180-182.

1940. Aboriginal Use of Bitumen by the California Indians. Calif. Div. Mines, Bull. 118, Pt. 1, p. 74.

——— and E. M. Lemert

1947. Observations on Archaeological Sites in Topanga Canyon, California. UC-PAAE 44:237-258.

——— and A. E. Treganza

1944. Aboriginal Mines and Quarries of the California Indians. Calif. Jour. Mines and Geol., 20:291-359.

Hoots, H. W.

1931. Geology of the Eastern Part of the Santa Monica Mountains, Los Angeles County, California. U.S. Geol. Surv. Professional Papers, 165-C.

Martin, P. S., and J. B. Rinaldo

1947. The SU Site Excavations at a Mogollon Village, Western New Mexico. FMNH-PAS 32, no. 3, Publ. 601.

Massey, W. C.

1947. Brief Report on Archaeological Investigations in Baja California. SWJA 3:344-359.

Olson, R. L.

1930. Chumash Prehistory. UC-PAAE 28:1-21

Rogers, D. B.

1929. Prehistoric Man of the Santa Barbara Coast. Santa Barbara Mus. Hat. Hist.

Rogers, M. J.

1929. The Stone Art of the San Dieguito Plateau. AA 31:464-467.

1939. Early Lithic Industries of the Lower Basin of the Colorado River and Adjacent Areas. SDM-P No. 3.

Sayles, E. G. and E. Antevs

1941. The Cochise Culture. GP-MP No. 29.

Treganza, A. E.

1942. An Archaeological Reconnaissance of Northeastern Baja California and Southeastern California. A Ant 8:152-163.

1947. Notes on the San Dieguito Lithic Industry of Southern California and Northern Baja California. In work cited for Heizer and Lemert, 1947, pp. 253-255.

Walker, E. G.

1936. A Ceremonial Site at Porter Ranch, San Fernando. SM-M 10:98-104.

1937. Sequence of Prehistoric Material Culture at Malaga Cove, California. SM-M 11:210-214.

1945. The Dig at Big Tujunga Wash. SM-M 19: 188-193.

PLATES

EXPLANATION OF PLATES

Plate 13

Excavation at Tank Site. a. General view of excavation taken from the top of a telephone pole. Small portion of the north-south trench may be seen at the left. Right shows exposed burials and features. b. General view of excavation showing burials 2-5 and associated metates. c. Mature soil profile in section 23L1 showing soil horizons A, B, C. The entire exposure is artifact-bearing. Note the fineness of the texture in horizon C as contrasted with the adobelike cracked zone in horizon B.

Plate 14

Views of Tank Site. a. Panoramic view of a section of Topanga Canyon looking east-southeast. Photograph taken at about the same elevation as the Tank Site but from the opposite side of the canyon. Sites shown are the Tank Site (LAn-1), LAn-2, LAn-3, LAn-4, and LAn-5. b. View of the Tank Site looking north. The Tank Site lies just to the right of center in the cleared area above the break in the line of oak trees. c. View looking northeast. The foreground is site LAn-2. The Tank Site is shown by the grassy area just above and to the right of the center of the picture.

Plate 15

Burials. a. Burial 1, with segments of tibia and fibulae in position. Stones are core tools and rejects. b. Burial 5. Shows highly disintegrated condition of bones, which have been isolated on a pedestal of highly altered mound debris. Burial suggests slight flexure of the knees. Possible hearth in foreground. c. Burial 6. Crushed skull in center and portion of humerus and radius. Partial rock cairn composed of metates, core tools, and reject stone surrounds burial. Burial 7 (partial reburial) was later located under the inverted metate to the far left (see pl. 4, f). d. Burial 2, showing associated metate and possible hearth at lower right. e. Burial 4, with associated metate and mano. Burials 3 and 4 in background. f. Burial 3, with associated metate and manos. Chert knife (?) (pl. 9, i) near head of left femur.

Plate 16

Features. a. Feature 12: two possible hearths and a badly weathered, inverted sandstone metate. b. Feature 11: badly weathered, inverted sandstone metate and core tools. Right of picture shows small mortar (pl. 12, a) and white pigment slab. c. Feature 5: complex of stone, including two inverted metates, one of which is "killed." d. Feature 8: artifact and stone concentration in the 0-in. to 6-in. and 6-in. to 12-in. levels. Possible hearth in foreground. e. Feature 10: badly weathered inverted sandstone metate, mano, and core tools. Two fragments of human bone suggest possible reburial. f. Burial 7: partial reburial, with bundle of human bone formerly covered by the overturned metate. To the left is the crushed skull of burial 6.

Plate 17

Scraper planes, types IA and IB. a-d. Variations in type IA scraper planes. e, f. Type IB scraper planes. Line drawings show specimens as viewed from the front and left side.

Plate 18

Scraper planes, type IIA. a-e. Variations in type IIA scraper planes.

Plate 19

Scraper planes, types IC and IIB. a-c. Scraper planes, type IC. d-f. Scraper planes, type IIB.

Plate 20

Choppers and scrapers. a, b. Bifaced choppers. c. Cobble scraper. d, e. Unifaced choppers or heavy duty scrapers. f, g. Snub-nose scrapers. h-j. Flake scrapers or knives. k, l. End scrapers. m, n. Straight-edge knives or scrapers. o, p. Ovate or discoidal scrapers.

Plate 21

Projectile points. a-e. Heavy leaf-shaped blades. f-h. Contracting-stem projectile points. i, j. Concave-base points or knives. k-n. Lozenge projectile points. o, p. Side-notched projectile points. q-t. Projectile point fragments. u. Small worked musselshell. v. Clamshell-disk bead.

Plate 22

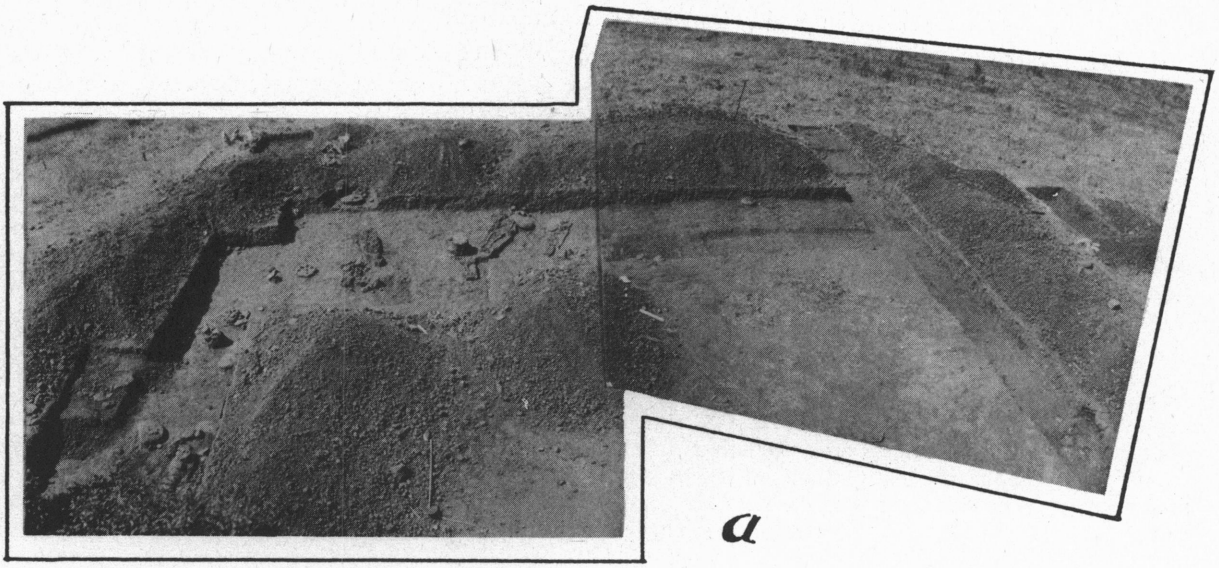
Manos. a. Unifaced mano, type IA. b. Unifaced mano, type IB. c. Bifaced mano, type IIA. d. Unifaced mano, type IC. e, f. Bifaced manos, type IIC. g. Bifaced mano, type IIB. h. Bifaced mano, type IID. i. Trifaced mano, type III.

