Bulletin of the

TEXAS ARCHEOLOGICAL SOCIETY

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TEXAS ARCHEOLOGICAL SOCIETY

The Society was organized and chartered in pursuit of a literary and scientific undertaking; for the study of history, prehistory, and the major artifacts of man and fossils representing the past floras and faunas of Texas; for the encouragement of the proper collection and preservation of such artifacts and fossils in museums and their study and classification and the publication of the results of researches incident thereto.

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TEXAS ARCHEOLOGICAL SOCIETY

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A Clovis Fluted Point From Hood County, Texas

S. Alan Skinner and Randle Rash

In October of 1968, Scott James, a second grade student in Granbury, Texas, found a Clovis fluted point in a pile of gravel which had been brought to his home from a gravel quarry located on the Brazos River in Hood County. Being curious about this large projectile he reported the find to Mr. Rash who subsequently relayed the information to the Anthropology Research Center at Southern Methodist University through Mr. Charles A. Smith, Jr., then secretary for the Texas Archeological Society.

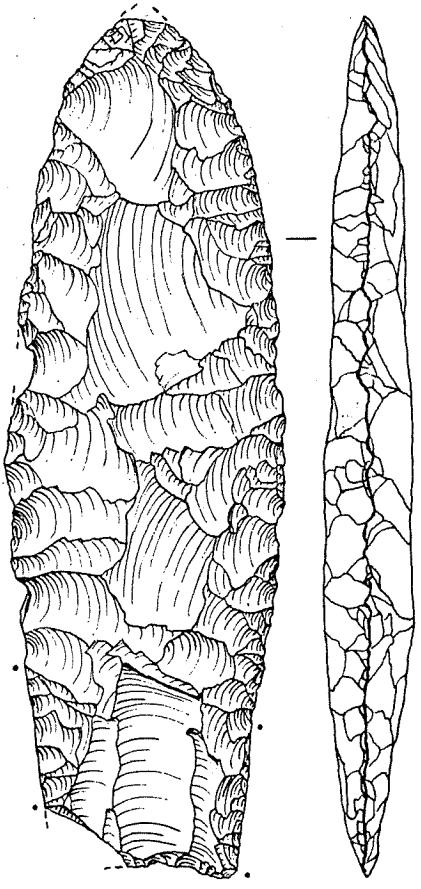

Fig. 1. Clovis fluted point from Hood County, Texas. Dots indicate the extent of lateral grinding. Full size.

The exact location of the gravel wash is uncertain but it was on the east side of the Brazos River in the vicinity of Granbury. The point appears to have been manufactured from locally available flint. In this particular vicinity, flint occurs as cobbles within bands of conglomerate which are present in the Cretaceous age limestone bluffs which border the river.

The point (Fig. 1) is made of a tan to light gray mottled flint. There is no evidence of stream smoothing of the flake scars or the edges. The tip, one corner of the base, and a notch on the left edge are recent and expose the unpatinated gray flint in the center of the point. Before the point was broken, Rash observed that there was a finely chipped notch present in the same location as the recent notch. The broken length of the point is 113 mm., the maximum width is 36 mm., and the maximum thickness is 9 mm. The point weighs 53.8 grams.

Primary flaking was carried out in a transverse manner to prepare the blank and is evidenced by the large scars on the upper three quarters of the body. The flake platforms were removed by subsequent chipping.

Secondary chipping is generally in an oblique manner directed toward the base from the lateral edges and usually does not extend over half of the facial span. The point was retouched before the flutes were removed. Three flakes were removed to create the flute on each face and in all cases the fluting flakes end in a hinge fracture. The lateral edges of the base are ground as indicated in the drawing. The butt of the base may have been ground but this is uncertain due to recent battering.

Although the point is not in a primary archeological context, it lends further support to a long period of occupation within the area. This find and recent work in the De Cordova Bend Reservoir area, particularly by Blaine, Harris, Crook and Shiner (1969) point to the presence of groups of Paleo-Indian peoples at the end of the Pleistocene. We now have to begin looking for sites where we can test to see just what life was like for these central Texas Paleo-Indians.

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The Resch Site 41HS16, Harrison County, Texas

Clarence H. Webb,
Forrest E. Murphey, Wesley G. Ellis and H. Roland Green

INTRODUCTION

In the four-state Caddoan Area a number of ceramic complexes precede the earliest distinctive Caddoan ceramics. Sand-tempered pottery, apparently the first ceramic along the Texas Coast (Wheat 1953, Ambler 1967, Aten 1967), appeared at least by 150 A.D., with associated Tchefuncte sherds. Inland in the Caddoan Area sand-tempered pottery was reported from the McGee Bend Reservoir in East Texas (Jelks 1965), in Southeastern Arkansas (Hoffman, personal communication 1965) and in variable but usually small amounts from a number of other sites in East Texas, Northern Louisiana and Southern Arkansas, on pre-Caddoan levels and generally preceding clay-tempered wares.

Clay-tempered ceramics are first known in the Caddoan Area in the Fourche Maline Focus of eastern Oklahoma (Bell and Baerreis 1951: 19-27), immediately following non-pottery Archaic levels. On a Hopewell-Marksville Woodland level clay-tempered pottery has been reported in the Bellevue Focus of northwestern Louisiana (Fulton and Webb 1953), at the Coral Snake (McClurkan, Field and Woodall 1966) and Jonas Short (Jelks 1965) mound sites near the Sabine River, from the Cooper Site in northeastern Oklahoma (Bell and Baerreis 1951: 27-33) and the Kirkham Site in north-central Arkansas (Dickinson and Lemley 1939). Clay-tempered pottery was dominant throughout Marksville, Coles Creek and Caddoan ceramics, only being supplanted by shell tempering in the eastern part of the Caddoan Area in late proto-historic times.

Bone-tempered pottery apparently was a Texas innovation. It appeared on the coast and in East Texas almost as early as sand tempering. Bone occurs as an aplastic in a small percentage of nearly all pottery types in the state, with the exception of those in trans-Pecos (Suhm and Jelks 1962). It is the major aplastic in the pottery type Leon Plain of Central Texas. It occurs in Goose Creek, Alto, Sanders, Frankston and less frequently in Titus and Texarkana ceramics. In northwestern Louisiana bone tempering occurs in a small percentage (up to 3%) of pre-Caddoan and Caddoan ceramics (Fulton and Webb 1953, Webb 1948, 1959). It is present in Fourche Maline pottery in Oklahoma, and Frank Schambach (personal communication 1968) has found considerable amounts of bone-tempered

pottery as far east as the Ouachita River in south-central Arkansas, in what he terms Lowland Fourche Maline, on a presumed Tchefuncte time level; in these two states bone tempering diminishes or disappears in later Caddoan wares.

These three ceramic traditions are associated, in their earliest manifestations, with projectile point and tool types carried over from the Late Archaic. No immediate and substantial change in the way of life is in evidence as pottery was introduced.

It seems pertinent to the study of these ceramic traditions to report our findings at the Resch Site in Harrison County, Texas, in which the ceramics cover the span from Tchefuncte to early Caddoan times and within which the three aplastics—bone, sand and clay—are almost equally represented. Evidences of trends in popularity of these aplastics are available; the associated artifacts will be examined with especial attention to projectile point changes; and speculations will be entertained about the way of life of the people who left these artifacts.

LOCATION OF THE SITE

The Resch Site, 41HS16, is located on lands owned by Frank Resch, Jr., of Marshall, Texas, and is 9 miles southwest of this town, in the southern part of Harrison County. Approximate Latitude is 32° 26′ 30″ N; Longitude 94° 25′ 30″ W. The site is situated on the east bank of Potter's Creek, about 5 miles northwest of the outflow of Potter's Creek into the Sabine River (Fig. 1). The site covers a clearing of about 5 acres on an almost level terrace which is elevated 7 to 8 feet above the narrow flood plain. Now in pasture, the clearing was cultivated for many years and at one time a farm house was situated thereon. It is ¼ mile north of Farm Road 2625.

TOPOGRAPHY AND NATURAL SETTING

Potter's Creek is a small stream which rises in the hill country west of Marshall, one of a number of small streams which drain the southern half of Harrison County into the Sabine River (the northern half is in the Cypress Bayou-Caddo Lake drainage system and a small sector of the southeastern part of the county drains into Cross Lake; both of these eventually reach the Red River). Potter's Creek flows southward and slightly eastward to the Sabine at the southern edge of the county. The entire valley of Potter's Creek from the level of the site to its terminus is only 1 to 2 miles wide; it is widened at the level of the site by two small tributaries from the east (Fig. 1). The actual flood plain is about 600 feet wide and the active stream bed is 30-40

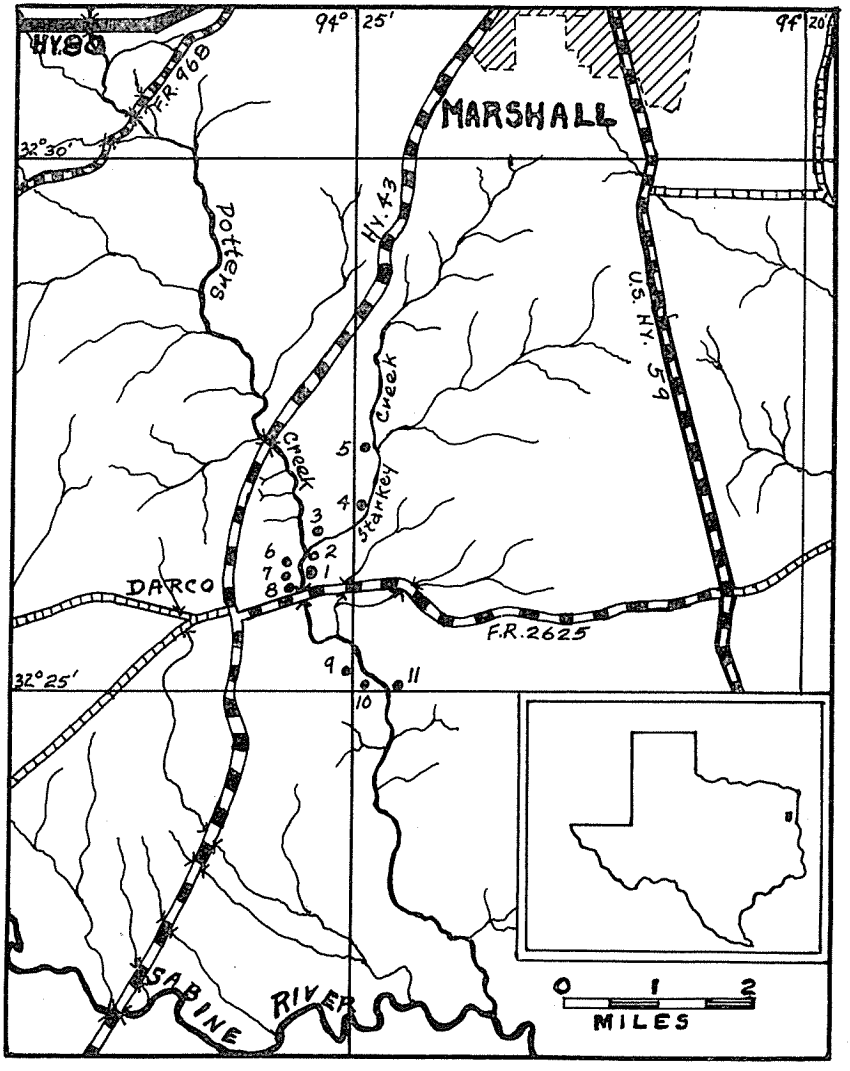

FIG. 1. Potter's Creek valley, showing archeological sites. No. 1 is the Resch Site.

feet in width. It is moderately rapid and carries a good volume of water the year round despite its small size. When the site was first visited the water was clear and fresh but during the past three years it has become badly polluted. Below the site the stream has few tributaries and meanders more than at the site level although the valley narrows to no more than a mile in width.

Flanking the flood plain are numerous small rises, representing dissected and flattened hill remnants or stream terraces. Further laterally are the slopes of the dissected sand-clay hills, with a soil which has a high content of iron and contains hematite and sandstone nodules.

This is rolling hill country within the confines of the Gulf Coastal Plain. It is in the Austroriparian Biotic Province of East Texas, described previously by Davis and Davis (1960), Jelks and Tunnell (1959), Johnson (1962) and others. The rainfall averages 40-50 inches annually, supporting an abundant vegetation. The hills surrounding the site are pine-clad with scattered oak, hickory, persimmon and sweetgum trees. Along the terraces and the stream valley the trees are in greater variety including oaks, elms, gums, walnuts, several varieties of hickories (Shagbark, Hicoria ovata, and Texas hickory, Carya buckleyi, producing hickory nuts; Hicoria pecan, or native pecans, and Hicoria glabra, producing pignuts), birches, sassafras, persimmons, hawthorns, hackberries, wild cherries and wild plums, chinquapins and rare bois d'arc or osage orange. Shrubs, including huckleberries; vines, including blackberries, wild grapes and muscadines; and numerous varieties of weeds produce a thick underbrush in the flood plain. Clearings on the terraces and sloping hills quickly grow crabgrass, bermuda grass and sedge. The number of native food sources in this list is impressive.

Native animal life is still abundant: two species of rabbits, three species of squirrels, opossums, raccoons, deer, black bear, foxes, wolves or coyotes, occasional bobcats and pumas, gophers (unfortunately), minks and skunks are all present; armadillos have invaded within recent years, and in former years otters, beavers and prairie dogs were indigenous. Snakes are not infrequent, including water snakes, king snakes and the poisonous varieties of moccasins and copperheads (as we learned to our sorrow when one of the children was bitten by a copperhead during an afternoon's dig and was desperately ill for a few days). Numerous birds include quail, doves and woodcock of the more edible species. Migratory waterfowl include ducks, geese, cranes and herons; during the 19th century passenger pigeons, turkeys, and trumpeter swans abounded. Before the stream became polluted, fish and turtles were present but the small size of the stream makes it unlikely that either they or shellfish were important food sources in aboriginal times. It seems more likely that nuts, fruits, plentiful indigenous and seasonal game, and arable soil for horticulture were the attractions in this valley.

ARCHEOLOGICAL RELATIONSHIPS AND OCCUPATIONS

Harrison County reflects an intermediate archeological position between east Texas and northwestern Louisiana, probably because of its connection with both Sabine and Red River drainages. Sites in the northeastern part of the county show affiliation with the Coles Creek, Bossier and Belcher complexes, while others in the county relate to Alto, Titus or Frankston Foci. The indicated pre-ceramic complexes include Early and Late Paleo-Indian (Clovis, Plainview, Scottsbluff, Meserve and San Patrice) and La Harpe Aspect Archaic, judging by projectile points found on the surface.

The valley of Potter's Creek was occupied during each of the culture periods known for this part of East Texas, from Archaic to European contact times. Despite the wooded terrain a surprising number of sites are known (Fig. 1) in the vicinity of the Resch Site. Immediately north of the site, across a small draw, a terrace elevation has surface finds of sherds and chips. Minimal testing showed materials similar to those at Resch, signifying scattered occupation during the same time period. Further north (Fig. 1-2) another knoll has thin Archaic occupation, although the collection is inadequate for classification. Still further north, the Jones South Mound (knoll) is ½ mile from Resch Site, lying between Potter's Creek and a tributary, Starkey Creek (Fig. 1-3). Plain clay-tempered sherds, including those of a bowl with incurving rim, and one linear punctated sherd do not provide information which is adequate for specific assignment. Another small site (Fig. 1-4) on the Jones Ranch is similarly not assignable. The third site on this ranch, Jones Pine Tree Mound (knoll), is approximately 1½ miles northeast of Resch Site (Fig. 1-5). Sherds there are more abundant; clay and bone tempering are about equally represented. Pottery types Pease Brush-Incised, Karnack Brushed-Incised, Ripley Engraved, unidentified linear punctated, red-filmed plain and numerous other plain sherds are represented.[1]

Across Potter's Creek from the Resch Site are three sites: Resch Burial Mound, High Knoll, and Susie Slade burial site (Fig. 1-6, 7, 8). High Knoll has limited surface findings and is not assigned. Excavations at the Resch Burial Mound disclosed burial pits which were 2 to 5 feet in depth; skeletal material had almost vanished but apparently the bodies were extended. Burial placements included pottery vessels of types Ripley Engraved, Hodges Engraved, Glassell En-

[1]Reference concerning pottery types should be made to the Texas Hand-book (Suhm and Jelks 1962), to Ford's group for the Lower Mississippi (Ford 1951, Ford and Quimby 1945, Ford and Willey 1940), and to Webb 1959, 1963. For projectile point types see Suhm and Jelks 1962, Bell 1958, 1960, and Ford and Webb 1956.

graved, Cass Appliqued, Pease Brushed-Incised, and Karnack Brushed-Incised, arrow points of types Bassett and Perdiz, and polished celts. The combination of Belcher Focus and Titus Focus ceramics is further evidence of the intermediate position of Harrison County between the Caddoan complexes of northwestern Louisiana and East Texas. Twenty-five pottery vessels were available for study; of these 13 were bone-tempered, and 12 were clay-tempered. Although not consistently true, there was a tendency for the Belcher Focus vessels to be clay-tempered, while the majority of the Titus vessels were bone-tempered.

The Susie Slade Site, 41HS13 (Fig. 1-8) afforded materials of the European contact period, with many pottery vessels and with trade goods in most burials, including glass trade beads, metal knives and bridle parts. Recognized pottery types were Simms Engraved, Taylor Engraved, Maddox Engraved and Maydelle Incised, all in clay-tempered paste. No shell-tempered pottery was found at this or any other site in the valley.

Downstream, and also on the west side of Potter's Creek, the old Brown Place (Fig. 1-9) is a village site on a terrace overlooking a relict channel. The sampling is small but three whole pottery vessels from a burial and sherds from the surface indicate an early Titus Focus occupation, similar to the situation reported at the Harroun (Jelks and Tunnell 1959) and Whelan (Davis 1958) sites. One of the vessels is a bottle with cylindrical spout, the top of which has encircling engraved lines like those seen on Hickory Engraved bottles of Alto ceramics; the body has a courant scroll design with central circles and with pendant or tented heavy spurred triangles; it probably would be classified as Ripley Engraved. A bowl is carinated and shouldered; the shoulder bears Avery Engraved decoration, while the flaring rim has encircling engraved lines. A third bowl, also carinated and with notched lip, has two horizontal rows of scratchy engraving forming a tented design. All vessels are clay-tempered. Accompanying projectiles are predominantly Bonham type, with one or two which could be called Alba.

At Henry Brown Sites No. 1 and No. 2 (Fig. 1-10, 11) on opposite sides of Potter's Creek about 2 miles south of the Resch Site, burial placements showed both villages to represent the contact period, although there were defiinite differences in the pottery complexes. At Henry Brown No. 1, on the west side of the stream, there were glass trade beads, trade knives and clay-tempered pottery of types Simms and Taylor Engraved. At Henry Brown Site No. 2 a number of burials contained glass trade beads, a brass or copper disc, and pot-

tery vessels of types Keno Trailed, Patton Engraved, Taylor Engraved, Natchitoches Engraved, Wilkinson Incised, Cass Appliqued, Maydelle Incised, Clements Brushed and Bullard Brushed. Arrow points were predominantly leaf-shaped, of Nodena type, with a few of Maud type. Of the 13 pottery vessels available for study, 6 were bone-tempered, 7 clay-tempered. Affiliations with Allen, late Titus and Glendora Foci are suggested by vessel types.

EXPLORATION AND EXCAVATION PROCEDURES

The existence of the Resch Site had been known to the Resch family since the time of the present owner's grandfather and the site had been clear and in cultivation for many years. Forrest Murphey, Wesley Ellis, Roland Green and their wives, of Marshall, Texas, explored the site while they were engaged in excavations of the Resch Burial Mound and Susie Slade Sites across the creek. During 1963 and 1964 they made preliminary tests to discover the depth of the midden and the possible nature of its contents. In one of these trial pits Mrs. Murphey unearthed, at about the 3 foot level, fragments of an entire vessel of Tchefuncte pottery (Figs. 8 d and 9). Realizing the unusual nature of this vessel and of the sherds and lithics found at the site, they contacted professional archeologists. Buddy Jones saw the site and identified the vessel, but was unable to give assistance at that time. The senior author was later contacted by Wesley Ellis and made arrangements to visit the site in early 1965.

This site is on the southernmost of two adjoining clearings, each about 4 to 5 acres in size, and both recently reverted to pasture land. Occasional surface sherds or chert flakes are to be found over most of the lower clearing but are concentrated nearer the stream. The major part of the site is along the crest and slopes of a mildly eroded terrace (Fig. 2) that is irregularly oval in shape along a NW-SE axis. Potter's Creek swings sharply against the northwestern portion of the terrace and apparently has eroded into it at its highest level, which is 7 to 8 feet above the flood plain. From this high point the terrace slopes gradually away from the stream and also slopes gently southward. At the southwest angle of the clearing (Fig. 2) the slope is steeper, down to flood plain level; at this point the creek swings westward into the valley but traces of an old channel cut across the southern edge of the site. In the center of the clearing, immediately east of the major site, there is a low area which is marshy in wet weather and shows no evidence of aboriginal occupation, although there are traces of occupation east of it, along the margin of the clearing. At the southeastern end of the site there is another oval-

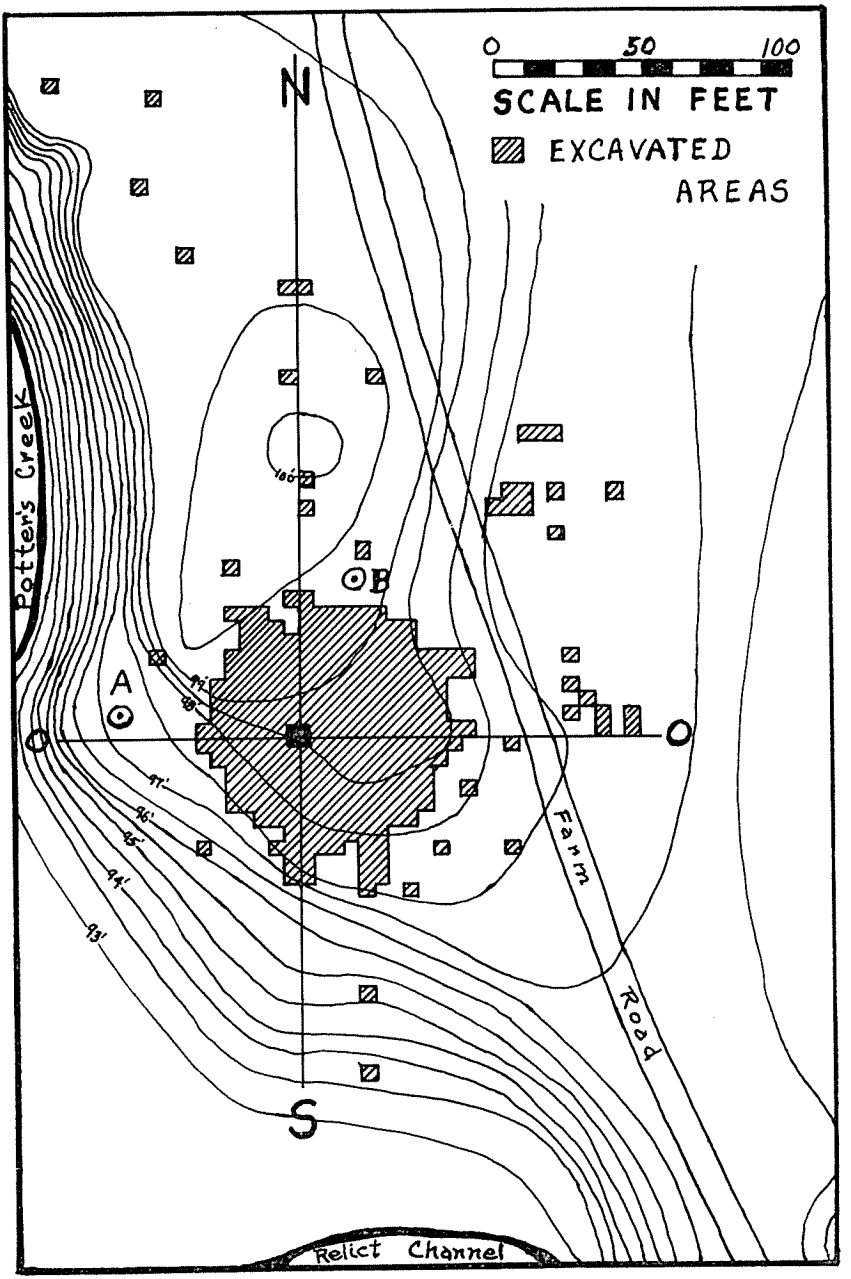

FIG. 2. Resch Site, showing excavated areas and terrace contours. Elevations in feet, with arbitrary figure of 100 feet at crest.

shaped depression, tree-covered, which has the appearance of a borrow pit (possibly resultant from road building during the 19th century, although we could find no record of such). It is known that a dirt road passed through the site, near the present road (Fig. 2) and that a house was located at the south end of the excavated area.

Work was started on the site on March 14, 1965. After the preliminary survey, base-line N-S and E-W coordinate axes, based on magnetic north, were set in the area chosen for initial investigation, near the place where the Tchefuncte vessel was found. A metal stake was implanted at the 0-0 intersection and this was triangulated with nails set in two trees, a gum on the bank of the stream west of the intersection and a pine to the northeast (Fig. 2 A, B). That part of the site around the intersection was staked in a grid of 5-foot squares. The excavation began in the first 3 squares south of the horizontal axis (E-W) and parallel to the east side of the vertical axis. By agreement bordering lines or profiles were recorded simply in feet from the original coordinate axes and squares were recorded by number in relation to these axes (i.e., the first three squares were E1S1, E1S2 and E1S3).

Participants in this initial excavation were the authors and their wives, Dr. A. L. Wedgeworth of Shreveport, his son Lang and daughter Ann, and Dr. Antley of Barksdale Field, La. Subsequently other friends and visitors have given assistance for which the authors are appreciative. These include the owner, Frank Resch, Jr., and members of his family, all of whom have had a sustained interest and have prevented depredation; Burney McClurkan, who investigated the site as a possibility for the 1966 Texas summer dig, and his son Kevin; Lou Fraser, Kelly Arnold, Billy Maloney, Terry Roden, Michael Beckman, Reverend Jim Simpson, Monroe Dodd, Jr. and his family, Rosemary Webb and the Webb grandchildren, Sarah, Bill, John and Larkin. Most of the excavations were carried out between 1965 and 1968 by the Murpheys, Ellis and Greens, joined by the Webbs on 40-50 afternoons. The dig has been conducted as a family affair, with the wives attending to creature comforts like food, refreshments and care of the children, when they were not participating in the excavations. Tarpaulin shelter, refrigeration, electricity for lighting, campfire cooking, garden vegetables in the excavated areas, and even television have been available, with lounge chairs for respite from digging. The senior author highly recommends this comfortable approach to archeological exploration; withal a high quality of technique was attempted. Records were kept by Murphey and Webb, and Webb accepted the responsibilities of typology and description.

Each square was excavated by 6-inch vertical levels, since no natural stratigraphy was discernible. Levels were recorded as Levels 1 to 9 beginning from the surface. Each level was troweled by thin vertical slicing or horizontal shaving, dirt was screened when this seemed indicated by the appearance of small objects and, after completion of each level, its floor was scraped to look for features. Excavations were carried 6 to 12 inches below the last appearance of artifacts or midden stain, usually 48 to 60 inches. Objects from each 6-inch level were placed in labeled sacks and at the end of each day's work they were cleaned and individually labeled by Murphey, indicating square and depth by level. At intervals they were transferred to Webb for typing and tabulation. In most instances individual squares were worked and refilled as completed, since this was pasture land and open pits were avoided. Balks were left between squares to record profiles and prevent caving; after adjoining squares were worked, the balks were troweled. In some instances 2 to 5 adjoining squares were excavated simultaneously, when the party was large, or in order to uncover or search for features, or to secure profiles. Field sketches were made by Murphey or Webb.

In the central block (Figs. 2, 3) 245 squares were excavated, a total of 6,125 square feet. In addition 13 squares were dug as tests outside the immediate periphery of this block; 19 were dug across the access road on the east side; and 8 were dug north of the N100 foot line along the highest part of the ridge. Three test squares were placed adjacent to the borrow pit along the old stream bed south of the clearing (Fig. 2). Altogether 288 squares were dug, covering 7,200 square feet of surface and incorporating approximately 25,000 cubic feet of midden.

RESULTS OF EXCAVATIONS

Over the major excavation block, the top 7 to 11 inches were a sandy loam topsoil of the plow zone, with grass, weed and shrub roots in abundance, and with many interruptions. At least by the 12-inch depth, on Level 3, a homogeneous midden zone appeared. This zone is of fairly loose sand with enough clay and midden humus to make this a darker reddish-brown sandy loam, and it continues down to the 30-36 inch depths of Levels 5 and 6. The soil then shifted to a lighter color with numerous white sand streaks and a number of small sand cones that were vertical, circular on cross section, and ¼ to ½ inch in diameter (Fig. 4 A, C). At a depth of 36 to 42 inches, by Level 8, clear white sand appeared and continued as far as we tested, which was usually down to 48-60 inches but in a few instances was as deep

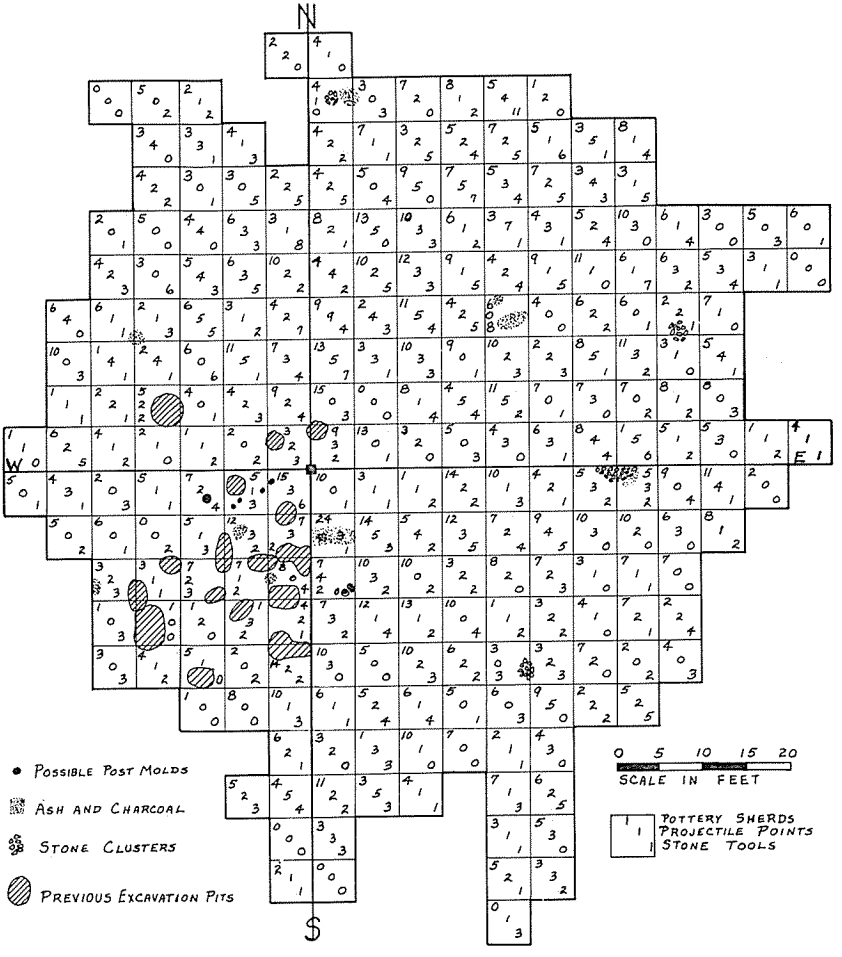

FIG. 3. Central excavated block, showing major features and indicating numbers of sherds, projectile points and stone tools by squares. 5-foot grid.

as 72 inches. Occasional streaks or small disturbances in the upper part of this sand were followed. Some appeared to be small aboriginal disturbances, although none had the characteristics of a storage pit or recognizable appendage to a house structure. Others seemed to be deep root penetrations.

Many profiles and horizontal levels were recorded; several examples are shown in Fig. 4. Fig. 4 A illustrates a typical profile taken from the initial 3 squares near the 0-0 intersection. The floor of these squares (E1S1, E1S2, E1S3) at the 36 inch depth (Fig. 4 C) shows

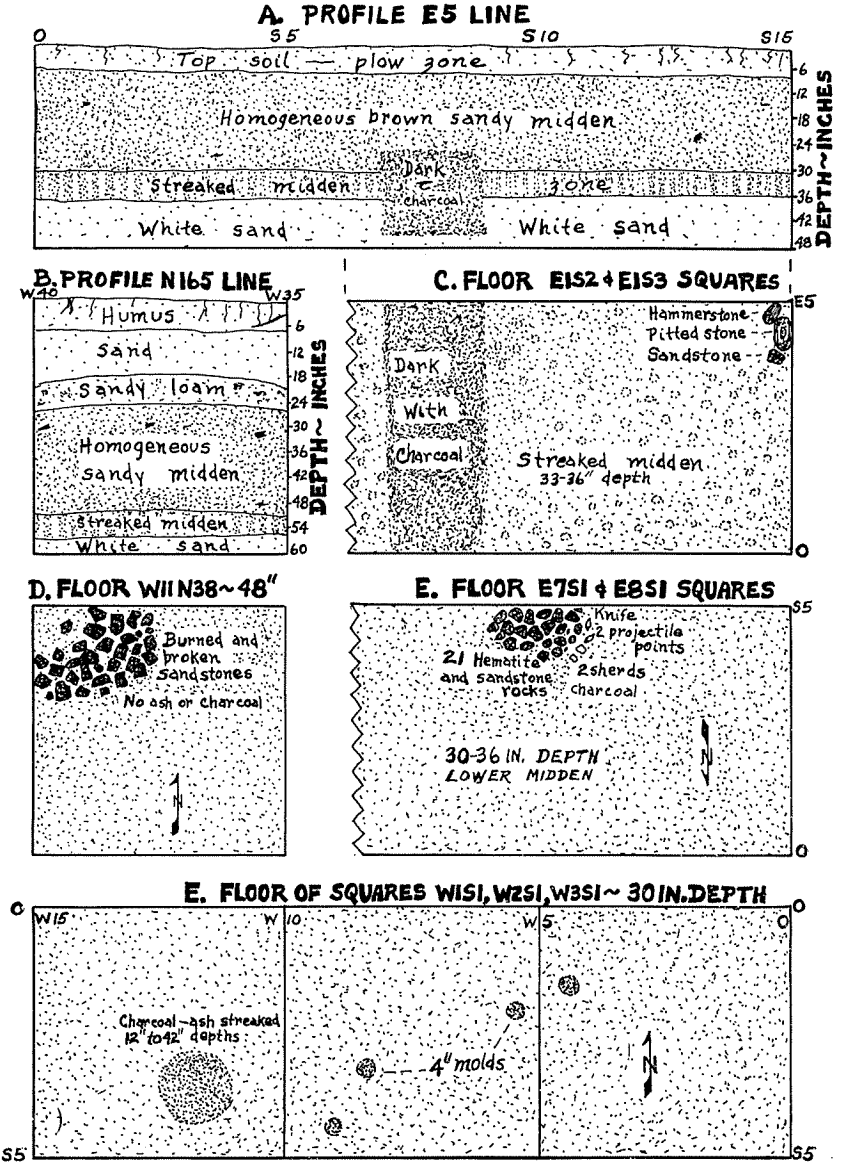

FIG. 4. Selected profiles and floors at indicated excavation levels.

the type of occasional dark soil and ash band found at this level, none of which could be shown to form a house outline; also this floor shows the numerous small circles of transected white sand columns, which

we thought could result from insect burrows, tree roots, a water filtration phenomenon, or some similar non-human agency. They were much too regular in size and distribution to have resulted from stakes or wands stuck in the sand by inhabitants. There were many rodent and insect burrows in the midden, also a number of large vertical columns or cones of burned soil, charcoal and sometimes rotting wood, interpreted as burned stumps resultant from land clearing in the last century. These originated from the top 12 inches.

The topsoil and first few inches of midden of Levels 1 and 2 contained few aboriginal artifacts, such as flakes, stone tools, and occasional sherds. There were many objects from the 19th or early 20th century occupation, including square nails, crockery sherds, buttons, household and farm implement fragments, and rotting cedar or cypress wood. Beginning with Level 3 below 12 inches, these objects disappeared with rare exceptions in intrusions, and aboriginal artifacts progressively increased in numbers, with the greatest concentration in Levels 5, 6 and 7. They became very scanty in the white sand of Levels 8 and 9. Figs. 21, 22 indicate these trends. Objects like sherds, projectile points, knives, scrapers, flakes and other smaller objects tended to be dispersed throughout the midden thickness; similarly they were scattered horizontally throughout the excavated block, with only a few concentrations (Fig. 3). Debris consisting of hematite and sandstone nodules, petrified wood slabs or fragments, whole and broken small chert cobbles, and flakes, was found throughout the midden. One of the excavators coined the term "stash pits" for the frequent clusters of pebbles, with occasional artifacts, found in filled gopher tunnels.

Clusters of larger stone objects included hammerstones, manos, pitted stones, anvils, and fire-darkened and cracked sandstones. Fig. 4 C illustrates the occurrence, at the 33-36 inch depth of Square E1S3, of such cluster: a hematite hammerstone, a pitted stone and a broken sandstone. Fig. 4 E shows a larger group, between the 30-36 inch levels of Squares E7S1 and E8S1, which includes 21 sandstone cobbles averaging fist size and many fire-blackened or broken; 50 small pebbles of sandstone, petrified wood and hematite; a few fragments of charcoal; and 44 stone flakes. Eighteen of the flakes were of petrified wood, 9 of tan chert, 7 of red chert and 10 of gray chert or flint. At the edges of this debris were 2 pot-sherds, 2 dart points and a chert knife. This was interpreted as a hearth, although ash was missing and the soil was not fire-hardened. The location of a number of these clusters is indicated in Fig. 3. The largest was found in 4 adjoining squares, E15-16, N16-17, at the 30-36 inch depth in which many of these

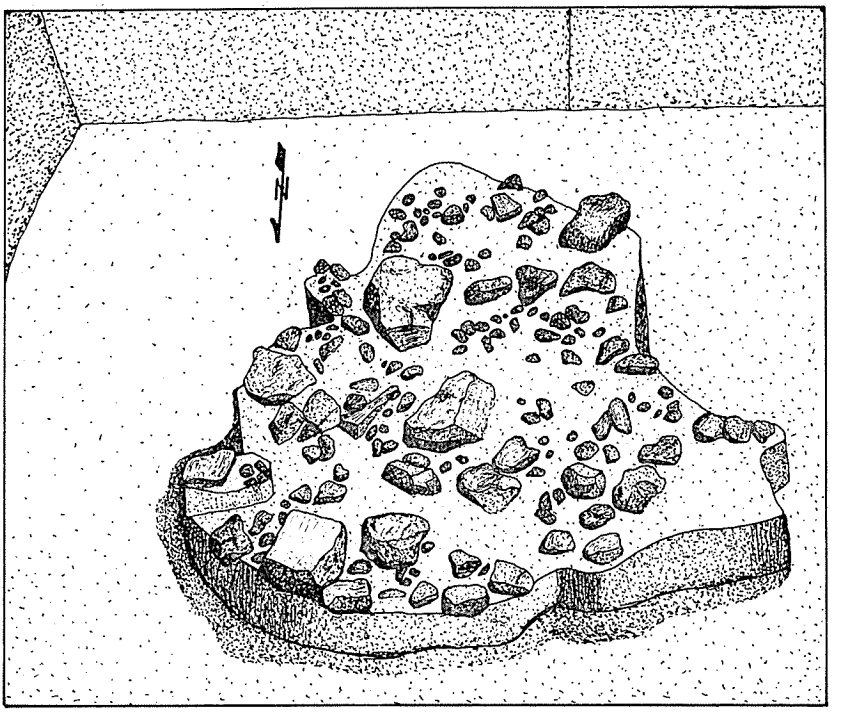

FIG. 5. Large rock cluster in squares N16, 17—E15, 16 at 30-36 inch depth (Level 6).

accumulations occurred (Fig. 5). This was a mass of stones over an irregular area, 5 to 6 feet in diameter, numbering several hundred and varying in size from pebbles to rocks 7 to 8 inches in diameter and weighing 10 to 15 pounds. Included were masses and flat segments of iron-sandstone, hematite of hard and soft varieties, petrified wood and chert cobbles. Several could have been used as hammerstones or anvils and one was a pitted stone, but most showed no evidence of use. Also, curiously, no charcoal, ash or artifacts were in association. The purpose of this rockpile is only conjectural and possibly it was simply this—a rockpile for future use.

We found no prepared hearths and no ash beds with associated animal bones which might indicate cooking areas. Moreover, despite a few molds which might represent posts set by the inhabitants, we found none which were arranged in anything like a house structure. In 3 adjoining squares (Fig. 4E) 4 molds of 4 inch diameter and a larger mold, 16-18 inches in diameter and charcoal-stained, showed on the 30 inch level. The large interruption could be followed from

12 inch depth to 42 inch, the smaller molds could be followed from 30 to 36 inch depth. However, no adjoining squares had molds to form a pattern with these.