Plate 23

Worked stone artifacts. a. Fragment of perforated schist pendant. b. Incised slate pendant. c. Rubbing stone with one pit. d. Rubbing stone with two pits. e. Small stone with incised design. f. Shale with incised geometric design. g. Grooved abrading stone. h. Abrading stone, possible awl-sharpener. i. Pebble rubbing stone. j, k. Abrading stones. l. Obsidian reamer. m. Chert reamer. n, o. Side scrapers. p. Retouched specimen showing degree of patination on old flake scars. p′. Surface specimen showing degree of patination on old flake scars. q. Hand pick. r. Atypical side scraper. s. Side scraper.

Plate 24

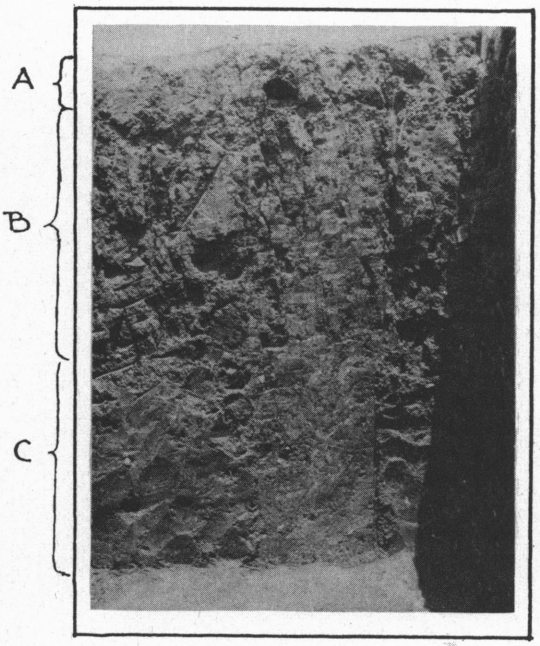
Ground stone artifacts. a. Small mortar. b. Pestle. c. Stone disk. d. Beveled stone disk. e, g. Stone cogs. f. Stone disk. h. Barrel-shaped stone. i. Large stone disk with central depression. j, k. Possible stone cogs.



a

SOIL HORIZONS AS SHOWN
IN NORTH WALL OF SECTION
23L1

TOTAL DEPTH OF DEPOSIT 62"



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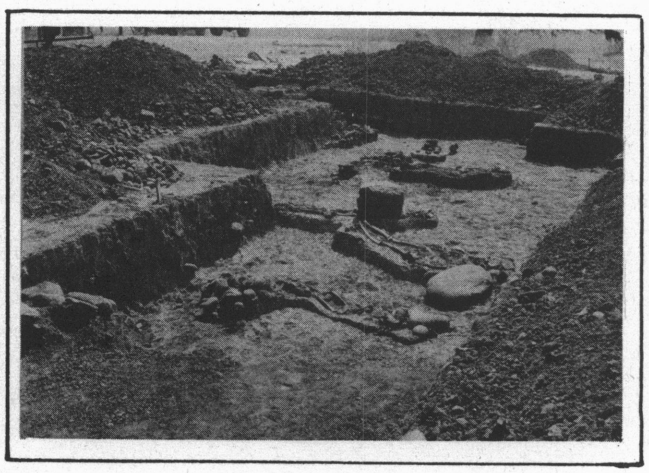

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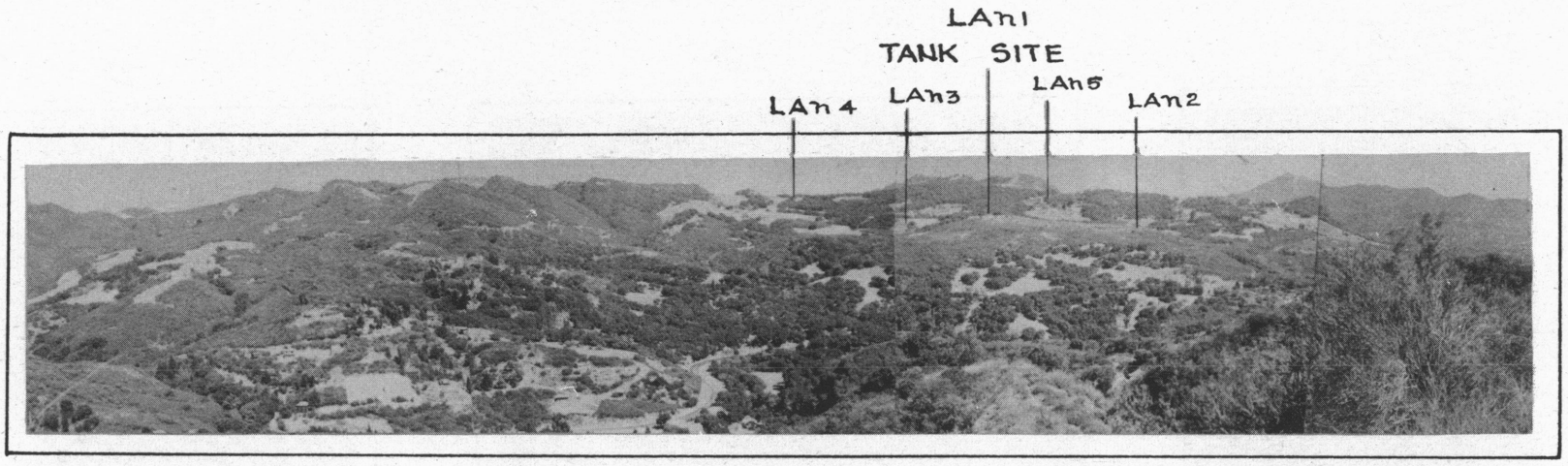
Plate 13. Excavation, Tank Site