No evidence of burials was found. The few bones found were badly decayed and all seemed to be animal bones. A few were recognized as deer bones but most were inadequately preserved to allow identification—often only streaks of white bone in the midden sand. Fragments of charred walnuts, hickory nuts and pignuts were scattered through the middens. No other plant food sources were recognized. Only small fragments or streaks of wood charcoal were found, apart from the burned wood in the tree stump interruptions. Nut and wood charcoal was saved for radiocarbon dating.

In the southwestern sector of the excavated block a number of previously dug and filled pits were recorded (Fig. 3). The fill of these pits rarely contained artifacts, except for flakes and discarded spalls, and those few that were found were not used for stratigraphic analysis. The surface in this sector slopes rapidly toward the old stream bed, beginning about 20 feet southwest of the 0-0 intersection, but the midden and the subjacent midden-sand junction had a similar downhill trend, so that it was not necessary to correct the depth relationship of recovered objects in analyzing the artificial stratigraphy. In fact, the midden thickness varied surprisingly little over the entire site.

We had hoped that the northern end of the terrace, immediately by the stream, would show a heavier midden and a higher yield of artifacts. However, the 8 test squares (Fig. 2) north of the N100 foot line, nearly all in a wooded area, were less productive than most of the excavation block. On the northern crest the top 18 inches consisted of a 6 inch zone of topsoil with root masses, then a 12 inch zone (Fig. 4 B) of lighter sand below which was the darker homogeneous sand-loam midden. Very little was found in the top 18 inches and 4 of the 5 sherds from Levels 1-3 had the characteristics of Coles Creek or Early Caddoan. The midden below the upper sand had a mixed zone on top at 18-26 inch depth, then the dark homogeneous zone down to about 50 inches, then the streaked zone to approximately 52-56 inches, below which was sterile white sand as shown in Fig. 4 B. In one of the northern squares, W11N38, a cluster of burned and broken sandstones occurred at the 48 inch level, Level 8 (Fig. 4 D). The evidence therefore is that the original occupation in the northern part of the ridge was at about the same elevation as at the excavation block and that the present higher elevation at the northern end is the result of deposit of sand on top of the terrace after the major occupation of the site. The mechanisms by which the midden

was built up uniformly by a 2½-3 foot increment during occupation of the site and by which the superimposed sand was deposited on the northern end after its desertion were not revealed by excavation. There were no discernible layers of water-deposited sand or clay.

The three tests along the old stream and near the borrow pit south of the site showed shallow middens with only traces of occupation. The midden was no more than a foot in depth, slightly darkened, with rapid transition to the sterile subjacent sand. Rarely were flakes and broken stones found. These evidences of light occupation discouraged further exploration.

The eastern slope of the terrace between the access road and the depression in the center of the clearing (Fig. 2) was more productive. There were 19 squares excavated in this area. The midden had about the same thickness as in the excavated block and the density of occupational evidences averaged about half that of the major block. Ten sherds were found in Square E23N2, 9 of these in Level 5 (24-30 inches). Square E16N16 yielded 7 sherds, 6 of these in Levels 6 and 7. Otherwise a low yield of 1 to 4 sherds per 5 foot square indicated a diminished occupation. The only feature of significance in this part of the site was the large rockpile in Squares E15-16 N16-17. We concluded that the major occupation of the site was along the NW-SE axis of the higher terrace remnant paralleling the stream. Major excavations were confined to the southern portion of this because it was in open pasture, in contrast to the wooded northern portion, and also because it did not have the additional foot of soil overburden. The absence of trees made it possible to excavate a large block completely.

Artifacts

A. Ceramics

There are 1541 pottery sherds from the site, excluding those from which the original Tchefuncte vessel (Fig. 9) was assembled. The latter had been found and the vessel finished before organized excavation was undertaken, but the vessel is included because its location was within the excavated area and three additional sherds were found.

Three additional vessels have been assembled from the excavated sherds, one completely, the other two in major part sufficient for reconstruction (Fig. 8). For the latter two, sherds are present to complete the bases, major sections of the rim and enough body sherds to assure continuity from base to lip. Lesser portions of other vessels have been fitted together, but insufficient to justify reconstruction. Sherds from which these vessels and segments were assembled are included

in the sherd studies but the individual vessels will also be described under type studies.

The ceramics from this site show an interesting but disconcerting diversity. A respectable percentage fits into established types, from Tchefuncte, Marksville, Troyville and Coles Creek ceramics as described in the Lower Mississippi Valley (Ford and Quimby 1945, Ford and Willey 1940, Ford 1951) and from pre-Caddoan and early Caddoan ceramics of East Texas (Newell and Krieger 1949, Suhm and Jelks 1962, Jelks 1965). However, much of the pottery does not fit these established types, and further difficulties obtain in that a high percentage of sherds is undecorated. Moreover, a variety of aplastics used as intentional tempering or accidentally included makes for difficulties in organizing the material into a distinctive indigenous tradition. There are present three major aplastics—clay or grog (ground sherd), bone, and sand—which we think are intentional tempering materials; there are at least seven minor and probably accidental kinds of inclusions: hematite and gravel granules, charcoal, ash, ocher, quartz and burned-out vegetal material. To compound the typological difficulties, nearly half (43 percent) of the sherds (Table 3) have a mixture of two or more of these aplastics.

The decision was made to study and describe the ceramics in a tri-partite way: first, by dividing the sherds into three groups in accordance with the major aplastic, regardless of recognized types, and determining the characteristics within each group; secondly, reclassifying by recognized types or indicated groupings regardless of tempering; and finally, to assess the possible significance of the previous groupings through distributional or stratigraphic studies. The first method of study is pursued with full knowledge of the fact that many existing pottery types have varying temper characteristics and that some aplastics may be accidental or due to local variations in available clay beds. However, we have noted that the three major aplastics had different origins and histories during the development of ceramics in eastern Texas. Moreover, this decision was strengthened by indications, borne out by complete studies (Tables 1, 2), that vessel wall thickness, throughout the life of the site, was distinctly different for bone, sand, and clay-tempered sherds, despite expected overlaps. This difference extends also to those sherds which are sorted by major aplastic, even though a mixture is present: sherds tempered with bone, alone or as the major aplastic, are thicker; those tempered with sand are intermediate in thickness; and clay-tempered sherds average having the thinnest walls; even the extremes of wall thickness follow the same trends (Table 1).

TABLE 1

Range of thickness and average thickness of vessel walls, by type of aplastic, from measurement of 1437 sherds

Major aplastic	Range of thickness in mm.	Average thickness in mm.	Number of sherds measured
Sand	5-11	7.6	153
Sand plus bone or clay	4-12	7.7	204
Bone	5-13	8.3	372
Bone plus sand or clay	5-12	8.0	185
Clay	3-11	7.2	311
Clay plus bone or sand	3-11	7.0	212
Total sherds measured	3-13	7.69	1437

TABLE 2

Average thickness of vessel walls in mm., by type of aplastic and by midden levels. Number of sherds measured from each level is given in parentheses

Midden levels	Sand	Sand plus bone or clay	Bone	Bone plus sand or clay	Clay	Clay plus bone or sand
1 and 2	7.0 (6)	7.2 (4)	8.0 (9)	7.7 (4)	6.1 (7)	6.4 (8)
3	8.0 (8)	7.3 (9)	8.5 (31)	7.3 (6)	7.0 (28)	7.7 (16)
4	7.5 (21)	7.8 (35)	8.2 (88)	8.0 (35)	7.5 (60)	7.0 (37)
5	7.7 (28)	7.6 (57)	8.0 (81)	8.2 (48)	7.3 (61)	7.2 (52)
6	8.0 (44)	7.6 (52)	8.5 (91)	8.1 (48)	7.0 (84)	7.0 (52)
7	7.3 (40)	8.0 (41)	8.4 (61)	7.9 (39)	7.2 (65)	7.1 (44)
8 and 9	7.3 (6)	7.8 (6)	8.7 (11)	7.4 (5)	7.0 (6)	7.0 (3)

1. SAND-TEMPERED POTTERY There are 364 sherds which we classify as sand-tempered (Table 3). Of these 149 have sand as the only recognized aplastic, 107 have sand with small amounts or a few fragments of bone, 92 have sand with smaller amounts of clay particles or grog, and 16 have all three aplastics but sand is the major one. With two exceptions, to be described below, there are no perceptible differences in other physical characteristics between those sherds tempered with sand alone and those in which other materials appeared. In addition to these three aplastics, 23 of the 364 sherds have one to several granules of hematite per sherd; these nodules are smooth, round or ovoid, and 1 to 8 mm. in diameter.

As a group the sand-tempered sherds are firm to very hard, are rarely crumbly except when the surface has been eroded, and in most instances have adequate clay matrix to assure good agglutination of the small sand grains. Although the surfaces have a gritty feel and fine particles of quartz glisten with reflected light, the manufacture

seems to have included enough surface rubbing to float a thin coating of clay to the surfaces and make them reasonably smooth on both exterior and interior. However, when two sherds are rubbed together, a grittier sound is made than is true of the clay–or bone-tempered sherds. Sherd size, about the same as in the clay-tempered, varies from 1 to 8 cm. in greatest diameter and most of the sherds are between 2 and 5 cm. in diameter. A generally rectangular shape suggests that the vessel walls were built up by coils, although the few bases available seem to have been made in a unit. Thickness of the body

TABLE 3

Pottery sherds by aplastic materials and by excavation levels

Temper	Excavation levels 1	2	3	4	5	6	7	8	9	unknown	Totals
Sand		6	7	27	26	41	34	6	1	1	149
Sand-bone		1	4	16	27	32	23	2	1	1	107
Sand-clay		1	6	14	29	23	15	3		1	92
Sand-bone-clay		1		2	7	1	5				16
Bone		9	30	96	92	94	63	7	2	4	397
Bone-sand		1	7	30	42	43	38	6		2	169
Bone-clay		1	3	6	3	5	2			1	21
Bone-sand-clay		2		3	4	1	2				12
Clay	3	6	29	60	69	88	69	4	1	3	332
Clay-sand		3	7	25	37	39	33	4		1	149
Clay-bone	1	1	14	5	6	9	7			1	44
Clay-sand-bone	1	4	5	11	9	2	4	2			38
Other materials			2(a)	4(b)	1(c)	5(d)	2(e)	1(f)			15
Totals	5	36	114	299	352	383	297	35	5	15	1541

(a) 1 vegetal, vacuolated; 1 clay-gravel.
(b) 1 clay-bone-charcoal; 1 bone-clay-sand-fiber; 1 clay-ash-charcoal; 1 vegetal, vacuolated.
(c) 1 sand-gravel.
(d) 2 sand-gravel; 1 bone-sand-charcoal; 1 sand-charcoal; 1 clay-sand-ocher.
(e) 1 sand-grog-gravel; 1 vegetal, vacuolated.
(f) 1 sand-bone-gravel-ocher.

walls (Table 1) ranges from 4 to 13 mm., averaging 7.6 mm. in the sherds which are tempered with sand alone and 7.7 mm. for those with mixed temper in which sand predominates. Bases vary from 9 to 18 mm. in thickness.

Surface and core coloration of the sand-tempered sherds indicates variations of firing temperatures and conditions, with some possible variations resultant from the paste characteristics. Of the 364 sherds, 142 (39.01%) have uniform colors of exterior and interior surfaces and cores, usually light colors which include buff, orange, light to dark gray and light brown. Oxidizing temperatures are indicated. Some 122 sherds (33.51%) have the same range of lighter colors on

the exterior with black or dark gray for the interior and much of the core. This is presumably from firing in inverted position with smoke darkening of the interior. Fifty-five sherds (15.11%) are black on both surfaces and throughout the cores, indicating reduced firing conditions; another 21 sherds (5.77%), representing two vessels, are dark brown to black throughout. Seven sherds have light coloration of exterior and interior surfaces, with black cores; 5 have gray to black surfaces and very light cores. The remaining few sherds are variable, probably as a result of fire clouds. Two matching sherds with uniform color have a black substance on the exterior, possibly asphaltum.

The 364 sherds encompass 29 rim, 5 fragments of bases and 330 from the body walls. Four sherds have conical perforations, drilled from the outside. Two of these, presumably from the same vessel, are rim sherds in which the perforations are 3.5 cm. from the lip.

Nearly all of the 29 rims are vertical and direct (Fig. 6 i); none has the appearance of flaring or outward rolling. The lips are rounded in most instances, sometimes thinned by an external bevel. Six rims have flat lips, equal in thickness to the vessel wall. Four rims are incurvate, all with thinned, rounded lips, and two of these have lip notching; the notches are fairly deep, placed diagonally in one instance and transversely in the other (Fig. 6 e, f). Additionally, three of the rims with flat lips have tiny notches on the outer lip edge. Two of the latter probably derive from the same vessel, hence sherds from 4 vessels have notched lips; all others are plain.

Of the 5 basal sherds, three are small fragments which give no idea of size or shape. One is a complete small flat disc, 5.5 cm. in diameter and 9 cm. thick, with smooth exterior and rough interior surface. It is sand-tempered with a small amount of grog. Around the periphery there are 4 indentations, with an edge projecting downward, suggesting that the adjacent wall may have had podal projections (Fig. 10 j). The other basal sherd represents about ⅛ of the total base and is similarly small, about 5.5-6 cm. in diameter and 15 mm. in thickness. The ventral surface is concave and the doughnut-like edge extends directly upward for 1 cm. before curving outward (Fig. 10 f). It also has a mixture of sand with a small amount of grog, and the core is puddled or contorted as often seen in Tchefuncte sherds. No sherds which suggested a conical base were found.

The 330 body sherds are remarkable, insofar as evidence of shape are concerned, mostly in a negative way, except the four groups of matching sherds noted below. Fairly uniform size and shape is indicated by sherd curvatures; there are no appendages, appliques or acute angulations to indicate wall modifications.

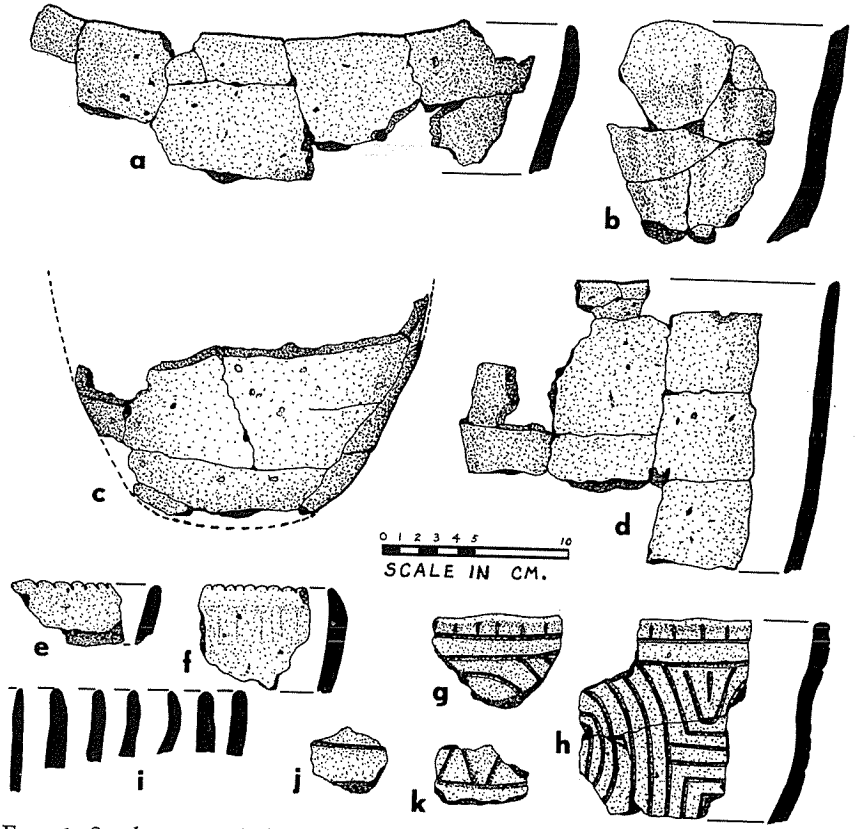

FIG. 6. Sand-tempered sherds. Plain sherds and vessel portions: a-f; notched rims: e, f; incised decoration: g, h, j, k; rim profiles, interior to left: i.

Five groups of matching sherds could be fitted to form sections of vessels. One of these will be described under decorated sherds. A second group consists of 13 sherds with heavy sand tempering, almost sandstone in consistency, reddish-buff in color, shading to black near the vessel base. They derive from what appears to be a flowerpot-like small vase form (Fig. 6 b), with walls which thicken from 9 mm. in the upper portion to 13 mm. where the wall joins the base, which apparently was circular and thick. The outer surface is irregular and has shallow vertical flutings placed 1.5-2 cm. apart, which corresponds to the distance between an adult's fingers, suggesting vertical smoothing with the open hand.

Three other sherd groups are fitted to form sections of deep open bowls or "flowerpot" vases. A group of 20 forms the lower wall of a vessel, indicating a circular base of 8-9 cm. diameter, and outward

flaring walls (Fig. 6 c). Another group of 21 sherds derives from the rim and upper wall of two vessels; one is a deep bowl and the other seems to be a vase form. Rim diameters of 24-28 cm. are indicated (Fig. 6 a, d). These sherds are preponderantly sand-tempered with some coarse bone and nodules of hematite; they have sufficient clay matrix to give a very compact paste, and they are well fired to a red-brown color. The result is a hard, almost metallic ware which rings when tapped and which we dubbed "East Texas ironware"; it is the hardest and firmest prehistoric pottery which we have seen from this area.

Decorated sherds: Of the 364 sand-tempered sherds, only 18 (4.95 percent) are decorated, if we except the plain sherds with notched lips. Four of the 18 are from one vessel, including two rim sherds (Fig. 6 g, h). The indicated shape is a barrel-like jar with vertical rim and flat lip, with wall thickness of 8-11 cm. The paste is sandy with rare bone and hematite fragments, as hard as the "ironware" described above. The entire outer surface is decorated with firm incised lines. Two parallel lines encircle the rim, and between the upper line and the lip there are vertical nail punctations. Body panels are indicated, with concentric circles or arcs surrounding a central rectangle. Separating these major panels are small double groups of concentric rectangles. Two other small sherds have single deeply incised straight lines and two have curving incised lines. Two rim sherds have diagonal lines incised with a notched or forked tool to produce double incisions, and another small sherd has multiple, closely placed parallel incisions. One large and 3 small sherds of another vessel show a single horizontal incised line, above which are V-shaped lines which possibly form alternating triangles (Fig. 6 k). One sand-tempered sherd has tool punctations zoned by deeply incised lines (Fig. 10 p), another has horizontal incised lines. The final decorated sherd is black, sand-tempered, firm, with nail pinches which form V-shaped or triangular punctations (Fig. 10 e).

Vessel shapes which are indicated by the above descriptions include deep bowls, large "flowerpot" vase forms with gently curving lower walls, cylindrical and barrel-shaped jars, and bowls with constricted rims. Flat disc bases and concave extended bases are indicated and tetrapods are possible. Shallow finger fluting of lower vessel walls occurs.

2. BONE-TEMPERED POTTERY There are 599 predominantly bone-tempered sherds from the site (Table 3) of which 397 are tempered with bone alone, 169 with bone and some sand, 21 with bone and small amounts of clay-grog, and 12 with all three aplastics but with

bone predominating. Only 12 of the bone-tempered sherds show particles of hematite, which indicates that the potters were less likely to pick up this extraneous material when they used bone for the aplastic than when they used sand or grog. However, many of the sherds of all three wares had tiny brown specks or smudges which we interpreted as due to the presence of hematite ocher in the local clays.

In general physical characteristics this is a good ware. The sherds are firm, with a greater tendency to brittleness than the clay or sand-tempered sherds. The surfaces, except when there is considerable sand in the paste, are smooth but not polished. Wedging of the paste is somewhat better than in the other wares, although the larger particles of bone make this imperfect. Sherd size varies more; there are numerous large sherds, in excess of 6 cm., but also many small fragments, apparently due to the brittle quality; numerous small sherds are split through the core. Unit construction of the bases and coiling for the vessel walls is indicated by sherd fracture; the coil breaks are often beveled, indicating that they were welded by shearing motions of the hands, as described by Aten (1967) at the Jamison site. In the Resch sherds this motion was upward or from the base toward the rim on the exterior, downward on the interior, which is opposite to that described by Aten. Body walls are thicker than in the other wares, with a range of 5 to 13 mm. and averages of 8.3 mm. for sherds tempered with bone alone, 8.0 mm. with mixed temper (Table 1). There is no evidence for a change in this tendency during the occupation of this site (Table 2). Bases were 12-17 mm. thick.

The external surface coloration is more pleasing than in the other wares. Reds, oranges and reddish buff colors predominate, with lesser numbers of varying shades of gray, and a few dark brown to black. A white speckled appearance is given by the numerous bone particles, which vary from barely visible up to 5 mm. in diameter. Few of the sherds are smoothed sufficiently to float enough clay to the surface to cover the bone particles. Firing is variable, so that clouds or variations in color on the same vessel are produced; oxidation is generally more complete than in the clay-tempered sherds from this site. Of the 599 sherds, 169 (27.88%) are uniformly light in color throughout the core; 290 (48.41%) have light colors on the exterior with darker cores and interior surfaces; 59 (9.85%) are dark on both surfaces and through the core; and 51 (8.51%) have light surfaces and dark cores.

The 599 sherds include 27 rim sherds, 30 derived from bases, and 542 from body walls. Three sherds have perforations, two of which exhibit counter drilling. There are no vessel appendages, specialized

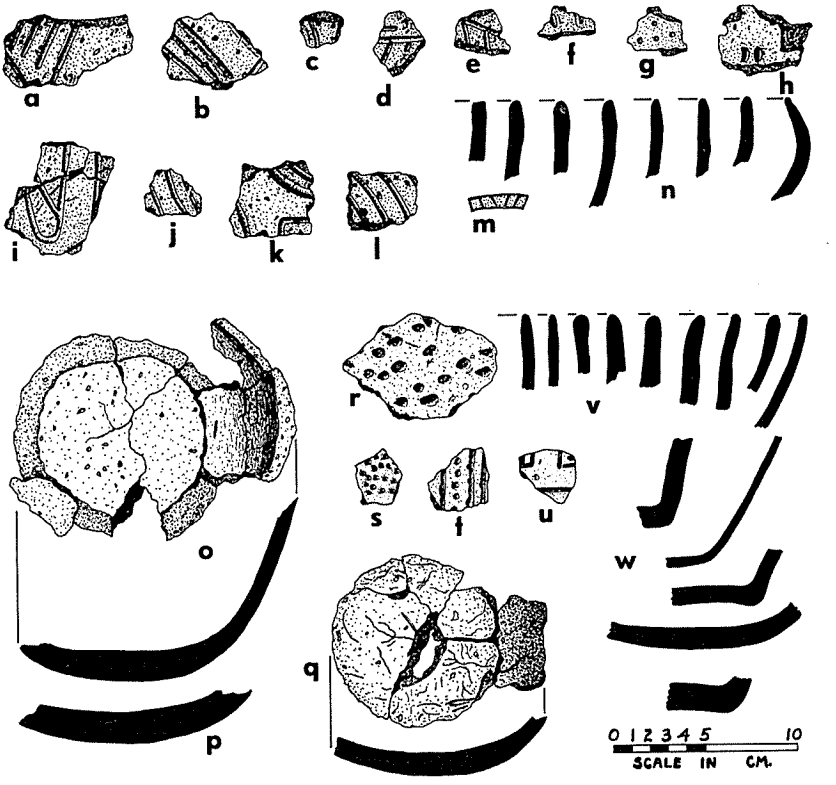

FIG. 7. Bone and clay-tempered pottery sherds. Bone-tempered deeply incised or trailed sherds, straight-line: a-e; bone-tempered punctated sherds: f-h; bone-tempered curvilinear incised sherds: i-l; diagonally incised lip: m; profiles of bone-tempered rims: n; bases of bone-tempered vessels: o-q; clay-tempered punctated sherds: r, s; zoned punctated sherds: t, u; profiles of clay-tempered rims: v; profiles of clay-tempered basal sherds: w. Interior of profiles to left.

shapes or vessel modifications other than the decorations described below.

The rims more often are direct, not thinned, with rounded lips (Fig. 7 n). Eighteen are direct, 6 incurvate, 3 excurvate; 10 are thinned, 17 are not; 17 of the lips are rounded, 9 (including 6 from Vessel 4) are flat, and one has a slight external roll. One (Fig. 7 m) has diagonal incisions across the flat lip, one with thinned and rounded lip has tiny notches, and one is a segment of eared rim.

From the 30 basal sherds, 4 complete bases were reconstructed. In

each of these, the base had broken into 4 sherds. These 4 bases are 9.2, 10, 11.5 and 12.4 cm. in diameter. They are disc-shaped, flat or gently concave on the interior and gently rounded or convex on the exterior (Fig. 7 o-q). The other basal fragments show a similar shape, some being more strongly convex. Vessels with these bases would be unstable on a flat surface. There are no podal appendages or evidences of concave, squared or extended bases.

The 542 body sherds are not remarkable, except that the thickness and curvatures on many indicate a moderately large size, consistent with Vessel 4 described below. This conclusion is also suggested by the fact that 90 percent of the total bone-tempered sherds are from the body wall, 10 percent from rims and bases combined. The same proportions hold for the sand-tempered sherds, and these may be compared with a proportion of 81% body sherds among the clay-tempered. Moreover, two groups of bone-tempered sherds, in addition to Vessel 4, were matched in sufficient numbers to indicate vessel diameters of 20-25 cm.

There are 58 decorated sherds among the 599 bone-tempered (9.68%): 11 of these are rim sherds. Of these, 22 (including 7 rims) derive from Vessel 4 which has a band decorated with deeply incised diagonal lines in triangular grouping, with small punctated fields (Fig. 8 a). Thirteen additional sherds have similar diagonal and parallel lines (Fig. 7 a-e). One of these is a rim sherd with bone and sand-tempering. Several have clay or grog temper in addition to the sand, but bone is the predominant aplastic in the entire group. Three additional sherds have decorations with similar heavy, rounded lines which form curved patterns (Fig. 7 i-l). In all of these instances the deep, trailed lines resemble the lines which border the bands of rocker stamping to be described for the clay-tempered sherds.

Three sherds from the same vessel have a band of decoration which features alternating groups of diagonal lines and small punctate-filled triangles (Fig. 11 y, z). The incisions and punctations are made with a pointed tool. One rim sherd shows excurvate form. Two other sherds have single short incised lines, but the sherds are too small to disclose a pattern. Three thick sherds have random punctations made with the fingernail in two instances and with a pointed tool in the other (Fig. 7 f-h). One rim sherd shows two horizontal lines below the rim which is direct and rounded. Seven bone-tempered sherds are decorated with brushing (Fig. 11 aa-cc), which in six instances is vertical and in the seventh diagonal. A thin, well made sherd (Fig. 11 t) shows a combination of brushing and tool punctating. Finally, there are three bone-tempered sherds from high rims, one showing the

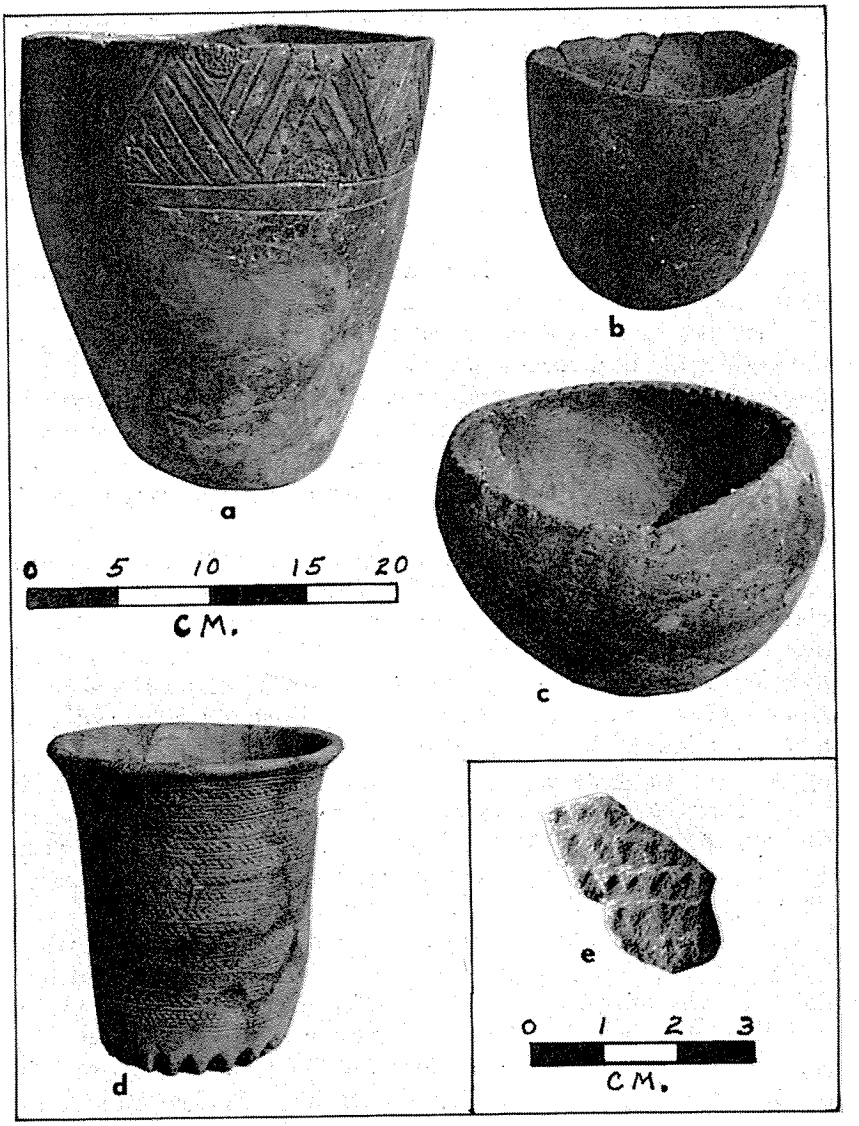

FIG. 8. Whole vessels, reconstructed, Resch Site. Vessel 4, Canton Incised, variety *talco*, a; Vessel 2, possibly Marksville Plain, b; Vessel 3, possibly Tchefuncte Plain, c; Vessel 1, Tchefuncte Stamped, variety *resch*, d; sherd of linear triangle stamped, McBean Creek Site, Burke County, Georgia (courtesy David S. Phelps).

lip which is thinned, and all exhibiting decoration with horizontal engraved lines (Fig. 11 o, p).

3. CLAY-TEMPERED POTTERY There are 563 sherds classified as clay-tempered. Of these, 332 have clay particles usually recognizable as crushed sherd (grog) as the only aplastic; 149 have clay with sand or grit as a second aplastic; 44 have clay as the major tempering but have a few particles of crushed bone in addition, and 38 have clay as the major with both sand and bone as minor aplastics. In the total group, 24 sherds have particles of hematite of the same size as noted for the sand-tempered sherds.

In comparison with the sand-tempered sherds, the clay-tempered group tends to be firm but not as hard, lacking the metallic appearance and ring on tapping. The paste is not uniform and many of the sherds have a crumbly core. Conversely, the surfaces are smoother and some of the thinner (Coles Creek and Caddoan) sherds have a homogeneous paste with hard, polished surfaces. The sherd size is comparable to the sand tempered, 1 to 8 cm. in greatest diameter, and most of the sherds are 2 to 4 cm. in diameter, with the same tendency to rectangular breakage which indicates coiling manufacture. The vessel walls average 7.2 mm. in thickness in those sherds which have only clay tempering, and 7.0 mm. for those with mixed tempering, with a range of thickness from 3 to 11 mm. in both groups, As noted in Table 1, this wall thickness is less than in the sand-tempered or bone-tempered sherds. Clay-tempered basal sherds range from 10 to 15 mm. in thickness, averaging between 12 and 13 mm.

The coloration of the surfaces and cores shows more evidence of firing under reduced temperatures. Only 140 (24.9%) of the 563 sherds have a uniform light color throughout the core and on both surfaces. A much larger number, 236 (41.92%), have light colors on the external surfaces with black to dark brown interiors and cores, and an additional 78 (13.85%) have light exterior and interior surfaces and black cores. The color range of the oxidized areas includes dove gray, buff, reddish-orange, medium gray and light brown. The red-buff to light brown color predominates, but a few thin, polished, orange sherds are outstanding. There are 90 (16%) sherds that are black or dark brown throughout. One sherd has a black exterior and core, with a light gray interior. Colors of the remaining 18 sherds are variable or difficult to determine because of small size or worn condition. A single vessel often has variable coloration, with a tendency for the basal portions to be darker, especially on the interior, and "fire-clouds" are often present.

The 563 clay-tempered sherds include 71 rim sherds, of which 3 are rims of bottle spouts; 460 derive from the body wall; 22 from bases; and 10 additional spout sherds. Only one sherd, a rim sherd of

Vessel 3, has a perforation placed 2 cm. below the lip. It is drilled from the exterior and tapers from 8 mm. in diameter to 5 mm. at the interior opening. The opposite rim sherd is missing.

The 71 rims (Fig. 7 v) show a much greater tendency toward the incurvate form than among the sand-tempered sherds; 33 are incurvate, 26 direct and only 4 excurvate. One is not only incurvate but constricted and cambered (Fig. 11 i), 1 has an internal roll and 1 is angulated and is apparently a section of an eared bowl. A few of the lips are flat and 1 of these is twice as wide as the vessel wall. Nearly all are otherwise rounded and slightly thinned. Ten of the rims, including 6 from Vessel 3, have notches across the lips, transversely. The 3 spout rims (Fig. 11 l-n) are direct and all are decorated with horizontal engraved lines.

The 22 basal sherds (Fig. 7 w) include 9 with black interior surfaces and light exteriors; 2 black throughout; 5 with black cores and light surfaces; and only 6 which are light in color throughout the thickness. One base is almost complete, 9 cm. in diameter, 10 mm. thick and gently convex on the lower surface. Seven seem to be portions of flat discs, one of these having a probable diameter of 9.5-10 cm. Another circular base of similar size is gently concave on its lower surface. Two have upward extensions of 8-10 mm. on the side wall before curving outward, and one of these has a deep concavity of the lower surface (Fig. 10 g), similar to one of the sand-tempered bases. A small sherd (Fig. 10 h) with paste suggestive of Tchefuncte Plain has an outward projection or flange formation of the lower wall; another small sherd has a mammiform podal projection which is 1.7 mm. in diameter and 5 mm. in height (Fig. 10 i). Two sherds have rim and base components which show them to derive from flat bowls; both are plain and have slightly insloping direct rims.

Vessel shapes suggested by the body and rim sherds are shallow, flat bowls with narrow rims; deeper bowls; flower-pot shaped vases; jars with rounded bodies and upright or outward sloping high rims; barrel-shaped or deep semi-globular vessels with constricted orifices; cylindrical jars and bottles with tapered spouts.

Decorations include a greater variety than in the sand or bone-tempered ceramics. There are 49 decorated sherds (8.7%) among the 563 clay-tempered, excluding the 10 with notched rims. Eighteen sherds, of which 8 are rim segments, have multiple parallel incised lines, apparently all placed horizontally below the rim (Fig. 11 a-g, w). Three sherds have a single incised line. Two are small but the third is larger, with incurving cambered rim and one smoothly incised line below the rim (Fig. 11 i). One sherd is deeply incised with parallel

lines in zones (Fig. 10 o). One sherd combines rectilinear incising with zoned punctating. Another has a single row of punctates in the center of bands which are outlined by incised lines (Fig. 7 t). Two sherds with linear triangular stamping, found during the excavation, derive from Vessel 1. There are 4 sherds, 2 thick, 2 thin, with random punctations (Fig. 7 r, s), 3 made with tools, one with nail gouges. Thirteen sherds have rocker stamped decoration in zones outlined by deep incisions (Fig. 11 l-n). Six sherds have engraved decoration; 4 are bottle spouts with engraved encircling parallel lines. Two are bottle shoulders with similar encircling engraved lines (Fig. 11 r, s).

Three vessels have been reconstructed from clay-tempered sherds. Vessel 1 is the discovery Tchefuncte vessel (Fig. 8 d, 9). It is made of firm, clay-tempered paste, with better wedging than usual for Tchefuncte wares but with a thin powdery exterior coat which flakes off readily. Oxidizing temperatures resulted in light colors on both surfaces and through the core. Surface colors vary from orange-buff to greenish to light brown. The shape is a cylindrical jar with constricted base, mildly flared, rolled rim and rounded lip. The height is 17.2 cm. The diameters are: orifice 15.5 to 15.8 cm., midbody 12 cm., base 10.2 cm. The thickness of the vessel wall varies from 8 mm. near the lip to 6.5 at midbody and 7 mm. at the base. Only half of the base was found; it has 11 mammiform podal supports in cog-wheel arrangement around the outer circumference. The decoration consists of 14 encircling bands of triangular stamping apparently done with a single tool. Each band is decorated with alternating upright and pendant triangles and with a zig-zag ridge of clay of near-uniform width between the impressions. Between the bands are two parallel encircling lines formed by drag-and-jab technique. Three similar lines are between the topmost band and the lip, and three lines separate the lowest band from a narrow plain zone above the podal supports.

Vessel 2 (Fig. 8 b) is completed from 13 sherds, with only two small sherds missing. It is tempered with clay, bone and sand, with the clay predominating; the paste is somewhat lumpy and the surfaces irregular. It is a plain cylindrical jar with a wavy rim, to the extent that the height varies from 12.4 to 13.5 cm. Diameters are 13.9 to 14.4 cm. from the lip down through most of the body. The lower body curves in to a small, mildly convex disc base which is 6.5 to 7 cm. in diameter. The walls are thick, averaging 9 mm.; the base is 14 mm. in thickness .The rim is thinned by an inner bevel and the lip is rounded.

Vessel 3 (Fig. 8 c) is a deep bowl with incurving rim and constricted orifice. It was reconstructed from 19 sherds which afforded about two-thirds of the total vessel. The paste is clay-grit tempered,

firm with moderately smoothed but unpolished surfaces. The interior surface has a crackled appearance. The vessel is 12.8 to 13.4 cm. in height. Diameters at the rim, as reconstructed, are 16 to 16.5 cm. and at midbody are 18 to 18.5 cm. The walls average 8 mm. in thickness, but vary considerably, from 7 to 9.5 mm. The base is convex and there is no evidence of separate construction of a disc base; in fact, the base is continuous with the side walls. The rim is thinned to a slightly rounded lip, which has deep notches spaced at 8 mm. intervals. A perforation, 3 cm. below the lip, is drilled from the exterior; the opposing sherd is missing.

4. OTHER APLASTICS Fifteen sherds have other aplastics or some unusual combination of aplastics, most of which are probably accidental (Table 3). Three sherds are light in weight and have vacuoles which presumably result from vegetal materials which burned out in the firing process. Two of these sherds from the same vessel are decorated with a vertical band outlined by incised lines and bisected by a row of punctations. Five sherds have numerous particles of coarse gravel, mixed with sand or clay, or a sand-clay combination. Four sherds have ash or charcoal, along with clay, bone or sand in varying amounts. One sherd has a combination of bone, clay, sand and burned-out fiber. Another sherd has clay, sand and crushed ocher. The final sherd has sand, bone, gravel and crushed ocher. The last two sherds described have large amounts of ocher, not the occasional stain seen in the paste of many sherds. Except for the two decorated sherds all others with unusual aplastics are plain body sherds.

B. CERAMICS—POTTERY TYPES

In this section vessels or sherds will be assigned, where possible, to known pottery types of the Lower Mississippi Valley and of eastern and southeastern Texas. This can be done with certainty only for those sherds which are decorated or have distinctive features relating to form, lip treatment or basal segments. We shall then consider the untyped sherds, especially the plain, as they appear to relate to the ceramics of this area.

1. TCHEFUNCTE PERIOD

(a) TCHEFUNCTE PLAIN: 19 sherds are thought to be Tchefuncte Plain, on the basis of paste characteristics, surface finish or shape. Six of these are basal sherds which, in addition to consistent paste characteristics, have shapes which are confined to, or more frequent in, Tchefuncte ceramics. Three have annular bases with ventral concavities and with extension up the outer wall (Fig. 10 f, g). A fourth projects outward to form a flange base (Fig. 10 h). One has a mammi-

form podal support (Fig. 10 i) and the final sherd is the disc base (Fig. 10 j) with four downward projections which apparently joined tetrapodal supports on the wall.

Additionally, we think that Vessel 3 (Fig. 8 c) fits Tchefuncte Plain type. The modified globular bowl shape, the constricted orifice, the rounded and crudely notched lip and perforations are seen in this type (Ford and Quimby, 1945, Fig. 17). The clay-grit paste and the surface appearance is consistent, as is the vessel wall thickness and generally crude manufacture. Rounded or convex bases were not found often in the Lake Pontchartrain Tchefuncte sites, but were stated to be not uncommon at the Lafayette, La., mound (Ford and Quimby, 1945).

(b) ALEXANDER PINCHED: One sherd, black and sand-tempered with minimal clay particles, has the characteristic nail pinching (Fig. 10 e) to produce a V-shaped or triangular design seen in this type (Ford and Quimby 1945, Plate 7 p). This is of especial interest because typical designs of the Alexander series are rare this far west of the Mississippi.

(c) TCHEFUNCTE STAMPED, VARIETY RESCH: Vessel 1 (Fig. 8 d, 9) with the two additional sherds. This is a new subtype, agreed upon after discussion of Vessel 1 at the 1966 Caddoan Conference in Natchitoches, La. It was formerly included under Tchefuncte Stamped Type (Ford and Quimby 1945, Plate 2) and typical examples are illustrated in this plate, b, c, e, f.

Paste—Method of Manufacture: Coiled, flattened coils 3 cm. wide.