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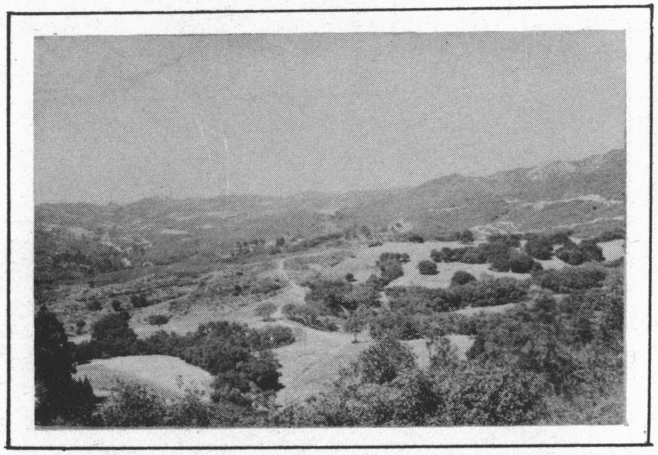

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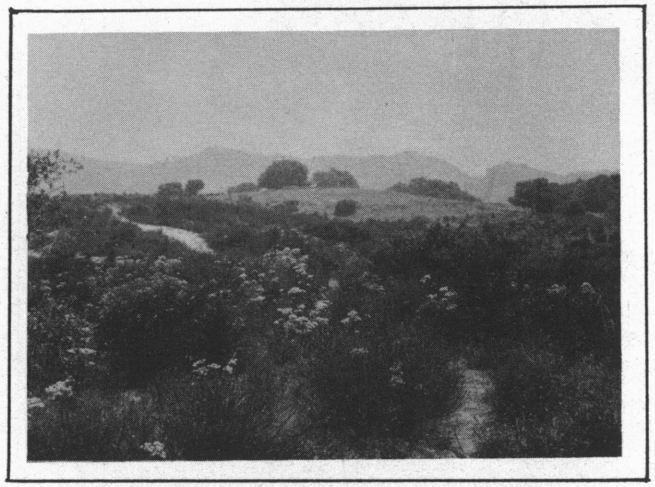

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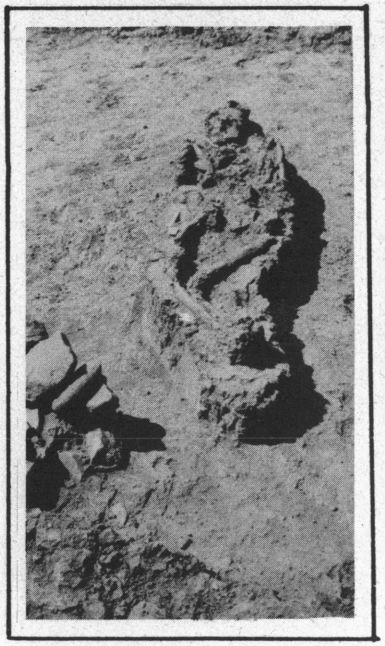
Plate 14. Views of Tank Site

a



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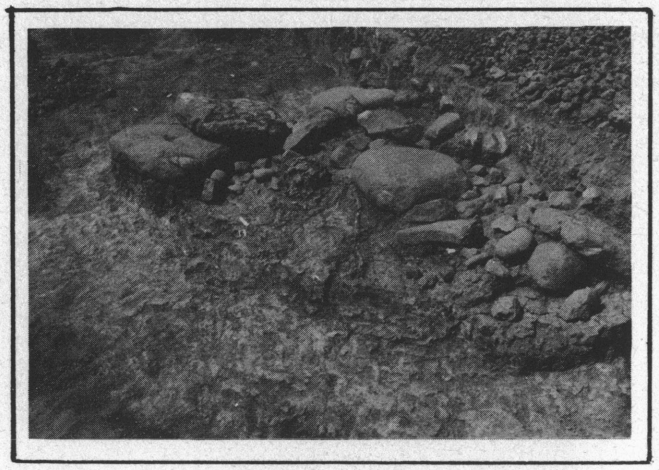

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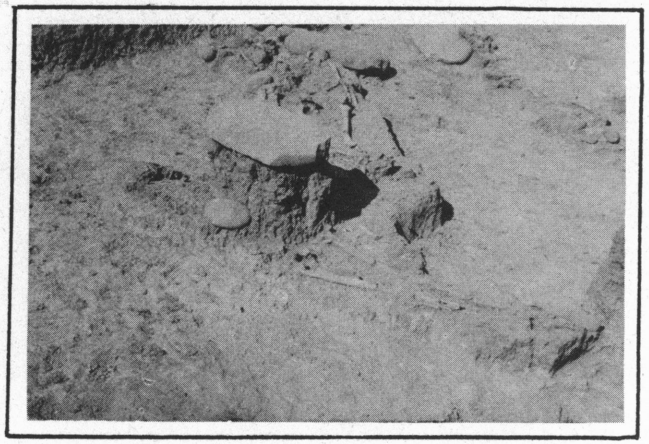

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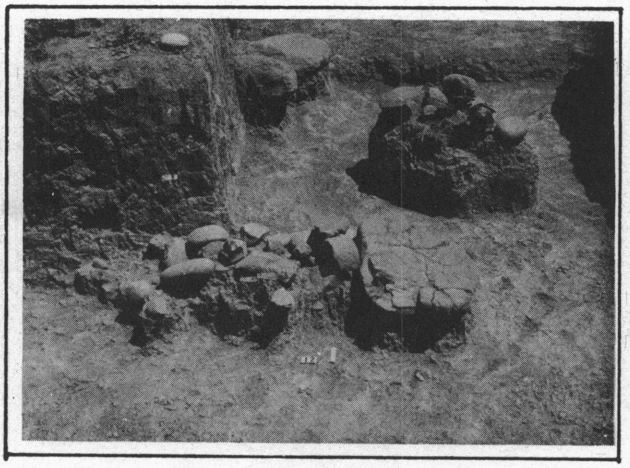
Plate 15. Burials at Tank Site



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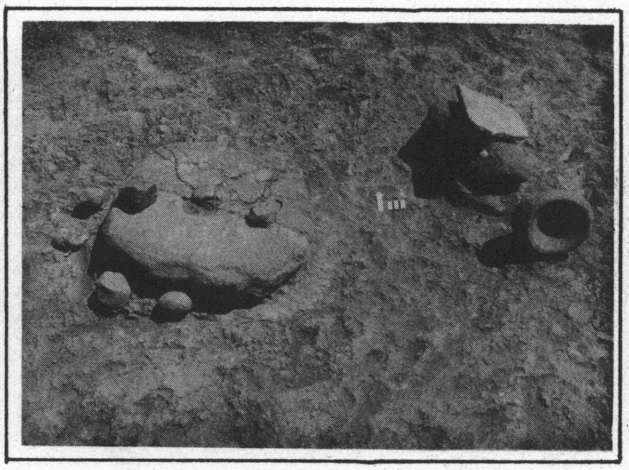

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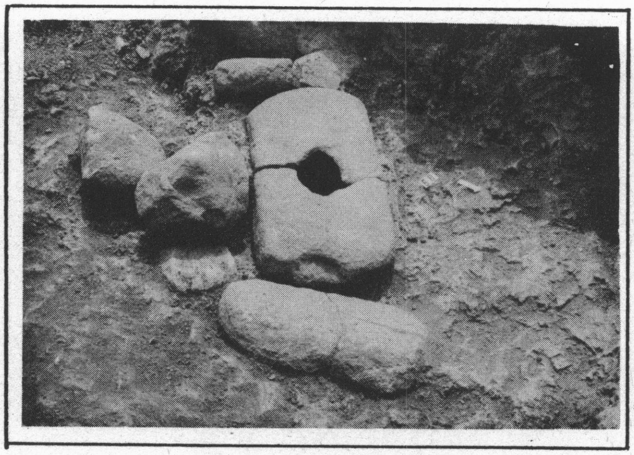

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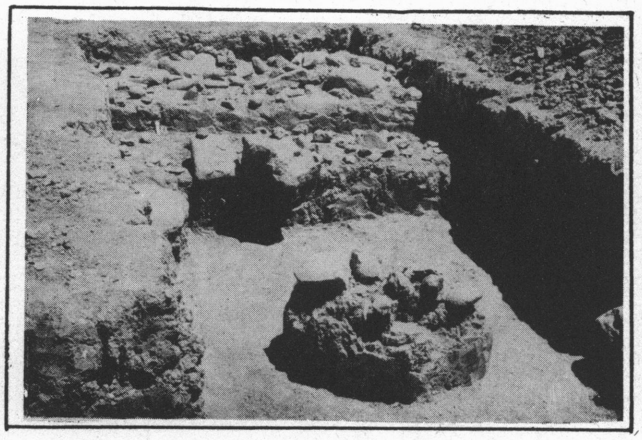

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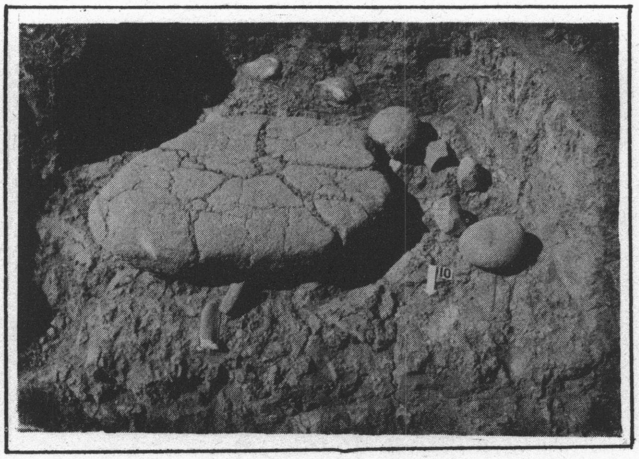

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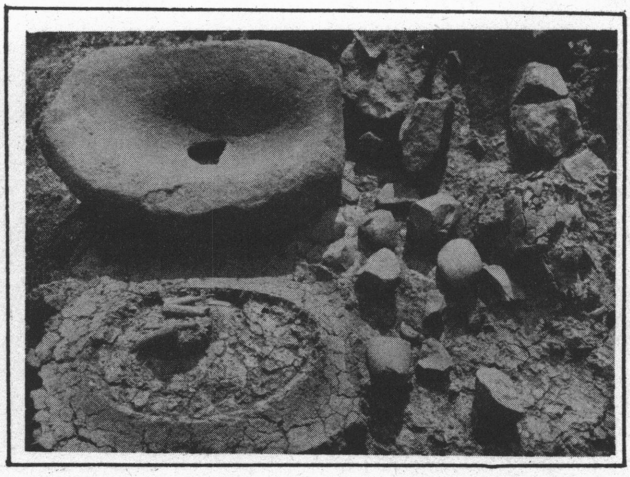

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Plate 16. Features at Tank Site