Tempering: Clay particles, smaller amounts of fine sand.

Texture: Fine clay paste with clay particles and some sand, with poor wedging which gives some contortion. Occasionally homogeneous texture.

Hardness: Tends to be soft, averaging hardness of 2; soft when damp and has little tensile strength.

Color: Various shades of gray to light buff on exterior; core usually dark.

Surface Finish: Interior and exterior smoothed but not polished. Thin coat of clay floated to surface tends to flake off or to have a crackled appearance.

Decoration—Design: Triangular depressions stamped on vessel in parallel rows over entire body surface. Arranged vertically, horizontally or diagonally in double row. Rows may or may not be separated by one or two parallel lines that are incised with drag-and-jab technique.

Technique: In the original Tchefuncte report, Ford and Quimby

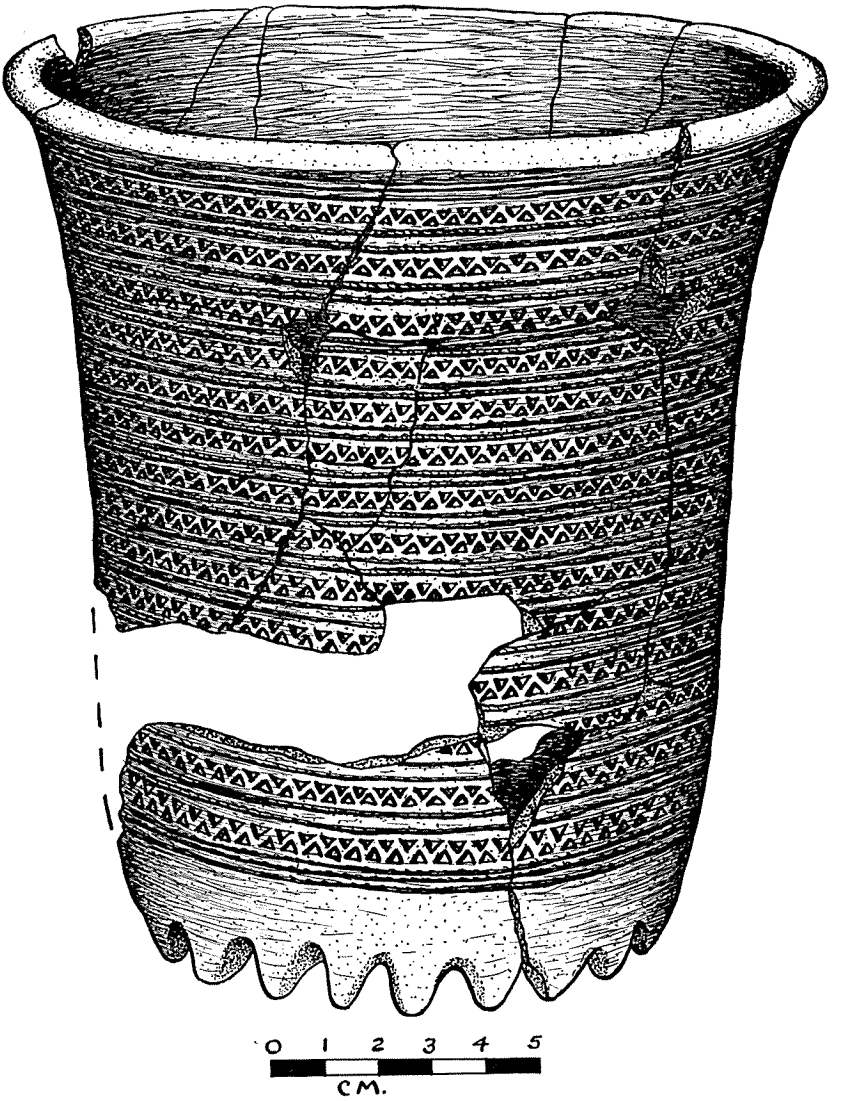

FIG. 9. Vessel 1, Tchefuncte Stamped, variety *resch*. Note linear triangle stamping and drag-and-jab incising.

(1945) illustrated sherds with this kind of triangular stamping under the type Tchefuncte Stamped, and thought it to have been made by rocker-stamping with a small notched tool. However, we have checked the decoration of Vessel 1 by magnification and from wax impressions, and are unable to detect evidence of rocker-stamping. Rather, the

triangles seem to be individual impressions of a triangular tool, and the intervening lines to have been made by the standard drag-and-jab incising technique which is frequent in Tchefuncte Incised type.

Form—Rim: Usually excurvate with rounded marginal thickening on the exterior.

Lip: Usually rounded. No notched specimens known.

Body: Deep pots with outward curving rims; midbody straight or slightly barreled. Possibly bowls.

Bases: Multiple teat-like podal supports on a flat disc base. Probably other forms of wedge-leg and teat-leg, tetrapodal or polypodal, as for Tchefuncte Plain and Tchefuncte Stamped.

Sizes: 17 cm. height and diameters of approximately 10 cm. at base, 12 cm. midbody and 15.5 cm. at rim for only whole vessel.

Chronological Positions and Relationships: Occurs in Tchefuncte Period. Found in ceramics of this period in the Lower Mississippi Valley, also 27 sherds at the Russell Landing Site on Catahoula Lake in central Louisiana (Gibson 1968, Fig. 5 a and p. 28), Sabine River drainage, East Texas, at the Resch Site. A similarly decorated ware was found in Burke County, Georgia at the McBean Creek Site, in Deptford context (David S. Phelps, personal communication, 1966). Fifteen sherds with a linear triangle stamping were found at this site in 1965, 6 of the sherds from one vessel. In temper, paste and other technological features, the sherds correspond to other Deptford sherds. The only identified shape was the simple bowl. Phelps stated "On a majority of the sherds, the application of the stamp is so careful that it appears to be a multi-unit paddle; on a few, however, the lines wander apart, attesting to the use of a single unit tool." One of these sherds is shown in Fig. 8 e.

2. MARKSVILLE—TROYVILLE PERIODS

(a) MARKSVILLE PLAIN: 4 sherds from as many vessels seem to fit the characteristics of this type. There are two rim sherds (Fig. 10 q, r) which are very similar, of smooth black paste, clay-tempered in one instance, clay and bone in the other, from bowls with incurvate and unthickened rims. A third rim sherd is slightly thickened by an infolded strip of clay; it is dark gray, clay-tempered, with smooth exterior and rough interior surface. A basal sherd shows evidence of a square base; it is clay-tempered, thick and has rough surfaces.

Vessel 2 (Fig. 8 b), which is clay-and-bone-tempered, has the cylindrical shape, thick wall, irregular orifice, thin and rounded lip, smoothed but lumpy surface and small vessel size, which are consistent with Marksville Plain. Our difficulty lies in the fact that none of these characteristics is diagnostic, that any of them may be present

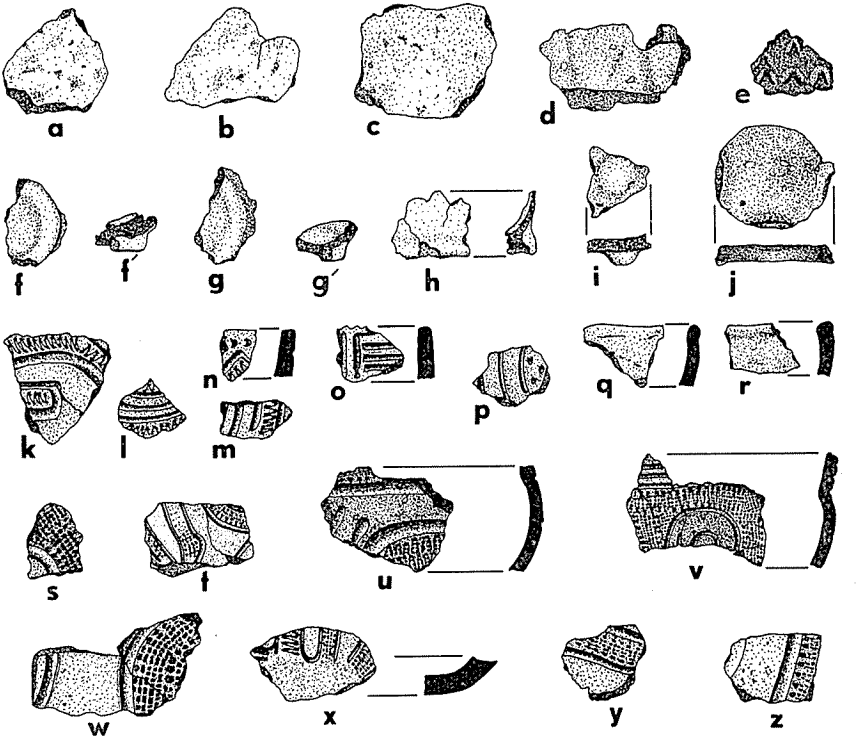

FIG. 10. Tchefuncte, Troyville and Marksville sherds. Tchefuncte Plain, a-d; Alexander Pinched, e; Tchefuncte bases, f-j; Troyville Stamped, k-n; Yokena Incised, o; Churupa Punctated, p; Marksville Plain, q, r; Marksville Stamped, s-z.

in Woodward Plain—or, indeed, in any Baytown plain ceramics. Moreover, bone tempering is not described in Marksville Plain of the Mississippi Valley. The latter is no deterrent in East Texas, however, as sherds of Troyville and Marksville Stamped types from the Resch Site, described below, are tempered with bone, sand and hematite, in addition to clay.

(b) CHURUPA PUNCTATED: One sand-and-grog-tempered sherd has three concentric parallel firmly trailed lines. Within the inner of these is a zone of deep conical punctates (Fig. 10 p).

(c) YOKENA INCISED: One small rim sherd has the characteristic incising, deep and firm with a round-pointed tool, of this type (Fig. 10 o). The rim is direct, the lip flat, with transverse grooves of the same size as the body incisions. The latter are arranged in parallel

position and apparently formed panels. The paste is clay-grit, with light gray exterior color and black interior.

(d) TROYVILLE STAMPED: 4 sherds, apparently from 3 vessels, have zoned rocker-stamped decoration which was done with a curved or straight bar tool (Fig. 10 k-n). The zones are outlined by deep U-shaped trailed lines, 4 to 5 mm. in width. One large sherd (Fig. 10 k) is of clay-bone-tempered paste, with brown exterior and black interior colors. Curvilinear lines outline narrow panels which are roughened by curved rocker-stamping. A smaller grog-tempered sherd (Fig. 10 l) is uniformly buff colored. It has 3 curving trailed lines with panels on each side, and the rocker-stamping is done with a small, straight bar tool. Two sherds (Fig. 10 m, n) of black grog-tempered paste with smooth surfaces may derive from the same small vessel. One is a rim sherd, direct, with flat lip, a horizontal row of hemiconical punctations just below the rim and the beginning of a decorated zone. The second sherd is from the wall at the base and shows curving diagonal grooved lines outlining a panel of rocker-stamping done also with a short, straight bar.

(e) MARKSVILLE STAMPED: 13 sherds from a minimum of 7 vessels have the zoned, dentate rocker-stamping characteristic of this type (Fig. 10 s-z). The deep U-shaped trailed lines which separate the plain and stamped bands are 2.5 to 7 mm. in width and about 1 mm. in depth. The stamping tools were 7 to 15 mm. in width and had 4 to 8 projections or "teeth." Four sherds were derived from a black, clay-tempered vessel (Fig. 10 v) with globular body and probably a cambered rim, on which there are at least 3 horizontal trailed lines. The rocker-stamping roughens the background for curvilinear plain bands; the stamping is regular and beautifully executed. Three sherds from a larger vessel (Fig. 10 w) are clay-tempered with buff exterior and black interior and core. The curvilinear bands are wide and are outlined by shallow, wide U-shaped grooves; the stamping is regular but rougher than on the first sherd. Two other sherds from different vessels have similar wide, shallow grooves and large designs; one of these is sand and grog-tempered, the other grog-tempered, with some sand, bone and hematite (Fig. 10 u, z). A smaller sherd (Fig. 10 y) has smooth grooves, 3.5 mm. wide, and well-executed rocker-stamping. It is clay-tempered with buff exterior color and black interior. The final two sherds (Fig. 10 t, x) are from the basal portions of the side walls, and one includes part of a circular base. The zoning lines are narrow and the zones are small, as are the stamp patterns (7-8 mm.). Both are clay-tempered, one with brown exterior and buff interior, the other with buff exterior and black interior colors.

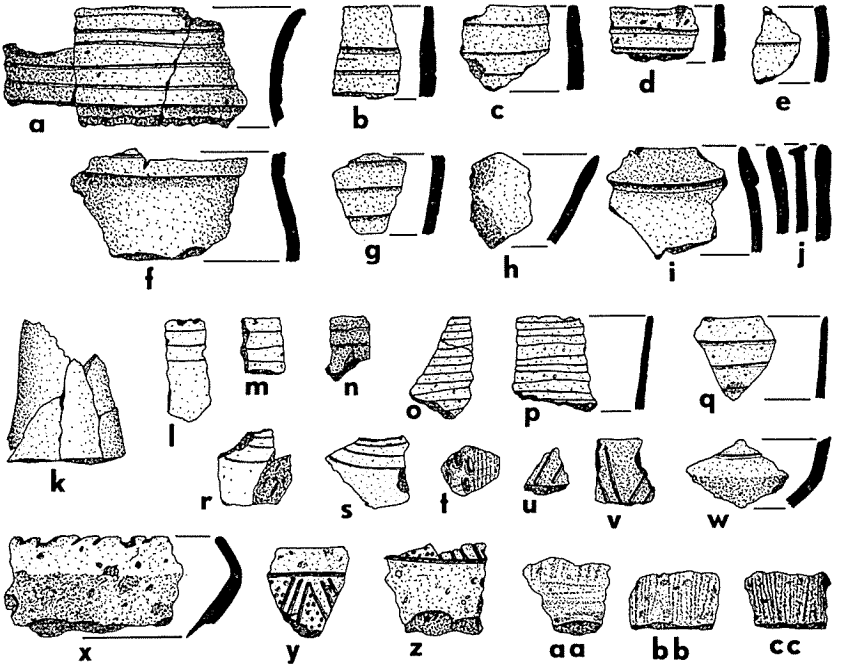

FIG. 11. Coles Creek and Caddoan sherds. Coles Creek Incised, a-g; Coles Creek Plain, h; Greenhouse Incised, i; Coles Creek rim profiles, interior to left, j; Caddoan bottle spout sherds, k-n; Hickory Engraved, l-n, r, s; Davis Incised, o-q, w; Pease Brushed-Incised, t; diagonal incised, u, v; plain carinated bowl, notched rim, x; Pineland Punctated-Incised, y, z; Broaddus Brushed, aa-cc.

3. COLES CREEK PERIOD (Fig. 11 a-j).

There are 18 sherds from an estimated 15 vessels which are recognizably from Coles Creek types. As is true of Tchefuncte, Marksville and Troyville sherds, it is probable that other sherds are from vessels of this period. Uncertain and questionable specimens were omitted.

(a) COLES CREEK PLAIN: 6 sherds, 4 of which are derived from rims and 2 from body walls, are of this type. One rim is direct, with externally beveled lip, smooth interior and polished exterior surfaces. It has firm paste and is clay-tempered with a small amount of sand and bone particles. A second rim is direct, with a lip which is flattened to overhang both exterior and interior walls (Fig. 11 j). The paste is firm and clay-tempered, and the surfaces are smooth but unpolished. The third rim sherd is large, about 1/5 of the vessel circumference, and incurves to a constricted orifice; it is clay-tempered with hematite nodules, and the surfaces are smooth. The fourth rim incorporates the

angle of an eared bowl (Fig. 11 h); it is dark brown to black in color, and tempered with clay, bone, sand and hematite. The two body sherds are buff to brown in color, clay-tempered and firm. One is thin, with smoothed exterior and rough interior surfaces; the other has a polished interior and a curvature which suggests a flat bowl shape.

(b) GREENHOUSE INCISED: 1 sherd of this type (Fig. 11 i) has a wide, externally folded rim which forms a graceful camber, below which is a single wide trailed line. The rim is incurvate to a constricted orifice and the lip is rounded. The sherd is clay-tempered, black on the interior and camber, light gray on the exterior wall; the inner surface is smooth, the outer is polished.

(c) COLES CREEK INCISED: There are 11 sherds of this type, 4 of which are rim sherds. Four sherds are from the same vessel (Fig. 11 a), and 3 are fitted to produce ¼ of an excurvate rim with narrow, externally rolled and rounded lip. Five parallel horizontal incised lines encircle the external rim area. The fourth sherd from this vessel (Fig. 11 f) suggests an undecorated sub-globular body which is separated from the rim area by a broad trailed depression. The paste is soft, with clay, bone, sand and hematite temper; the exterior surface color is light gray to brown, and the interior is black. Three other rim sherds of this type have 2 to 3 horizontal incised lines encircling the direct rims (Fig. 11 b-d). One has a thin flattened lip, and the others are rounded. Two are clay-grit-tempered and the third is bone-grit-tempered. Surface colors are brown to black. The 4 remaining sherds of this type (Fig. 11 e, g) have one to three smooth and firmly incised lines on the wall exteriors. Three of these sherds have smooth to polished exterior and interior surfaces, with buff to dark gray coloration; they vary from 5 to 7 mm. in thickness. Tempering is with clay in two instances, clay-grit-bone in the third. The fourth sherd has rougher surfaces because of sand-tempering. The exterior is gray in color; the interior is black. The incising, however, seems quite consistent with Coles Creek Incised type.

4. CADDOAN PERIOD (Fig. 11 k-cc).

There are 81 sherds from an estimated 42 vessels which fall into established Caddoan types or, in the instance of plain sherds, are compatible with vessel shapes or paste characteristics of the Caddoan periods.

(a) HICKORY ENGRAVED: There are 6 certain and 9 possible sherds of this type, all clay-tempered. Four bottle spout rim sherds (Fig. 11 l-n) and 2 sherds of bottle shoulder area (Fig. 11 r, s) have the encircling engraved lines typical of this type. Additionally there are 9 plain

spout sherds. From one vessel (Fig. 11 k), there are 8 sherds which are thick and form the tapered spout that is typical of the Alto ceramics.

(b) DAVIS INCISED: 11 sherds (Fig. 11 o-q, w) have smooth incised horizontal lines. Six of them are from open carinated bowls, 3 from jar forms with tall vertical rims, and 2 from vessels of uncertain shape. The vessel forms, paste characteristics (3 bone and 8 clay-tempered), and incising technique have more similarity to this type than to Coles Creek Incised.

(c) PEASE BRUSHED-INCISED: One bone-tempered sherd (Fig. 11 t) has brushed fields separated by a vertical band of punctuations.

(d) PINELAND PUNCTATED-INCISED (Jelks, 1965): 3 sherds, apparently derived from the same vessel, have a band on the upper body decorated with alternating fields of parallel diagonal incised lines and punctate-filled triangles (Fig. 11 y, z). They are bone-tempered with some sand.

(e) BROADDUS BRUSHED (Jelks 1965): 7 sherds, all bone-tempered and reddish-buff in color, have brushed roughening of the external surfaces (Fig. 11 aa-cc). The brushing is vertical on 4 sherds, diagonal on one, and in two different directions on the other two, which apparently derive from the same vessel. These sherds seem to fit the description of Broaddus Brushed type more nearly than that of Karnack Brushed-Incised type.

(f) DIAGONAL INCISED RIM SHERDS: 3 sherds (Fig. 11 u, v) from two sand-tempered vessels are parts of outflaring rims which were broken at the rim-body junction. They are decorated with alternating bands of right and left sloping diagonal lines which have undecorated triangles between the fields of incisions. The incised lines are made with a notched or two-pronged tool, so that each incision is double, with 1 mm. distance between the lines. The vessel shape and decoration arrangement are similar to Pineland Punctated-Incised type, which sometimes is sand-tempered.

(g) PLAIN SHERDS: 42 sherds seem to derive from the bodies of bottles, carinated bowls and jars, which have typical Caddoan shapes. There are two rim sherds of open carinated bowls: one black in color and clay-tempered, the other (Fig. 11 x) reddish-buff, bone-tempered, and with diagonal notches across the lip of an otherwise undecorated narrow rim. Seven sherds derive from sherd-tempered bowls, made of soft, reddish paste which is similar to that of some of the Davis Incised sherds. Some of these sherds may derive from the Davis vessels, but two have undecorated rims. Of the remaining 33 sherds; 9 are polished, black clay-tempered sherds which appear to come from bottles

and bowls (3 or 4 possibly derive from the same vessel); 5 are body sherds from a large plain bottle of brown clay-tempered ware; and the remaining 12 (1 bone-tempered and 11 clay-tempered) are from diverse vessels, which are thin and have paste characteristics or indicated shapes of Caddoan vessels.