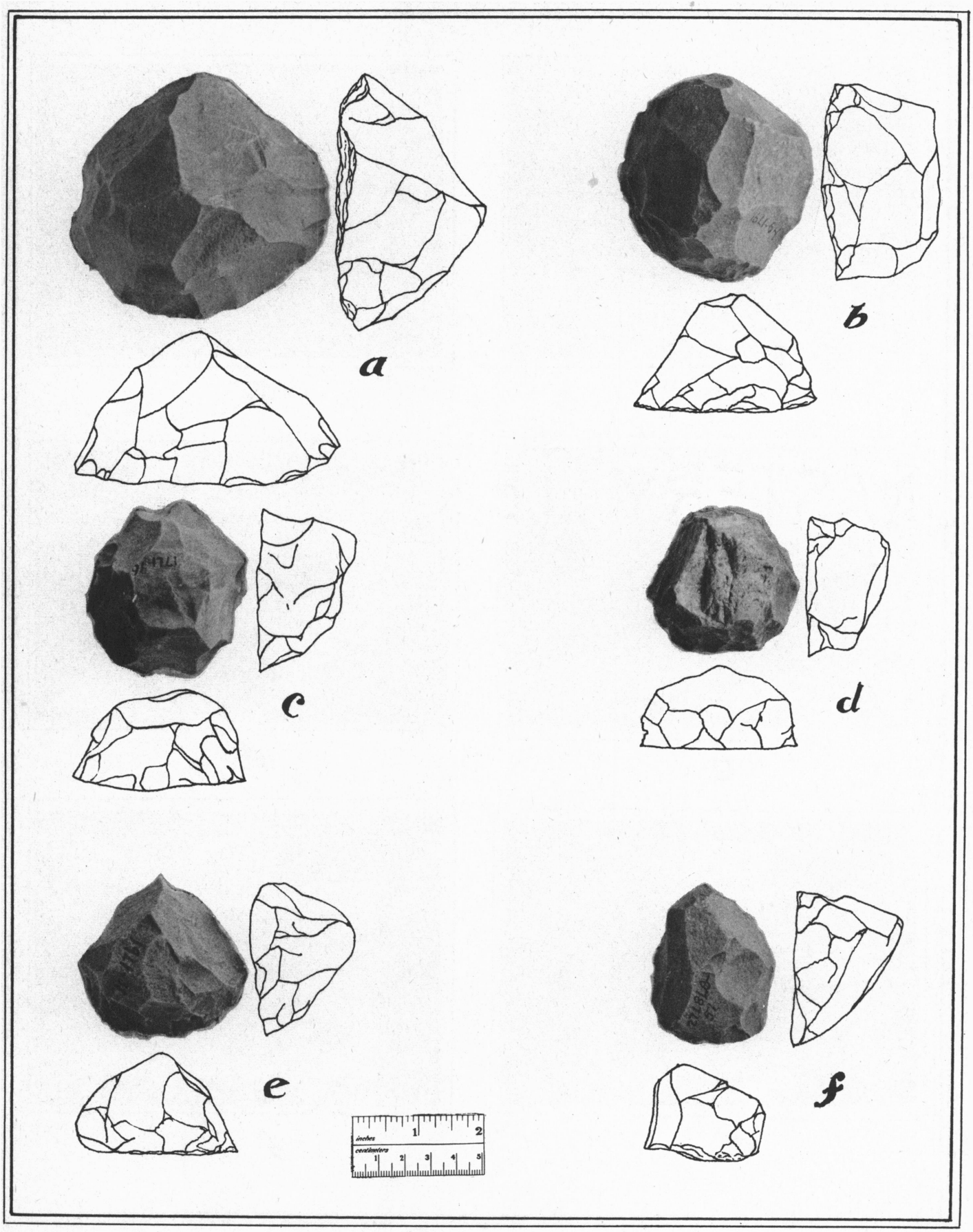

Plate 17. Scraper Planes, Types IA and IB

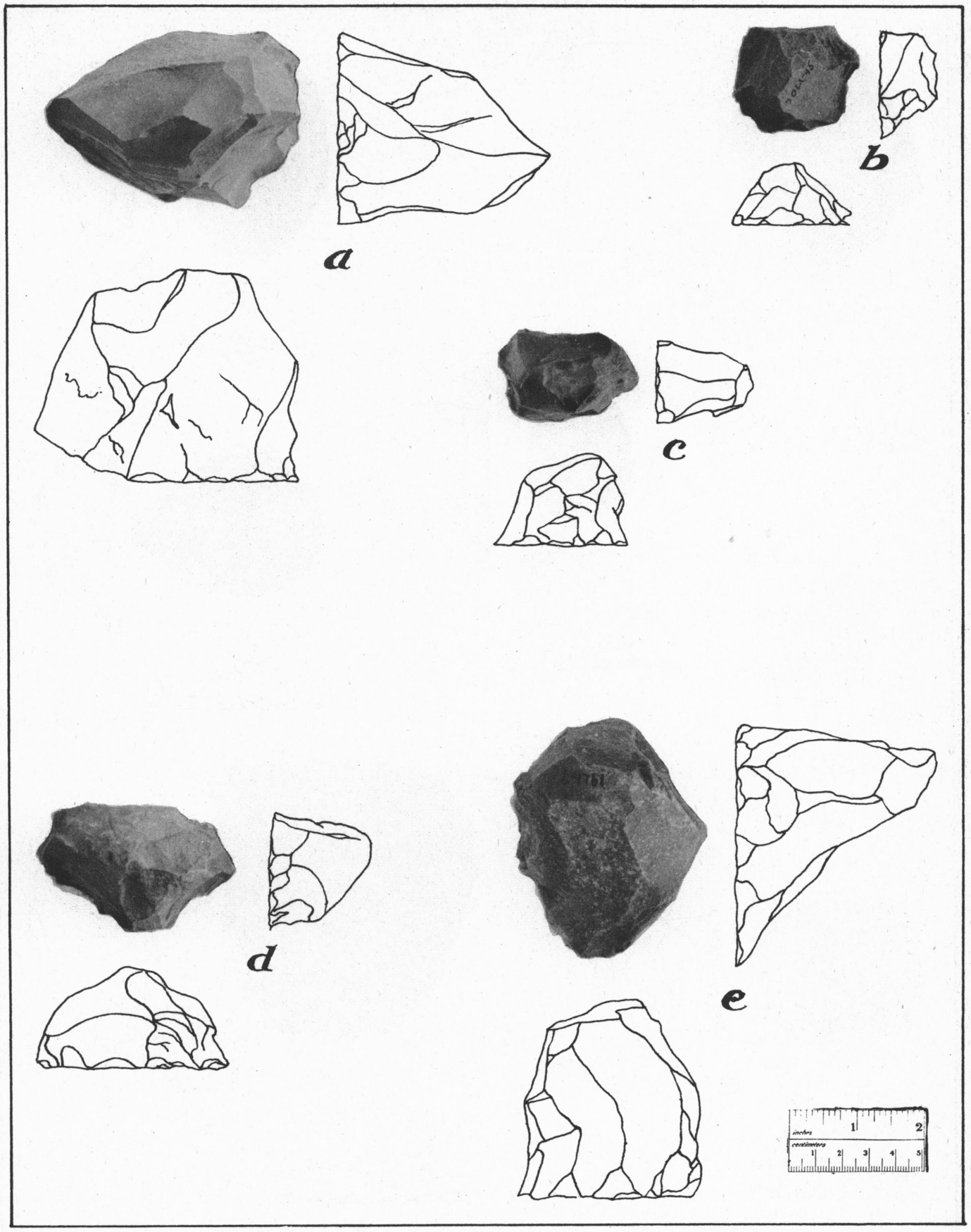

Plate 18. Variations in Type IIA Scraper Planes

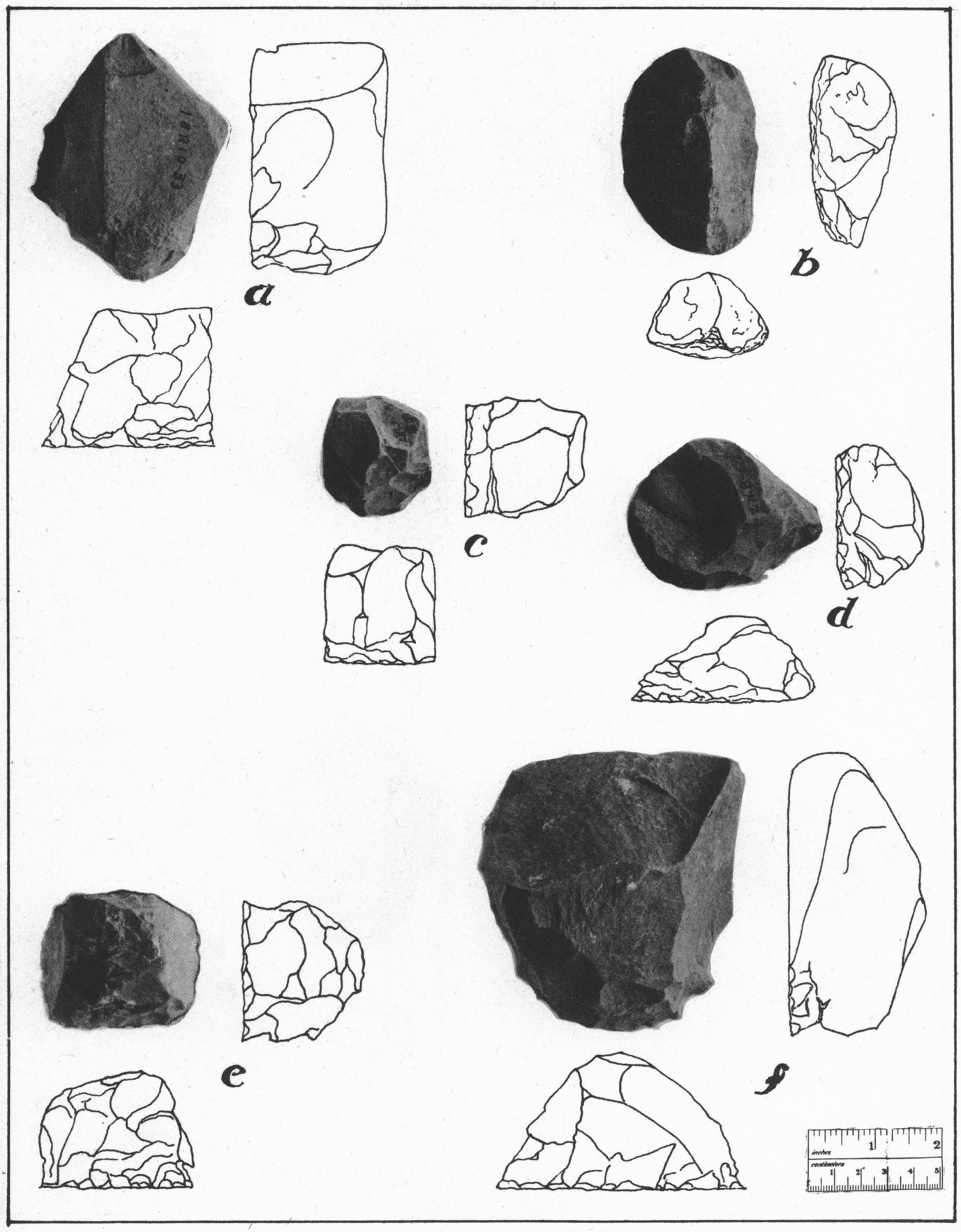

Plate 19. Scraper Planes, Types IC and IIB

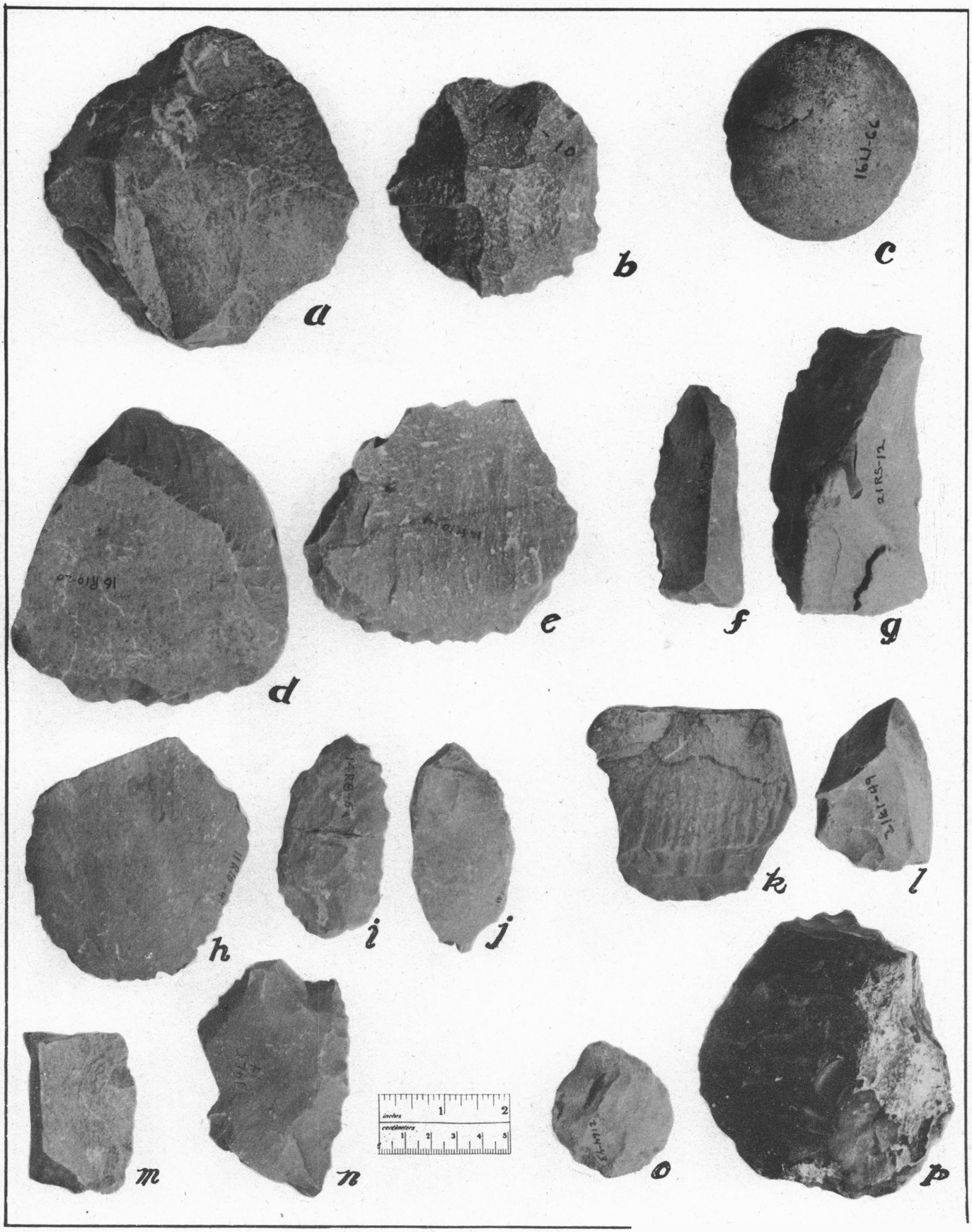