5. UNTYPED POTTERY SHERDS

Extraction of the above identified pottery sherds leaves a large mass of unidentified sherds as follows: 348 sand-tempered or predominantly sand-tempered sherds, of which 14 are decorated and 21 are plain rim sherds, (2 of the latter are notched); 557 bone-tempered sherds, of which 38 form Vessel 4, 19 are decorated and 18 are plain rim sherds, one of which has diagonal notching; 418 clay-tempered sherds, of which 11 are decorated and 36 are plain rim sherds, one of which is notched. Out of these there are 5 aggregations of sherds which deserve special attention because they can be assembled to the point of giving a good indication of size, shape and/or decoration.

(a) VESSEL 4 AND 16 additional sherds are bone-tempered and decorated with deeply trailed incised lines. Vessel 4 (Fig. 8 a) is a large deep urn of "flower pot" shape, heavily bone-tempered, with orange to red-brown surface color, except for small areas of black from irregular firing. It measures 25-26 cm. in height, 23-24 cm. in orifice diameter and 9.5 cm. in diameter of the flat disc base. The lips are flat, 7 mm. in thickness, the body walls are 8-9.5 mm. thick and the base is 14 mm. thick. The decorated rim is set off from the body by two parallel and horizontal deeply trailed lines, 1 cm. apart, and the decorated rim is 7 cm. high. The decoration is effected with trailed lines and punctations, the lines 2.5 to 3 mm. wide and 1-1.5 mm. deep. The punctations were done with a serrated tool. There are 14 decorative units around the rim, each a triangular area, alternately upright or pendant, filled with 4 to 6 diagonal lines each, except for the left angle of the base, which has a punctate-filled small triangular or semilunar area.

The 13 additional bone-tempered sherds have combinations of similar deep trailing. They are 7 to 9 mm. thick and most of the bone temper has been dissolved, leaving vacuoles (Fig. 7 a-e). There are no rim sherds and it is impossible to judge the vessel shape, although the curvatures suggest diameters similar to or slightly smaller than Vessel 4. Three other sherds have a like kind of trailing, but arranged in curvilinear patterns (Fig. 7 i-l).

In many respects, Vessel 4 and this group of sherds resemble Canton Incised type (Texas Handbook, 1962:23), because of the shape, the band of decoration around the rim, the combination of incised di-

agonal lines and punctations, and of varyingly directed lines. They differ, however, in that Canton Incised is most often clay-grit-tempered, with bone sometimes added, whereas all of the Resch sherds of this type are bone-tempered. More important is the incising and punctating with a pointed tool in Canton, whereas the Resch sherds are heavily and deeply trailed, very similar to the trailing of the Marksville sherds at this site. Another consideration as to typology is Pineland Punctated-Incised (Jelks 1965) of the McGee Bend ceramics, which has similar urn shapes and vessel sizes, but the same objections prevail. It seems probable that this bone-tempered incised-punctated ware at Resch is older than Canton and Pineland types and ancestral to them; we therefore suggest the tentative type Canton Incised, variety *darco*, for this ware.

(b) The vessel represented by the 4 sand-tempered sherds of Fig. 6 g, h is of considerable interest. This is a small jar, apparently smaller than Vessel 2, with thick walls (8-11 mm.) and flat lip. The profile shows an indentation below the rim, with recurved walls, so that the size and shape are quite consistent with Marksville pottery. The decoration is unlike anything in Caddoan ceramics and its nearest comparison is with Marksville Incised at the Crooks Site (Ford and Willey, 1940 Fig. 35 e), in which varying combinations of concentric circles, rectangles, diamonds and other rectilinear and curvilinear motifs appear. The rim punctations in the Resch vessel are nail executed instead of hemiconical tool punctations, and the incised lines are somewhat rougher; the sandy paste has a different texture and feel from Marksville ceramics, including the Marksville Stamped sherds at Resch. Some of the latter, however, have the same brown color as this vessel and have more sand in the paste than is usual in the Mississippi Valley. We suspect, therefore, that this vessel is an East Texas variant, in sand-tempered paste, of Marksville Incised type.

(c) The 14 plain sherds which seem to derive from one vessel were described under sand-tempered pottery. They show no other tempering material, are almost sandstone-like in gritty consistency, and the vessel form suggested by the six sherds which fit together is an open vase with flat or slightly convex base (Fig. 6 b). The size appears to be about that of Vessel 2. Other sherds, including 6 direct or slightly incurving rims (Fig. 6 i) are similar. This ware is probably related to or identical with Rockport Plain of the Texas Coast or Bear Creek Plain of the Brookeland Focus in McGee Bend area (Jelks 1965).

(d) A group of 40 plain sherds, 8 of which are rim sherds comes from 2 or 3 similar large vessels. Thirty of these have been fitted to-

gether into 3 vessels segments (Fig. 6 a, c, d). This is dark brown to black sand-bone-hematite pottery which we call "ironware." The vessel form is a "flowerpot" vase or deep bowl similar to vessel 4. It is larger and has a wider orifice that is estimated to be 30-35 cm. in diameter.

(e) Another large group of plain bone-tempered sherds, 12-15 of which come from one vessel, seems to derive from vessel forms very similar to the above group and to Vessel 4. A much smaller group of preponderantly clay-tempered plain sherds, including some rim sherds, probably represents similar large vessels of open vase form. Many of these sherds have a mixture of tempering materials, more often bone and grit, but additional amounts of crushed sherd or clay particles and hematite or ocher are not infrequent.

Among the remaining plain sherds, judging especially from rims, smaller cylindrical jars like Vessel 2, deep bowls and wider bowls with incurvate rims and constricted orifices, like Vessel 3 are indicated. These include sherds of all three major tempering characteristics, some with multiple temper. The majority of these vessels have relatively thick walls, in the 7 to 9 mm. range. The rims are typically unaltered, except for occasional thinning, and the lips are most often rounded but are flat in some instances, with occasional notching. The affiliation of most of these plain, thick-walled vessels of groups d and e is probably with Woodward Plain type.

Some of the plain sherds undoubtedly derive from the undecorated portions of decorated vessels, but the large proportion of plain rims indicates that many of the vessels were plain. Some of the thinner sherds, especially in the clay-tempered plain, possibly represent vessels from the Coles Creek and Caddoan periods, but do not have paste characteristics by which this can be determined with certainty.

Untyped Decorated Sherds: There are 23 untyped decorated sherds, 9 with sandy paste, 3 bone-tempered and 11 clay-tempered. Six small sandy sherds are from one incised vessel (Fig. 6 k). Eight others, mostly small fragments, have incisions. Three bone-tempered (Fig. 7 f-h) and 2 clay-tempered (Fig. 7 r) sherds are thick and have random punctations, 3 with the fingernail and 2 with tools. They resemble Wilkinson Punctated type of Louisiana and East Texas. Two thinner sherds have small tool punctations which seem to be random, but the sherds are small. The final two sherds (Fig. 7 t) from the same vessel are light and porous, as though tempered with vegetal matter which fired out. They have a decoration of vertical incised bands centered by a line of punctation.

C. Other Clay Objects.

Objects of clay, other than ceramics, are extremely rare. There are 5 small fragments of daub, which have impressions of twigs or grass on the surfaces. There is one small object of pinkish clay with smooth surfaces, 4 x 3.5 x 3 cm., with trapezoidal cross-section. Finally, there are 5 pieces of mud-dauber nests of sandy clay.

D. Projectile Points

There are 512 projectile points from this site, all but two derived from the excavations. Of this group, 464 are considered to be dart points, 48 arrow points and one lance point. The outstanding characteristics of the projectiles are: relatively small size, poor quality of manufacture, and preponderant use of local materials. Of the dart points 195 (42.03%), and of the arrow points, 15 (31.25%) were made of petrified wood; 208 (44.83%) of the dart points and 29 (60.42%) of the arrow points were made from local cherts which are largely tan, red, brown and gray pebble cherts. Only 61 (13.14%) of the dart points and 4 (8.33%) of the arrow points were made from materials which seem to be foreign to the area. Of these, 19 are novaculites and quartzites, probably from the Hot Springs, Arkansas locality. A mottled dark flint and several shades of light gray waxy chert, both thought to derive from central Texas, are next in frequency of materials presumed to be exotic in origin. Others are in small numbers and the source is uncertain. Thirty-seven of the dart points are broken in a way that prevents typing.

1. dart projectile points

(a) gary type: The Gary type (Fig. 12) makes up the majority of the dart points, 276 (64.63%) of the 427 typed points. In size, 29 of these are Gary Typical (Ford and Webb 1956), 4.6 to 6.6 cm. in length, 1.7 to 3.7 cm. in width and 7.3 and 12 mm. thick. Of the Gary Typical, 19 were made of petrified wood, 6 of tan and 2 of brown local cherts, 1 of white flint and 1 of white quartzite. Some 162 are Gary Small, with lengths between 3.1 and 4.5 cm., widths from 1.3 to 3.4 cm., and thicknesses from 6 to 13 mm. Of the Gary Small, 65 were made of petrified wood; 61 of tan, 15 of red-brown and 4 of gray local cherts. Seventeen Gary Small were made of foreign materials; 2 of white chert, 1 of black chert, 3 of mottled gray glint, 5 of lighter waxy flint and 6 of quartzites. There are 6 tiny Garys which, following MacNeish (1967), we have called Garyito. These are 2.1 to 3 cm. in length, 1.1 to 2.9 cm. in width and 4 to 9.3 mm. in thickness. Only 12 of the 66 were made of petrified wood, in comparison with 35 of tan chert, 10 of gray chert, and one of hematite. Eight are of foreign materials,

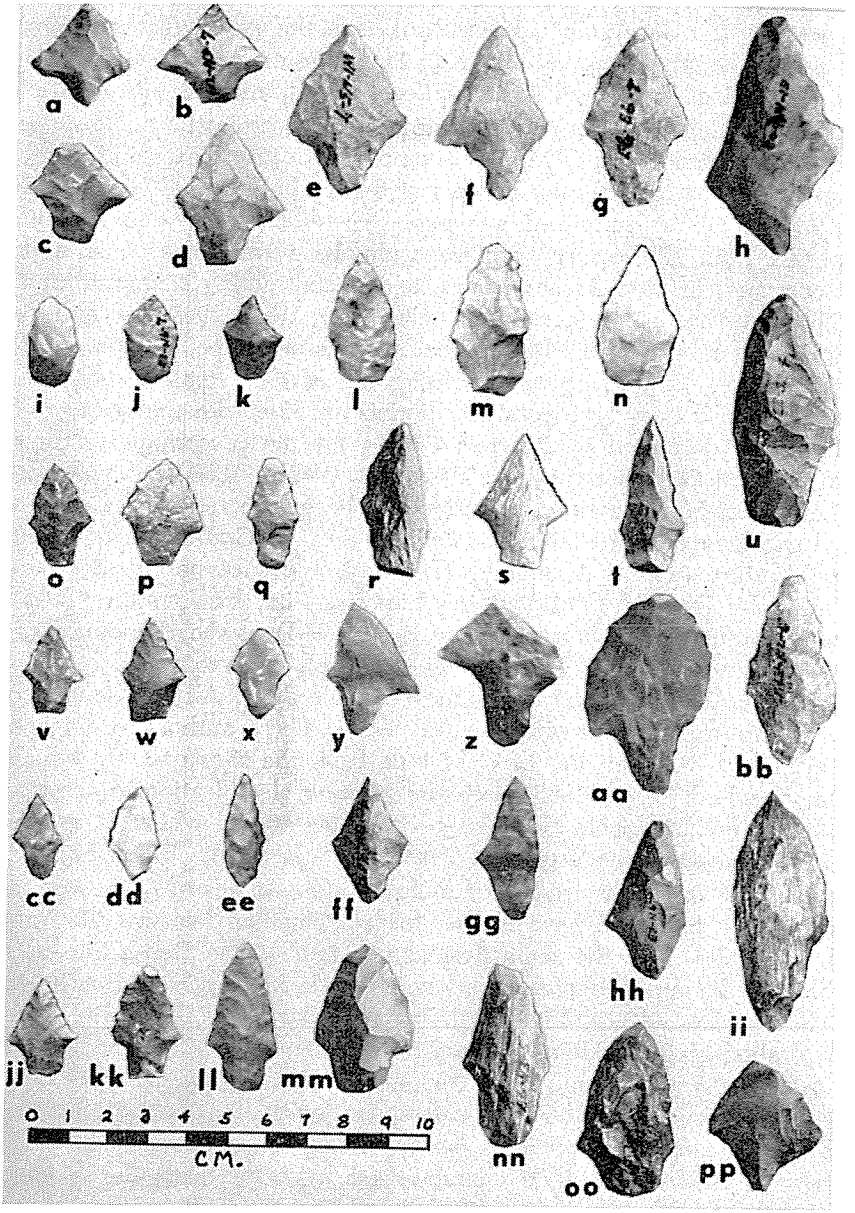

FIG. 12. Gary type projectile points. Variety *kaufman*, a-h; variety *hobson*, i-n; variety *emory*, o-t, v, w; variety *runge*, x-aa; variety *panna maria*, bb; variety *kemp*, cc-ii; variety *colfax*, jj-nn.

5 of quartzite, 2 of light cream chert and 1 of Central Texas gray chert. Of the Gary points, 19 are broken to the extent that measurements of length can not be obtained; 11 of these are of petrified wood, 4 of tan, 1 of cream and 2 of gray local cherts, and 1 of novaculite.

Contracting stem points constitute the major projectile point shape in Late Archaic and early pottery complexes in East Texas and northern Louisiana. Distribution studies at the Yarbrough and Miller sites (Johnson 1962) indicated a progressive shift during the Archaic period from side-notched and expanded-base traditions to straight stems and, in Late Archaic times, to the contracting stem tradition. The latter has been expressed in types Gary, Wells, Desmuke and, to some extent, in sub-varieties of Kent and the new type, Woden, introduced by Jelks (1965) in describing the McGee Bend material. A tendency for Gary type points to diminish in size with the passage of time was described by Baerreis (1951) for the preceramic cultures of Eastern Oklahoma and by Ford and Webb (1956) for northern Louisiana. More recently, attention has been directed to the overall morphology of Gary points, as reviewed by McClurkan in a recent publication (1968). A number of varieties or subtypes were established by Duffield (1961) at the Limerick Site, by Johnson (1962) at Yarbrough and Miller Sites, by Ross (1966) at the Forney Reservoir Sites, by Sorrow (1966) from Bardwell Reservoir, and by McClurkan (1968) from Livingston Reservoir Sites. All of the above sites are in eastern or north central Texas. These authors recognized seven to fifteen varieties of Gary type from the sites or areas which they studied. Story (1965) used the Johnson classification in description of artifacts from the Cedar Creek Reservoir, which is in the Trinity River drainage of East Texas and west of the Resch Site.

Table 4 shows the frequency of Johnson's varieties of Gary type at the Resch Site. We have chosen his classification because the Yarbrough Site is in the same drainage system as the Resch Site and because the application of variety names makes for easier comparisons. The *kaufman* variety (Fig. 12 a-h) was popular at the Resch Site, with a total of 47, or 17.03% of all Gary points. Ten of the 27 Gary Typical (between 5 and 8 cm. in length) are of this variety, whereas only 4 of the tiny Garys are. This corresponds with the observation elsewhere that *kaufman* tends to be larger than other varieties of Gary type in East Texas. It is characterized by wide triangular blades, distinct shoulders and triangular, pointed stems.

The *alsa* variety, another larger point with triangular blade but with wider stems and indistinct shoulders, and the similar but smaller *kenedy* variety are missing at the Resch Site. The *hobson* variety (Fig.

TABLE 4
Varieties of Gary type projectile points at Resch Site, by size

	Garyito (tiny) 2-3 cm.	Gary Small 3.1-4.5 cm.	Gary Typical 4.6-6 cm.	Broken	Total
Variety *kaufman*	4	25	10	8	47
Variety *alsa*	0	0	0	0	0
Variety *hobson*	5	5	1	0	11
Variety *emory*	33	57	4	2	96
Variety *runge*	1	7	1	2	11
Variety *kemp*	22	39	6	0	67
Variety *panna maria*	0	2	4	0	6
Variety *kenedy*	0	0	0	0	0
Variety *colfax*	2	11	1	4	18
Other Gary points	0	16	1	3	20
Totals	67	162	28	19	276

12 i-n) tends to be small. Five of the 11 specimens are Garyito or tiny Garys and 5 are small Garys, between 3.1 and 4.5 cm. in length. These have wide, rounded stems and are rather well made.

The *emory* variety of Gary point (Fig. 12 o, t, v, w) is the most numerous at Resch Site, with a total of 96 points (34.78% of all Gary points). Thirty-three of the *emory* variety are tiny Garys (less than 3 cm. in length), 57 are Gary Small and only 4 are Gary Typical. *Emory* variety tends to be slender, with a contracting stem which has a straight instead of pointed base. There are distinct shoulders (Fig. 12 o, p, s, v, w) on 46 of the *emory* variety, while 50 are more slender, with only a suggestion of a shoulder. This trait is especially pronounced in the Garyito size. Johnson's illustration from the Yarbrough Site (Johnson 1962, Fig. 4) also demonstrates narrower and wider forms in this variety.

The *runge* variety, with long narrow stems and short blades (Fig. 12 x-aa), is represented by 11 specimens at Resch: one tiny, 7 small and 1 typical size, with 2 broken. The *panna maria* variety is even less numerous, only 6 specimens. Two of these are small and 4 typical in size. They tend to be rough, thick, with indistinct and slender outline (Fig. 12 bb).

The *kemp* variety (Fig. 12 cc-ii) is second in frequency among the Gary points from Resch, a total of 67 (24.27%). Twenty-two of these are tiny, 39 are Gary Small, and 6 are Gary Typical. These are slender points, better made than most of the Gary varieties, with long triangular blade and triangular pointed stem. There is the same dichotomy as in *emory* variety between specimens with slightly wider blades and distinct shoulders, and specimens with narrower blades

and barely discernible shoulders. Thirty-eight of *kemp* variety have distinct shoulders (Fig. 12 cc, ff-hh) and 29 have indistinct.

The *colfax* variety (Fig. 12 jj-nn) is represented by 18 specimens, only two of which are tiny Garys; most of the specimens are Gary Small in size. They have comparatively short blades, the edges of which are generally convex instead of straight. The stems tend to be nearer straight-sided than most Gary points, although rounded at the base. Except for the tendency to small size, this variety is easily confused with the *quinlan* variety of Kent type, as shown in Johnson's (1962) Fig. 5 i, j.

Twenty Gary points from this site do not fall into any of these varieties. Twelve (Fig. 12 pp) are similar to *alsa* variety, having wide triangular blades with rough chipping, but the stems differ in being narrow and short, almost "nubbin" like in size. All of these are small. Two points are modified leaf-shaped (Fig. 12 u) with convex edge blades and gracefully rounded stems. The remainder are nondescript, and several are altered by breakage.

(b) WELLS TYPE: Only 5 projectiles are classified as Wells type (Fig. 13 a-c) using the major criterion that the contracting stems constitute 55 to 67% of the total point length. They are 3 to 4.3 cm. in length, 1.6 to 2.6 cm. in width and 8-9 mm. in thickness (smaller than listed in the Suhm and Jelks (1962) Handbook, as are most of the projectiles from this site). Four are fairly well made, one rough. The materials from which they were manufactured are: one each from local gray chert, light gray Central Texas chert, sandy quartzite, petrified wood and waxy gray flint. Two points are distinctive in having relatively long stems and very short, small isosceles triangular blades (Fig. 13 b).