Plate 20. Choppers and Scrapers

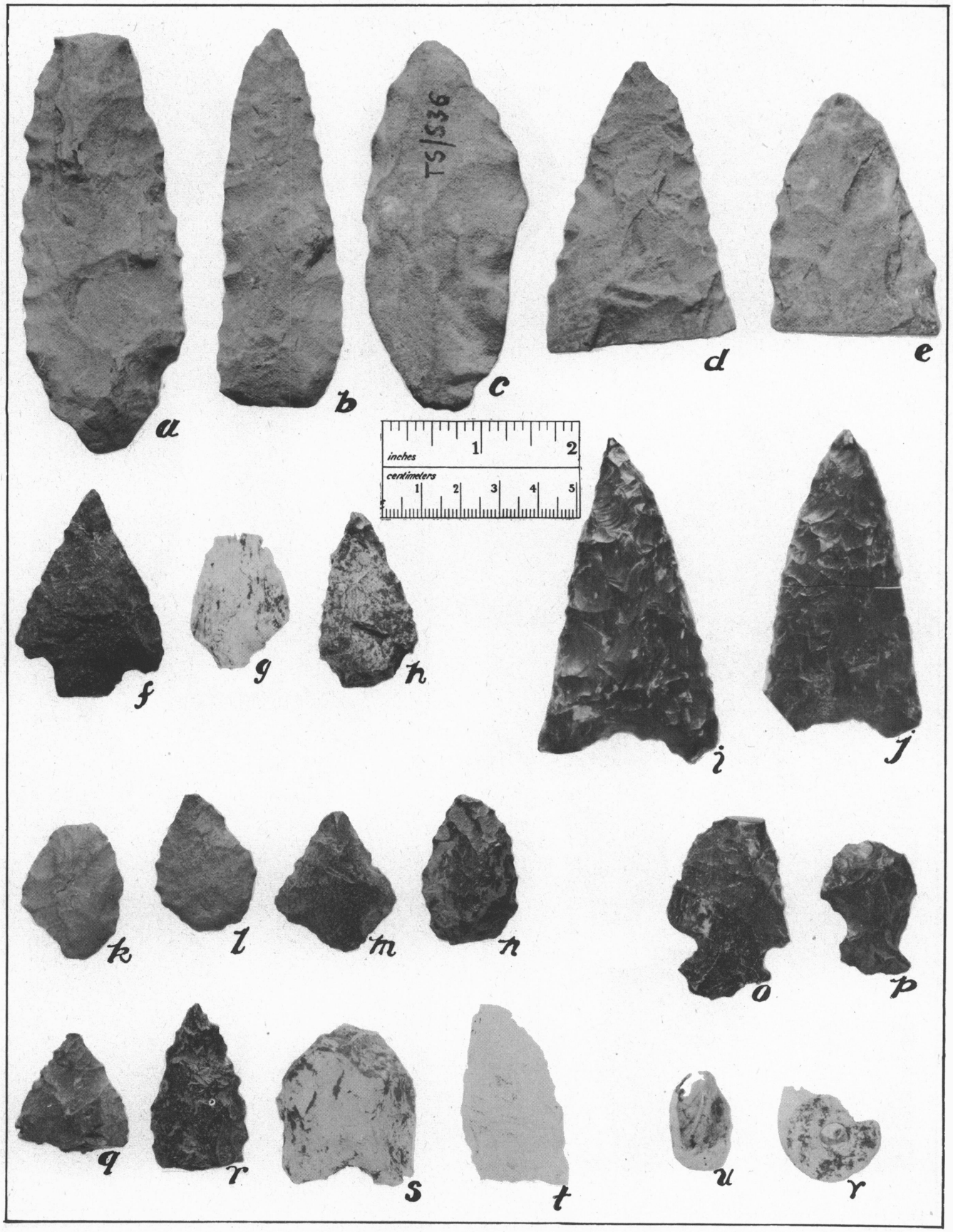

Plate 21. Projectile Points

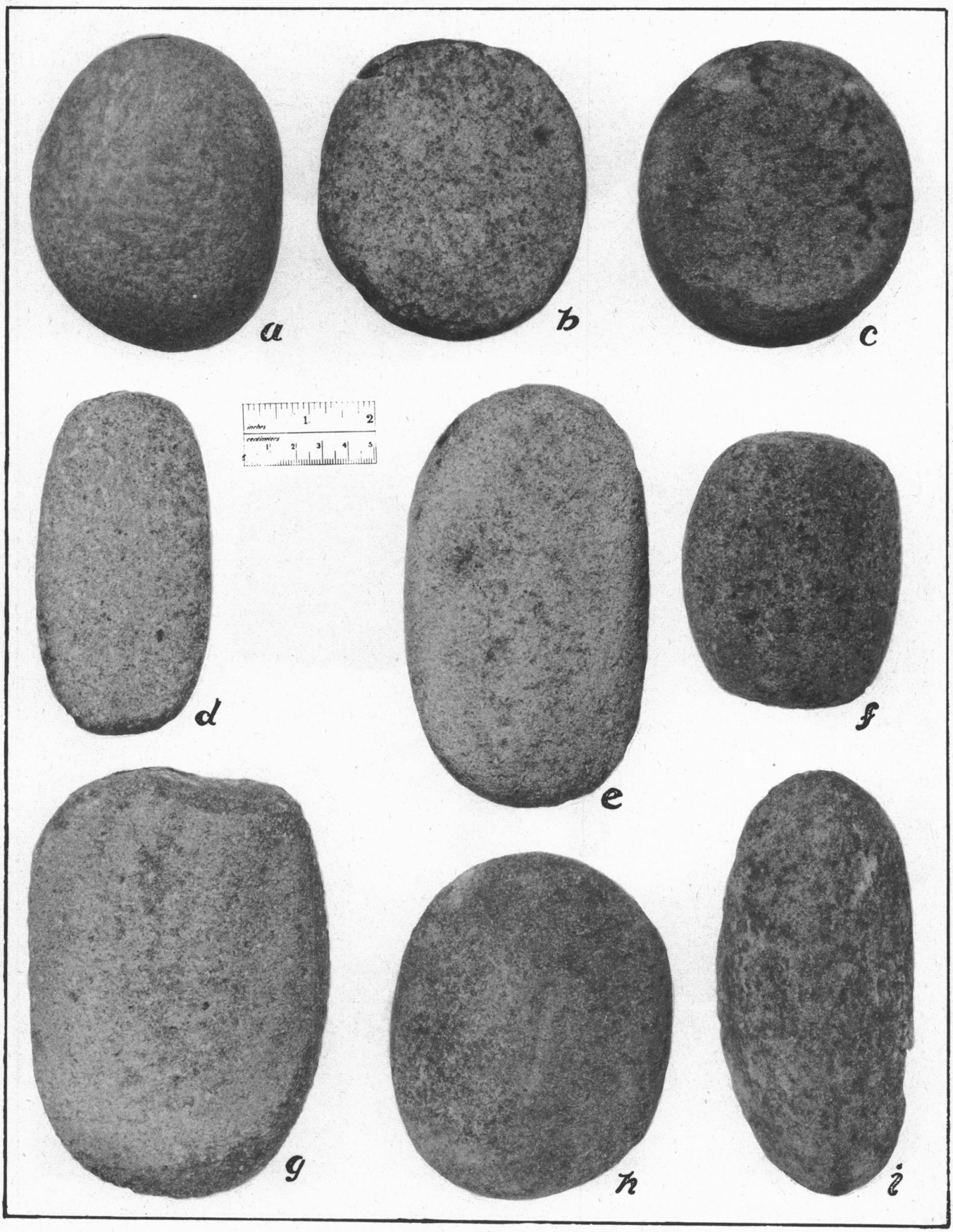

Plate 22. Manos