(c) DESMUKE TYPE: There are 6 points which we classify as Desmuke type (Fig. 13 d-f) with some hesitation, because it appears that the lozenge-shaped projectile points which occur from Oklahoma and East Texas across northern Louisiana and southern Arkansas to the Mississippi Valley, although internally consistent and closely resembling Desmuke points, do not equate in all respects with the Desmuke point which was described (Suhm and Krieger 1954; Suhm and Jelks 1962) from southwestern Texas. The bases tend to be relatively longer and the blade edges are more often mildly convex than in the original descriptions. If anyone would prefer to classify our specimens as a variety of Gary point, we would have no quarrel. The senior author has noted, at a number of sites in northern Louisiana and especially at the Poverty Point site and other sites of this complex, that Gary points are often of foreign materials, especially novacu-

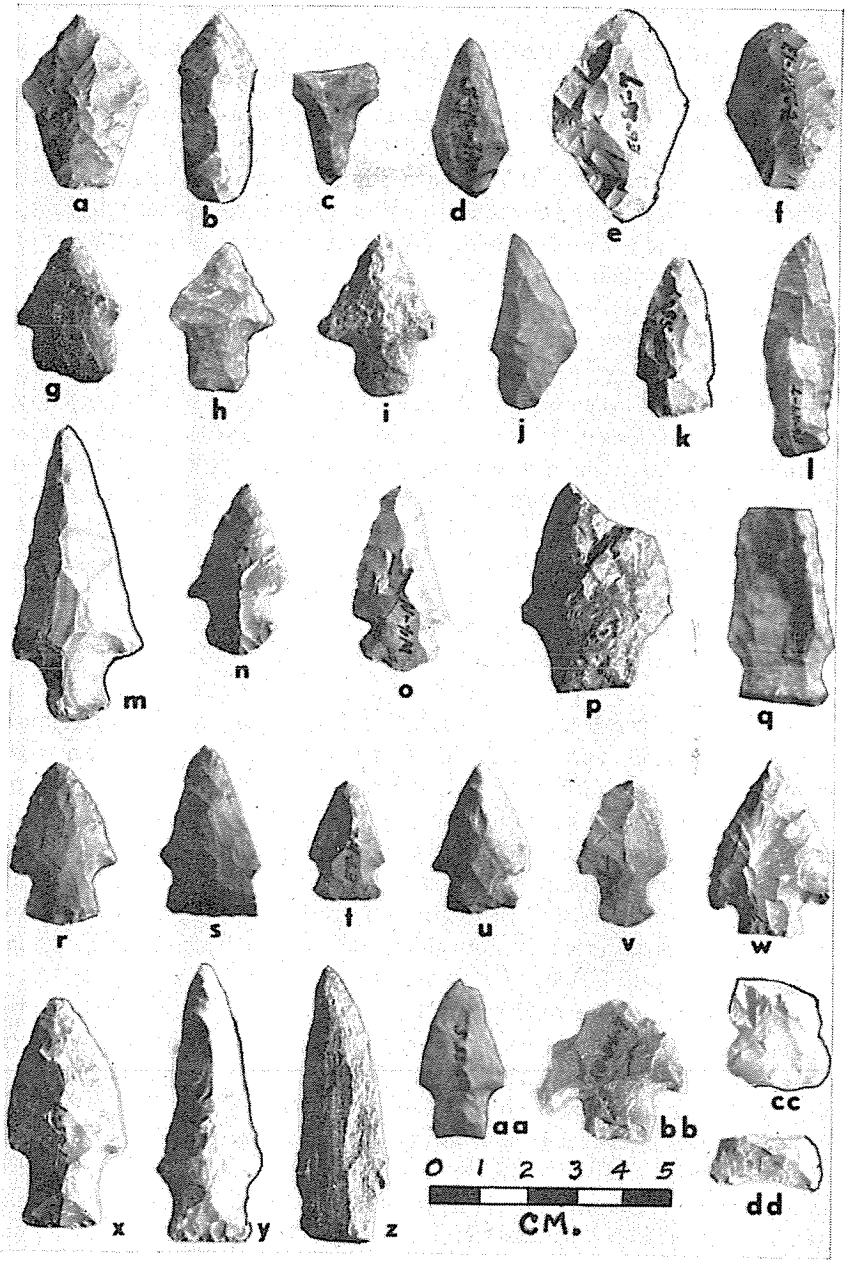

FIG. 13. Projectile points. Wells type, a-c; Desmuke or lozenge-shaped, d-f; Elam, g-i; Kent, j-l; Palmillas, m-o; Yantis, variety *swan*, p; Yantis, variety *cook*, q; Ellis, r-w; Yarbrough, variety *dike*, x-z; Yarbrough, variety *mabank*, aa; Marshall, reworked, bb; Trinity base, cc; concave base, dd.

lite and quartzites from the Hot Springs area. At these same sites the lozenge-shaped Desmuke-like points share this use of quartzites, indicating that this point is a companion or variant of the Gary type.

The 6 Desmuke points are 3.4 to 4.4 cm. in length, 2 to 2.8 cm. in width and 8-12 mm. thick. They are slightly crude, with large flake scars and minimal edge retouch; 4 show central longitudinal ridges on one or both faces. Different materials are represented by 3 points of local buff, tan or red chert, one of petrified wood, one of novaculite and one of brown foreign chert.

(d) KENT TYPE: 42 projectile points (9.83% of the dart points) are classified as Kent (Fig. 13 j-l), which is third in frequency at the site. Of these, 38 are slender in outline, while 9 are of moderate width in proportion to length. Most show evidences of carelessness in manufacture, with large flake scars, minimal edge retouch, asymmetrical stems or shoulders, and often with thick ridges on one face. Half of them show residual cortex at the base or on the faces. The lengths vary from 3 to 5.7 cm., the widths from 1.6 to 3 cm., and the thicknesses from 6.5 to 12.4 mm. Almost all are made of local materials, petrified wood in 26 instances, tan or gray local chert in 14. The two possibly foreign materials represented are one point of black and one of reddish chert.

(e) ELAM TYPE: 8 specimens (Fig. 13 g-i) are small, short and stubby in outline, with triangular blades and square or rectangular stems. Four of these have distinct shoulders and in outline are similar to Carrollton type, but their small size and the absence of smooth stem edges fit better into the Elam type. Three of the points show some smoothing of the stem bases. They range from 3 to 3.8 cm. in length, from 1.9 to 2.6 cm. in width and are 6.5 to 9 mm. thick. Materials are petrified wood in four instances, local cream, gray or tan chert in three, and Central Texas gray mottled chert in one.

(f) PALMILLAS TYPE: 16 specimens (Fig. 13 m-o), 4 of which are moderately short and wide, while the other 12 tend to be slender. They are more carefully made than the Kent points, averaging about like the Gary type, with edge retouch on most blades. The production of the bulbous stem resulted in distinct, usually squared shoulders, without barbs. Lengths vary from 3.7 to 6.5 cm., widths are 1.8 to 2.8 cm., and thicknesses 6 to 11 mm. Materials are mostly local: petrified wood in 8, tan chert in 4, brown and gray chert in one each. A white chert and a gray quartzite may be from Arkansas.

(g) YARBROUGH TYPE: 15 specimens (Fig. 13 x-aa) are subdivided into varieties as outlined by Johnson (1962). All are slender points with long triangular blades, with straight or mildly convex

edges and with mildly expanding or almost straight stems. Moderate shoulders were produced by the long, curving notches; no barbs are present. The stems show smoothing of the edges and bases in most instances, but this is less evident in those points made of petrified wood. Several of the Yarbrough points are very well made (Fig. 13 x), but most exhibit only average technology, about like the Palmillas and Gary points at this site.

Yarbrough type, *dike* variety: 3 specimens (Fig. 13 x-z). These are the largest of the Yarbrough type from this site. They are 5.3 to 6.3 cm. in length, 2.1 to 2.6 cm. in width and 7.5 to 9 mm. in thickness. The stem edges are distinctly concave and the bases straight. Stem edges and bases are ground smooth. Materials are petrified wood, buff local chert and Central Texas mottled waxy chert.

Yarbrough type, *lindale* variety: 11 specimens. These are smaller in size and more slender in outline. Five are broken and the remainder vary from 3.5 to 4.8 cm. in length, 1.8 to 2.5 cm. in width, and 8 to 10 mm. in thickness. They are not as well made as the *dike* variety, and in 4 of the 11 specimens stem smoothing is not manifest. The stem expansion is less than in the *dike* variety, with strong concavity only at the upper part of the notch, so that some stems are almost straight. The latter could be confused with Kent points and are separated on the basis of general outline or stem smoothing. Materials are petrified wood in 8 instances, light gray or tan local chert in two, and gray siltstone in one.

Yarbrough type, *mabank* variety: one specimen (Fig. 13 aa). This point of local tan chert has the typical concave edge and concave base of this variety, although the stem is straighter than usual. Stem edges and base are well ground. The tip is broken, but the probable length is 4.5 cm., the width 2.2 cm. and thickness 7.5 mm.

(h) YANTIS TYPE: 2 specimens fit the type Yantis (Fig. 13 p, q), as established by Johnson (1962) at the Yarbrough Site. They are large and crude, both broken across the blade, and are characterized additionally by wide concave side or corner notching and straight bases, with slight stem edge smoothing. One seems to fit the *cook* variety of Yantis; the concave notches expand to produce a wide, straight base. It is made of petrified wood. The second appears to be a *swan* variety of Yantis, with wide blade, deep concave notches and a straight base. It is made of a dull red petrified wood. The stem sides and bases of both specimens are smoothed.

(i) ELLIS TYPE (Fig. 13 r-w): 45 specimens represent 10.54% of the typed dart points, making this type second in frequency at the site, after Gary. About ⅓ of the specimens are nicely worked, the

remainder rather crude. They have about the appearance of most points of this type from east Texas and northwestern Louisiana: a slightly small and stubby projectile, with distinct, usually squared shoulders, rarely barbed (3 of the 44 at this site), with corner notching which produced expanded stems. The stem bases are most often straight, occasionally slightly convex or, less often, concave. Ten points are broken. Of the remainder, 7 are more slender than is usual for this type. The range of length is 2.6 to 4.4 cm., the width 1.5 to 2.9 cm., the thickness 4.6 to 11 mm. The consistency of size is indicated by the fact that 26 of the 35 intact points are between 3 and 4 cm. in length. One specimen with typical stem and lower blade has been resharpened to form a hafted scraper. Most of the materials from which these points were made are local: 13 of petrified wood, 20 of tan chert, 6 of red, brown or gray local cherts. Exotic materials include 1 of novaculite, 2 of mottled Central Texas gray chert, and 3 of gray flint of unknown source .

(j) BULVERDE TYPE: One well-made point of greenish-gray flint, possibly of Central Texas origin, seems to be typical Bulverde type (Fig. 14 bb). The length is 6.2 cm., the width 3.9 cm. and the thickness 10 mm. The blade is a straight-sided triangle; the shoulders are squared without barbs, and the stem is rectangular and wedge-shaped in profile.

(k) DELHI TYPE: One beautifully flaked and symmetrically made large projectile is of the type known from the Poverty Point culture (Ford and Webb 1956) as Delhi (Fig. 14 aa). It is made of a waxy black flint, possibly Webbers Falls argillite. The blade is long and leaf-shaped, with fine retouch flaking along the edges, ending in short barbs at the shoulders. The stem is slightly expanded, almost rectangular, with a straight and thinned base. The stem edges and base are smoothed. It is 9.6 cm. long, 2.8 cm. wide at the shoulders, and only 7 mm. in maximum thickness.

(l) SINNER TYPE (Fig. 14 y): One small slender point of tan chert is of the type which Hiram Gregory and the senior author have called Sinner type. It is related to the Evans type, a larger point with a single deep notch in the side of the blade, found in Arkansas and northern Louisiana in Late Archaic context (Ford and Webb 1956; Bell 1958:24). The Sinner type has multiple deep notches in the lower blade edges, numbering 2 to 5, and often varying in number on the two edges of a single point. Bases are squared to slightly expanded. The point is generally slender and often rough. The specimen from this site (Fig. 14 y) meets all of these criteria; there are three notches in one blade margin, none or possibly one (broken) on the other;

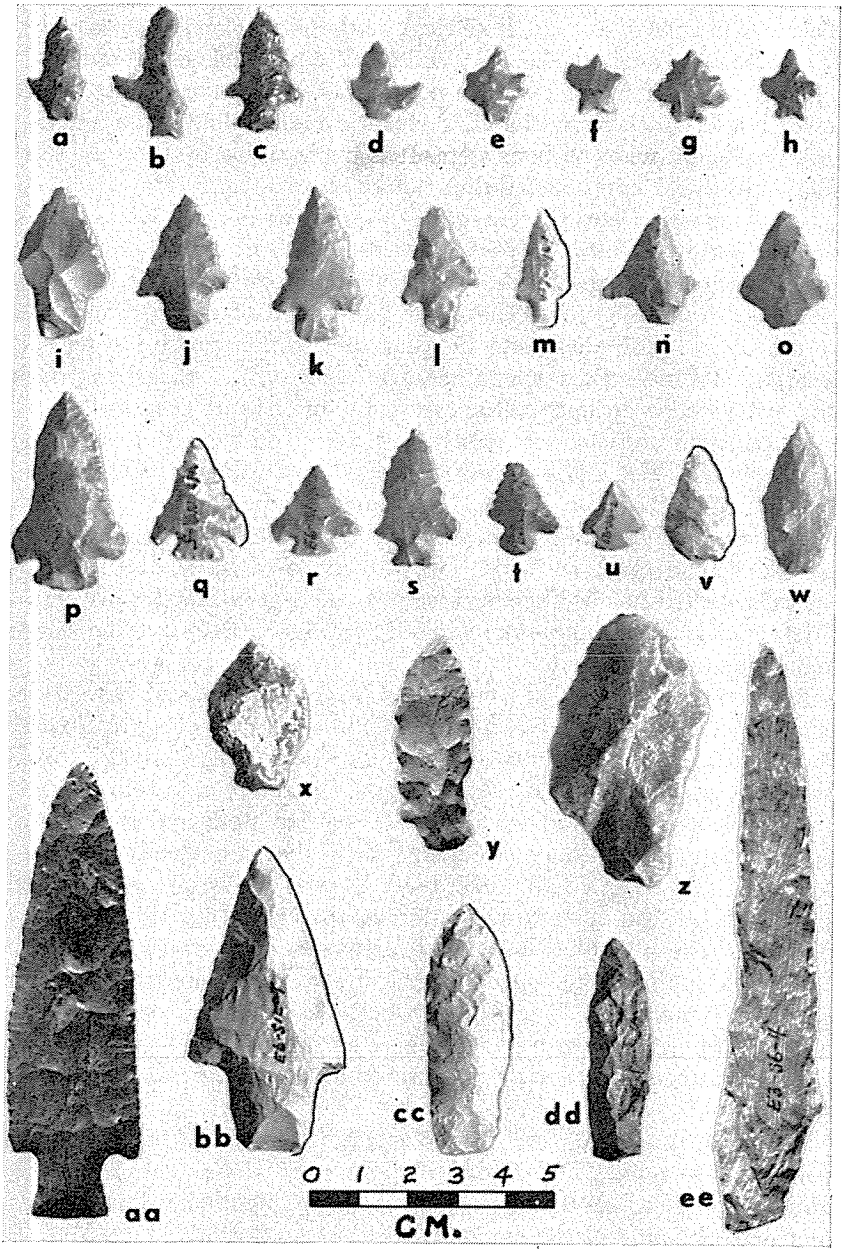

FIG. 14. Projectile points. Friley type, a-h; Alba, i-k; Bonham, l-m; Clifton, n, o; Catahoula, p; Colbert, q-u; Nodena, v, w; untyped leaf-shaped, x; Sinner, y; possible Gary or Yantis, z; Delhi, aa; Bulverde, bb; lanceolate and spike shaped, cc, dd; large point of petrified wood, ee.

the stem is square and asymmetrical, and the workmanship is poor. Dimensions are: length 4.5 cm.; width 1.7 cm.; thickness 9 mm.

(m) TRINITY TYPE: 1 broken point (Fig. 13 cc) has the stem and lower blade which show the characteristic high shallow side notches that produce a wide bulbous stem. It is made of an exotic gray flint. The width is 2.1 cm., the length is not known.

(n) UNTYPED POINTS: There are 8 entire or almost whole points that do not fit established types with certainty and will be described. Additionally there are 37 broken points or fragments in which the breakage prevents typing. The latter include 16 of petrified wood, 9 of tan chert, 4 of novaculite or quartzites which probably derived from the Arkansas Ozarks, one of white chert, and 7 of light or dark gray waxy cherts or flints that are probably of Central Texas origin.

Three small and slender points (Fig. 14 cc, dd) are similar to the Bradley and Flint River spikes described in Alabama (DeJarnette, Kurjack and Cambron 1962). They are slender leaf-shaped, with barely discernible basal narrowing and straight bases; they do not have the appearance of drills. Two are made of black and reddish-brown petrified wood. The third is a speckled gray flint from Central Texas and is small lanceolate (Fig. 14 cc) in outline, but the edges and base are not ground.

Three points of petrified wood (Fig. 14 x) are small and have wide, leaf-shaped blades with carefully worked, small projecting tips; weak shoulders and square stems with straight bases. They are 3.2 to 4.3 cm. in length, 2.1 to 2.7 cm. in width and 4 to 8.5 mm. in thickness.

One point of petrified wood has the square stem and deep basal notches to produce long, sweeping barbs that are characteristic of Marshall type (Fig. 13 bb). The blade is properly wide, with barbed shoulders, but the point is much thinner than usual for this type (4.4 mm.) and the blade has been worked into an end scraper.

A large point (Fig. 14 z) made of granular quartzite ("sugar quartz"), with wide leaf shape, has weak shoulders and either a narrow straight stem or a contracting stem. It may be Gary or Yantis type. The uncertainty exists because of a diagonal break across one shoulder.

An interesting fragment is the snapped-off basal segment of a concave-base point (Fig. 13 dd) of light gray waxy chert. It has the appearance of a lanceolate point base, with smooth base and edges, and with thinning of the concave base but no fluting.

2. POSSIBLE LANCE PROJECTILE POINT

There is one long projectile point (Fig. 14 ee) that is difficult to classify. It is a slender bayonet-shaped point of petrified wood, with

a rough and asymmetrical stem, a sharp tip, roughly finished edges and smoothly rounded unridged faces. It is 12.3 cm. long, 2.2 cm. wide at the shoulder, and 9 to 11 mm. thick. The stem is 1.8 to 2.2 cm. long.

3. ARROW PROJECTILE POINTS

There are 48 whole or fragmentary small and thin points that are classified as arrow projectile points. Although nearly half of them had tips or barbs broken off, all but four could be typed satisfactorily.

(a) FRILEY TYPE: 22 specimens (Fig. 14 a-h) make up exactly half of the typed arrow points. These are fragile points, and 13 of the 22 were broken somewhere, usually at the outward or upward projecting barb. Ten of the specimens have the unique characteristic of an upward projecting barb from one or both shoulders. Four otherwise typical points have barbs that project straight out from the shoulder, and in the remainder the barbs are broken off. Stems are expanded in 11 instances, rectangular in 9 and uncertain in the remainder. Blades are serrated in 12 instances and relatively smooth in the others. Lengths range from 12 to 28 mm., widths from 12 to 17 mm., and thicknesses from 2 to 4 mm. Eleven of the points were made of petrified wood, 11 of tan, red and gray local cherts.

(b) COLBERT TYPE (Fig. 14 q-u): 10 of the arrow points are of Colbert type (Webb 1963). These points are related to Scallorn type but have shorter and relatively wider blades, often with concave edges to produce a flare above the shoulder. The low corner notching produced expanded, often slightly bulbous, stems and straight or mildly barbed shoulders. Lengths vary from 14 to 31 mm., widths from 12 to 19 mm., and thicknesses from 2.8 to 4.6 mm. Two of these points are of petrified wood, 7 of local tan and red cherts, and one of quartzite.

(c) ALBA TYPE (Fig. 14 i-k): 3 points, two of local tan and one of green waxy chert, are of Alba type. They are symmetrical and well-made, with straight-sided triangular blades and rectangular stems: shoulders are straight and unbarbed. Lengths vary from 20 to 30 mm., widths from 12 to 18 mm., and thicknesses from 4 to 5 mm.

(d) BONHAM TYPE (Fig. 14 l, m): 3 specimens made of tan, cream and gray waxy cherts resemble the Alba points, but the smaller size and narrow rectangular stems place them into Bonham type. Lengths are from 23 to 25 mm., widths from 11 to 17 mm., and thicknesses are 3.6 to 4 mm.

(e) CLIFFTON TYPE (Fig. 14 n, o): 2 specimens, of tan and red local cherts, have the typical triangular blades and short, poorly developed, rounded stems of this type. They are 22 and 23 mm. in length, 17 and 18 mm. in width, and 4.5 and 5 mm. in thickness. One differs in having a projecting shoulder on one side.

(f) CATAHOULA TYPE (Fig. 14 p): 2 specimens made of red jasper and tan chert have the symmetrical shape, recurved blade edges, wide barbs and expanded stems which characterize this type. They are the most carefully made of the arrow points from this site. The larger point is 40 mm. in length, 23 mm. wide, and 4.5 mm. thick. The smaller one, which has a broken tip, is 20 mm. wide and 3 mm. thick.

(g) OVATE OR LEAF-SHAPED POINTS: Two small points (Fig. 14 v, w) have the ovate or leaf-shaped outline of Nodena type but are thicker and shorter than is usual for this type. One of petrified wood is 30 mm. long, 14 mm. wide and 6 mm. thick. The other, of gray flint, is 23 mm. long, 14 mm. wide and 7.5 mm. thick.

There are 4 broken and untyped arrow points, probably Friley type. Three were made of local gray, tan and red cherts; one of petrified wood.

E. CHIPPED STONE TOOLS

The difficulties which the classifier faces with chipped stone tools from East Texas sites have been recounted by Story (1965), Johnson (1962), Jelks (1965) and others. Our experience is no different. At the Resch Site these objects are numerous, even though the major part of the occupation was in the post-Archaic pottery-making periods. The tools are made of petrified wood and small chert or quartzite pebbles which exhibit poor textural qualities. The objects, moreover, seem to have been made hurriedly and carelessly by percussion flaking. Few of them show evidence of prolonged use or repeated resharpening, suggesting the custom of fashioning them hurriedly as needed or discarding or losing them often. We have followed the usual cusom of classifying these objects on the basis of shape, size and location of the knapping scars by which they were prepared. Certain groupings are suggested by the physical appearance or by the location of the presumed functional area, and in these instances we have followed the typology established by the above authors, in addition to that of Tunnell (1961), Davis and Davis (1960) and Duffield (1961).