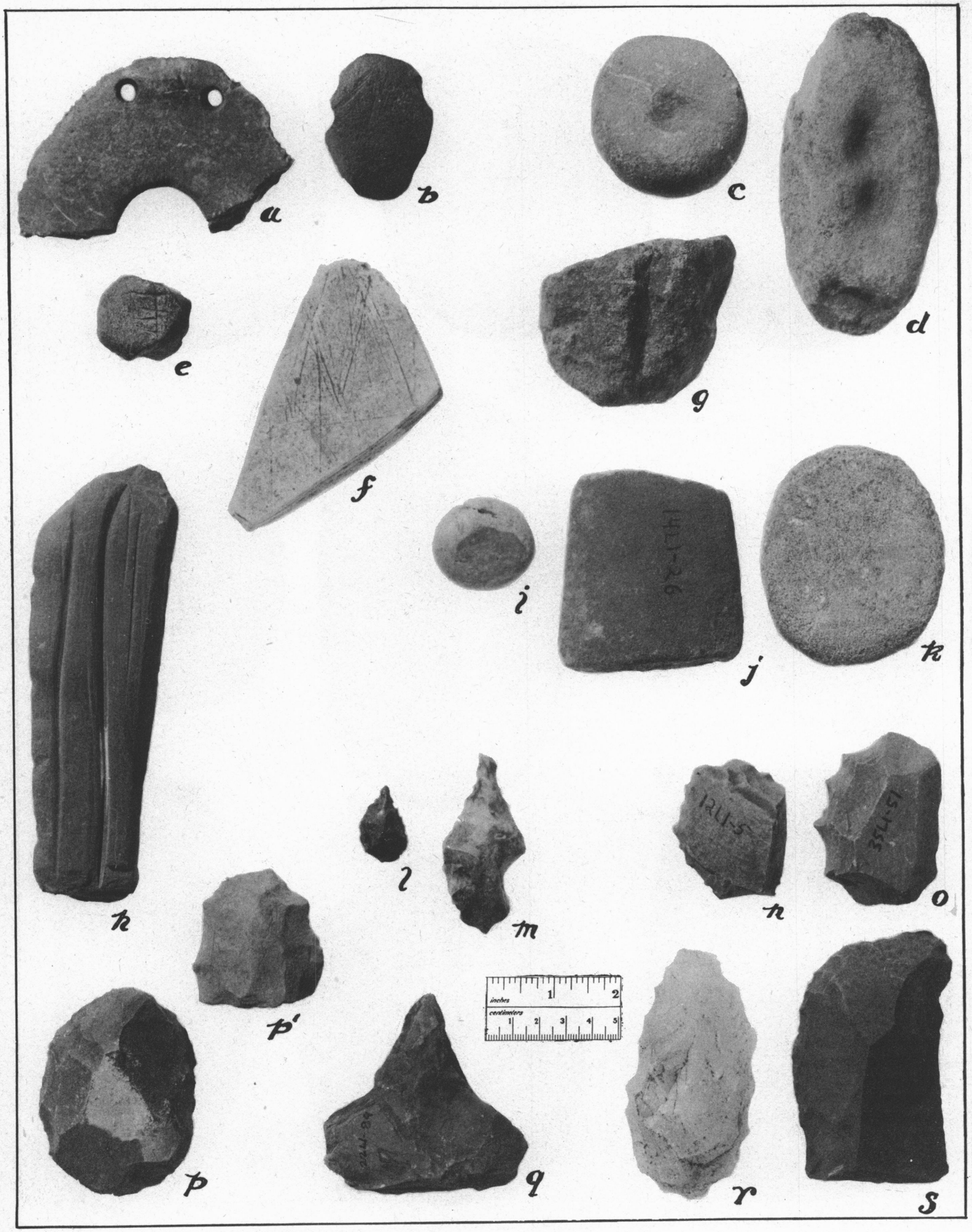

Plate 23. Worked Stone Artifacts

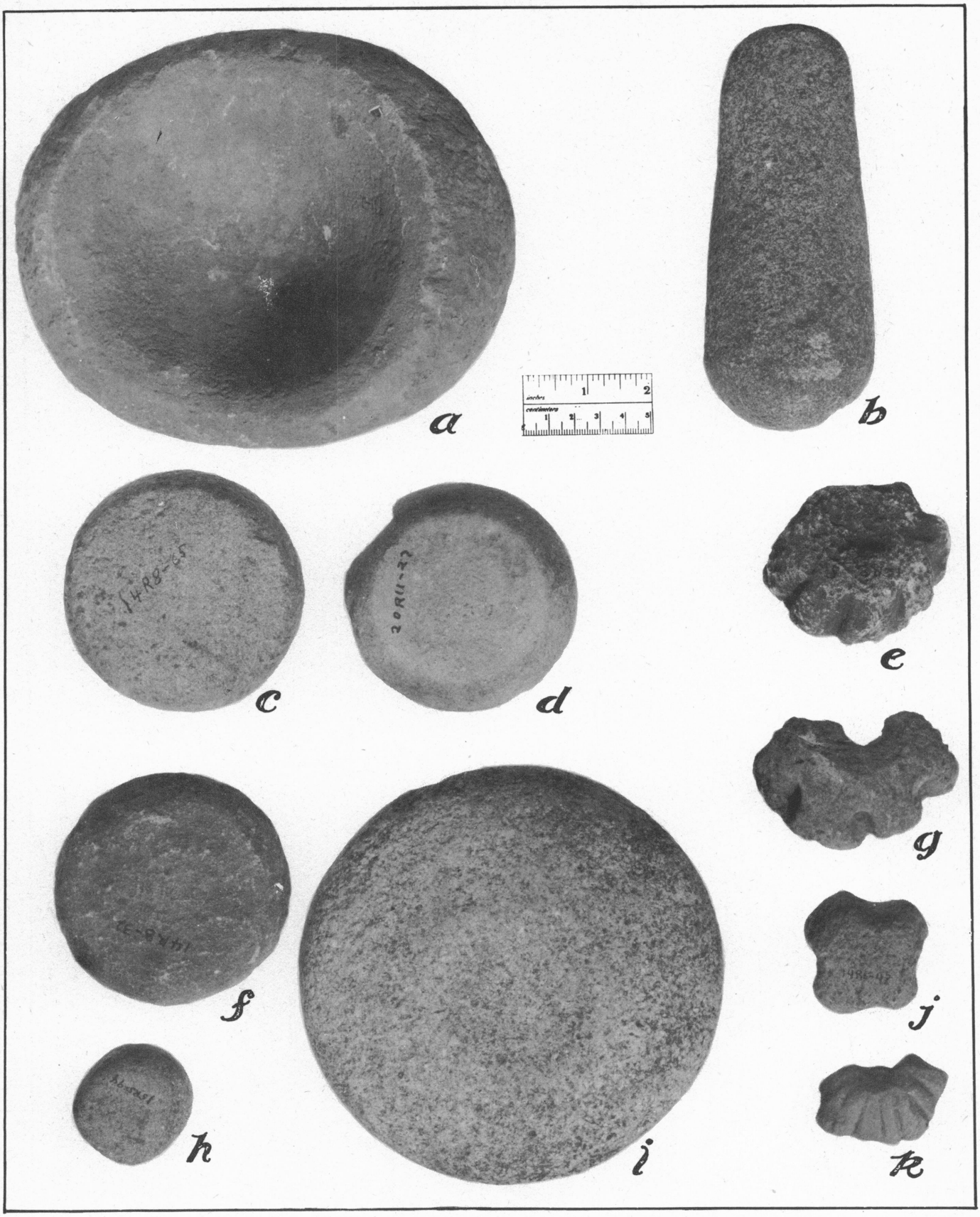

Plate 24. Ground Stone Artifacts