1. THIN BIFACIAL TOOLS. These are chipped tools of relative thinness, sometimes called knives or blades. A preference was manifested for thin slabs or sheets of petrified wood, often showing some of the original cortex on one or both faces. Otherwise materials are local cherts, occasional quartzites or slabs of hematite. The petrified wood was probably favored for these presumed cutting instruments because of the natural tendency to cleave in longitudinal spalls which easily produced a long sharp edge. There are 85 thin bifacials from the site.

(a) RECTANGULAR SLABS (Fig. 15 m, n): 13 specimens are long,

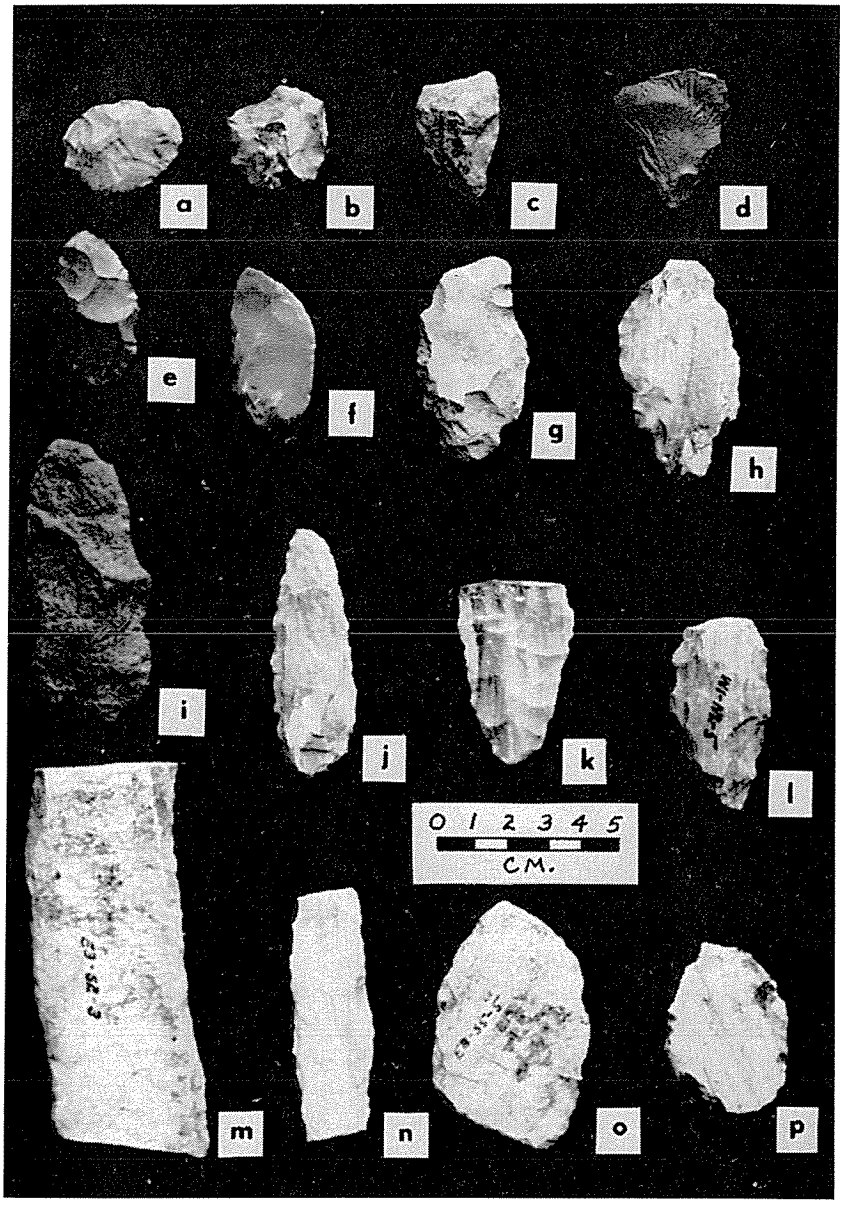

FIG. 15. Thin bifacial tools. Oval bifaces, a, b; triangular bifaces, c, d; small ovate bifaces, e, f; stemmed bifaces, g, h; large ovate bifaces, i, j; pointed slabs, k, l; rectangular slabs, m, n; flat oval biface, o, p.

thin rectangles of petrified wood, with each end showing unaltered cortex, the faces flat and unworked, and with functional sharp edges. Seven of the 13 have cutting edges bilaterally, 6 unilaterally with the opposite edge rounded or unaltered. One specimen has a longitudinal central ridge, and 5 specimens are slightly thicker than the typical tool, with one face flat and the opposite slightly convex. Lengths vary from 3.5 to 11.2 cm., widths from 2.4 to 4.5 cm., and thicknesses are 5 to 9 mm. in the 7 typical specimens, 10 to 13.5 mm. in the thicker ones.

(b) POINTED SLABS (Fig. 15 k, l): 12 specimens (all petrified wood) are flat objects with straight, unaltered bases and gently incurving sharp edges which meet in a point, producing a long ovate outline. The faces show only enough modification to make them fairly flat and smooth. The dimensions are rather uniform; the lengths vary from 4.2 to 6.4 cm., widths 2.2 to 3.1 cm., and thicknesses of 7 to 10.4 mm. in the typical forms. Five specimens are plano-convex and thicker, varying from 11 to 15 mm.

(c) OVAL BIFACES (Fig. 15 a, b): 5 specimens, 2 of petrified wood, 2 of tan chert, one of quartzite. These are small, thin, circular or oval bifacially-chipped objects, with thinned edges around the complete periphery or lacking finish in only a small arc. The maximum diameters vary from 2.8 to 4 cm., and the thicknesses from 6.2 to 12 mm.

(d) FLAT OVAL BIFACES (Fig. 15 o, p): 4 specimens, 2 intact, 2 broken. These are similar to the rectangular slabs and are made of flat sheets of petrified wood with smooth faces and fine chipping to produce a sharp edge around the entire circumference. Measurements of the two intact specimens are 6 by 4 cm. and 4.8 by 3.5 cm.; the broken specimens are 3.1 and 4.7 cm. wide; thicknesses vary from 3 to 7 mm.

(e) LARGE OVATE BIFACES (Fig. 15 i, j): 4 specimens, 3 of petrified wood, and one of brown hematite. They are long ovate elliptical or pear-shaped, thicker at the basal end. Three are worked around the entire periphery and one shows a small area of cortex at the base. The chipping is rough in 3 of the specimens, but one object of petrified wood (Fig. 15 j) is nicely shaped, with sharp edges. Lengths range from 5.7 to 7.9 cm., widths from 2.3 to 3.4 cm., and thicknesses from 8.5 to 12.8 mm.

(f) SMALL OVATE BIFACES (Fig. 15 e, f): 12 specimens, similar in outline but smaller than the above. The piece is chipped all around the edges in 9 instances, with a small amount of cortex at two bases. Chipping is bifacial with little, if any original surfaces on the bases.

Six of these objects are of petrified wood, 5 of tan chert, 1 of tan quartzite. Lengths vary from 3.8 to 5 cm., widths from 1.9 to 2.8 cm., and thicknesses from 6.2 to 12.3 mm.

(g) TRIANGULAR TO SUB-TRIANGULAR BIFACES (Fig. 15 c, d): 9 specimens which are similar in execution to the ovate blades but differ in having a triangular shape. They also resemble the pointed slabs in shape but are smaller, and the peripheral thinning includes the base. Seven of these blades are made of petrified wood, one of hematite and one of gray granular chert. Lengths are 3.4 to 4.6 cm., widths 2 to 3.1 cm., thicknesses from 6 to 10 mm.

(h) STEMMED BIFACES (Fig. 15 g, h): Seven specimens are ovate or slightly elongate and differ by having a stem for hafting. The rounded or unworked tips make it unlikely that they were projectiles in fact, 4 of the 6 have original cortex at the distal end. The edges are chipped by percussion with no evidence of pressure flaking. One of these tools has a diagonally directed and beveled edge, but the blade edge is convex. The stems are straight or slightly contracting and are short. Five of the objects are made of petrified wood, 2 of tan chert. Lengths range from 3.9 to 5.9 cm., widths from 1.8 to 3.2 cm., thicknesses from 7 to 11 mm.

(i) BROKEN AND IRREGULAR THIN TOOLS; 20 specimens are broken, apparently derived from the above categories but uncertain because of breakage. A few may be complete tools but are rough and irregular in shape. Thirteen of these objects are of petrified wood, 2 of tan chert and 5 of quartzite.

2. THICKER CHIPPED BIFACES: These are much thicker and rougher tools, and with a few exceptions, are even more difficult to categorize. Many are made of petrified wood, but a higher percentage is from other materials, mostly local cherts. The rough percussion chipping by which they were shaped occurs bifacially. There are 255 tools in this general grouping.

(a) ELONGATE BIFACIAL TOOLS (Fig. 16 a, b): 54 specimens have various modifications of ovate, leaf-shaped, rectangular, or lanceolate outlines, but all are relatively narrow and elongate, with rough chipping on both faces and around the edges. Some could be confused with or could have been used as projectiles, but as a group they have more the appearance of cutting tools. Many have one face rather flat, the other ridged, to give a triangular cross-section. Although chipped all over, 21 show small remnants of the original pebble cortex at one or both ends, and an equal number have traces on the faces. Twelve have an angulated or crescentic outline (Fig. 16 b) and most of these show a better cutting edge on the outer curve. One of

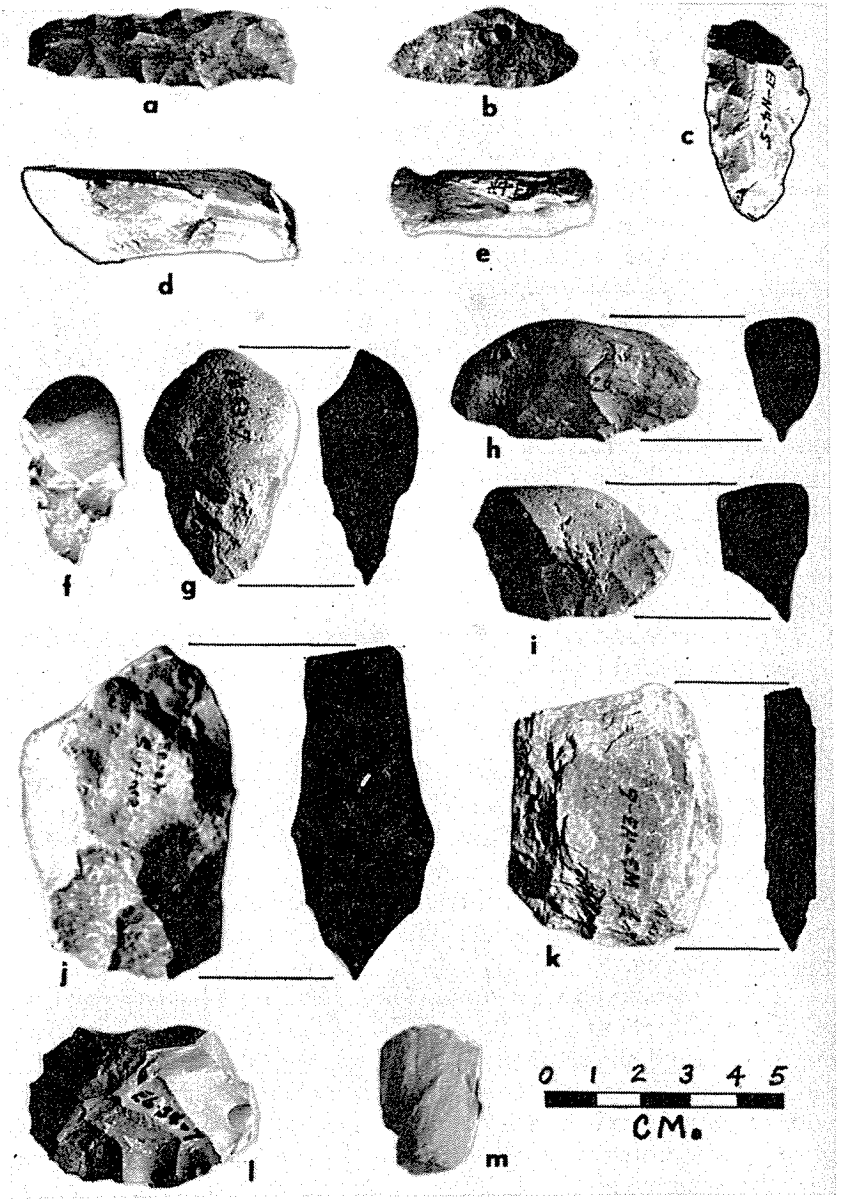

FIG. 16. Thick bifacial tools. Elongate bifacial tools, a, b; small bifacial tool, c; elongate end tools, d, e; pointed pebble tools, f, g; pebble side-blades, h, i; pebble chopper, j; chipped celt, k; "turtle-back" bifacial tool, l; thick end-scraper, m.

these objects has a graver-like tip, which may be fortuitous. Thirty-six of these objects are of petrified wood, 16 of tan or red local chert and 2 of quartzite. The lengths range from 3.7 to 6.9 cm., the widths from 1.5 to 2.4 cm., the thickensses from 5 to 15.5 mm.

(b) ELONGATE END TOOLS (Fig. 16 d, e): Eight specimens are similarly long and narrow, usually rectangular in shape, and differ in that the only cutting edge is at one end of the tool. All of these objects are of petrified wood, and 6 of the 8 show no chipping except at the tool end. The other two are roughly chipped to form the body but have no thinned edges. The chisel-like end is usually silghtly wider than the body and mildly curved. In two instances it is diagonally placed; it is not unifacial, but is formed by bilateral percussion chipping and fine flaking. The bifacial slant is not steep, as in end scrapers, but is at an acute, blade-like angle. Lengths range from 4.2 to 6.8 cm., widths from 1.4 to 2.5 at midbody and from 1.5 to 3 at the blade end; thicknesses are from 8 to 15 mm.

(c) SMALL BIFACE TOOLS, oval, ovate-acuminate, rectanguloid (Fig. 16 c): 90 specimens are small and relatively thick, rough bifacially worked objects. They are similar to the elongate bifacials except for smaller size and relative breadth. The chipping is rough, the edges are wavy and rarely show resharpening or pressure flaking, and the ends may be rounded or pointed. Some of these also could have been used as projectiles, but there is no basal thinning or stem formation and the tips are often blunt. As noted of the elongate tools, many show pebble cortex remnants on the ends or faces, and a general plano-convex shape is not unusual. There are 23 of these made of petrified wood, 52 of tan local chert, 12 of red chert or jasper, and 3 are of granular quartzite. The range of length is 2.8 to 5.1 cm., of width 1.5 to 3.3 cm. and of thickness 7.5 to 15.5 mm. Most of this group falls within the limits of 3 to 4.5 cm. in length.

(d) POINTED PEBBLE TOOLS (Fig. 16 f, g): 65 specimens are what would be called "Perkin Pikes" by Jelks (1965). These are pebble tools, with knobby bases of unaltered pebble cortex, and bifacial or trifacial rough chipping down to rounded or pointed ends, which must have been the functional part of the tool. A few were made from large spalls which had been thrown off larger cobbles; the original cortex appears on one face, with rough shaping on the other. The shaping of the tools in some instances starts near the cortex base but occasionally begins about the midpoint of the object. No use polish has been detected. Fourteen of these objects are of petrified wood, 35 of tan chert, 4 of red-brown chert, 1 of hematite, 7 of red-brown conglomerate quartzite, and 4 of rough gray granular quartzite. Lengths

range from 3.1 to 6.4 cm., widths from 2.3 to 4.2 cm. and thicknesses from 9.5 to 27 mm.

(e) PEBBLE SIDE-BLADES (Fig. 16 h, i): 14 specimens are similar to pointed pebble tools, except that the pebble is oval or crescentic in outline. The original pebble cortex is on the thicker side with a chipped-out blade on the opposite edge, in crescentic shape, worked the entire length of the object. The outline of the tool somewhat resembles a segment of a peeled orange. The blades, however, are fairly well sharpened. One of these tools is of petrified wood, 8 of tan chert, one of gray chert, 2 of brown chert, and 2 of gray quartzite. The lengths range from 3.7 to 6 cm., the width from 2.1 to 3.5 cm., and the thicknesses from 9 to 23 mm.

(f) OVATE "TURTLE-BACK" BIFACES (Fig. 16 l): 2 specimens are irregularly oval in outline, bifacially rough chipped, with one face relatively flat or mildly convex, the other steeply chipped. The large flake scars alternate at the edges to produce marked sinuosity of the blade, with no secondary pressure flaking. One object is of petrified wood, the other of tan chert. Dimensions are 5.5 by 3.9 by 2 cm. and 4 by 2.7 by 1.5 cm.

(g) CHIPPED PEBBLE CHOPPERS (Fig. 16 j): 5 specimens are rectangular blocks, 4 of petrified wood and one of rough red granular quartzite, unaltered except at one end to produce an irregular, rough blade. The shaping was by percussion chipping, with no pressure flaking or grinding. Hence the blade edges are irregular, although an effective tool seems to have resulted. The blades are convex from side to side, bifacially worked and equally sloped on the two faces. They are moderately steep in three instances, less steep in two thinner objects. Lengths are 5 to 7.5 cm., widths 3.3 to 5.2 cm., and thicknesses 1.8 to 3.5 cm.

(h) TWO ADDITIONAL TOOLS may belong with this group or may be called chipped celts (Fig. 16 k). They are made of flat petrified wood pebbles and have unaltered bases or polls and natural cortex on both faces and on the basal half of both edges. From this position on each edge, a rounded blade was produced by percussion chipping, bifacially. Because of the thinness of the original pebble, the blade bevel is not nearly so long and steep as in the previously described tools; otherwise the idea is the same. Lengths are 5 and 4.4 cm., widths 4.1 and 3.5 cm., thicknesses 10 and 6.6 mm., respectively.

(i) IRREGULAR BIFACES, CORES AND REJECTS: There are 9 rough, irregularly shaped, bifacially worked objects of medium size which do not fit any of the above categories. Three are of petrified wood, 5 of tan chert and one of gray chert. Additionally there are 6 pebbles

of various sizes which show some percussion chipping but not enough to call them tools. They may be unfinished tools, rejects or cores. One is petrified wood, 3 are tan chert and 2 are rough granular quartzite.

3. THICK UNIFACIAL TOOLS: Three groups of tools, totalling 29 objects, relate to the thick bifaces in that they have considerable amounts of pebble cortex on the surfaces, and show minimal rough percussion chipping to form the tool; they differ in that they are unifacially worked, the unworked face being flat.

(a) END SCRAPERS ON SLABS (Fig. 17 a, b): 8 specimens fulfill the specifications established by Johnson (1962). All were made from slabs of petrified wood and are rectangular in outline, with both faces flat. Percussion chipping at one end and occasionally on the lateral edges produced a steep unifacial bevel, which is concave on 4 specimens, straight or slightly convex on 3, forming a "gouge" bit. Lengths range from 3.3 to 4.3 cm., widths from 2.7 to 3.3 cm., thicknesses from 7 to 13 mm.

(b) OTHER UNIFACES (Fig. 17 d, e): 17 specimens. These are crude tools of small to medium size and rather uniform in details of manufacture. Superficially they resemble pointed pebble tools in having a thick basal end which is unmodified pebble cortex on the dorsal or convex face, with percussion chipped lower ends which narrow to a pointed or rounded bit. The tool outline is therefore roughly ovate. The difference lies in the flat planar surface, which is either the unmodified break of the original spall or has been flattened by transverse large shallow flakes. The cross section of the object is thick and semicircular. The longitudinal section is a modified triangle with the plane face forming the hypotenuse, the thick unmodified base and the slant down to the tool edge at the tip forming the shorter sides. The ventral face is occasionally concave, making the junction at the sinuous tool margins even more angulated. Usually ½ to ¾ of the dorsal or convex face is percussion chipped down to the margins; the functional edge usually involves about half of the circumference. Materials are: tan or red chert, 13 objects; gray quartzite 2; red granular quartzite 2. Lengths range from 3.7 to 4.6 cm., widths from 2.1 to 3.1 cm., and thicknesses from 1.2 to 3.3 cm.

(c) POSSIBLE GOUGES: 4 rough objects are cortex-base tools with one planar face and irregular percussion-chipped beveling on the opposite face to produce a possible blade. One is triangular in outline and plano-convex, the convex face being pebble cortex. The plane face is the result of its break from the larger cobble, with one modifying flake scar. At the larger but thinner end of the convex face, percussion flaking has produced an obtuse bevel to the bit edge, which is

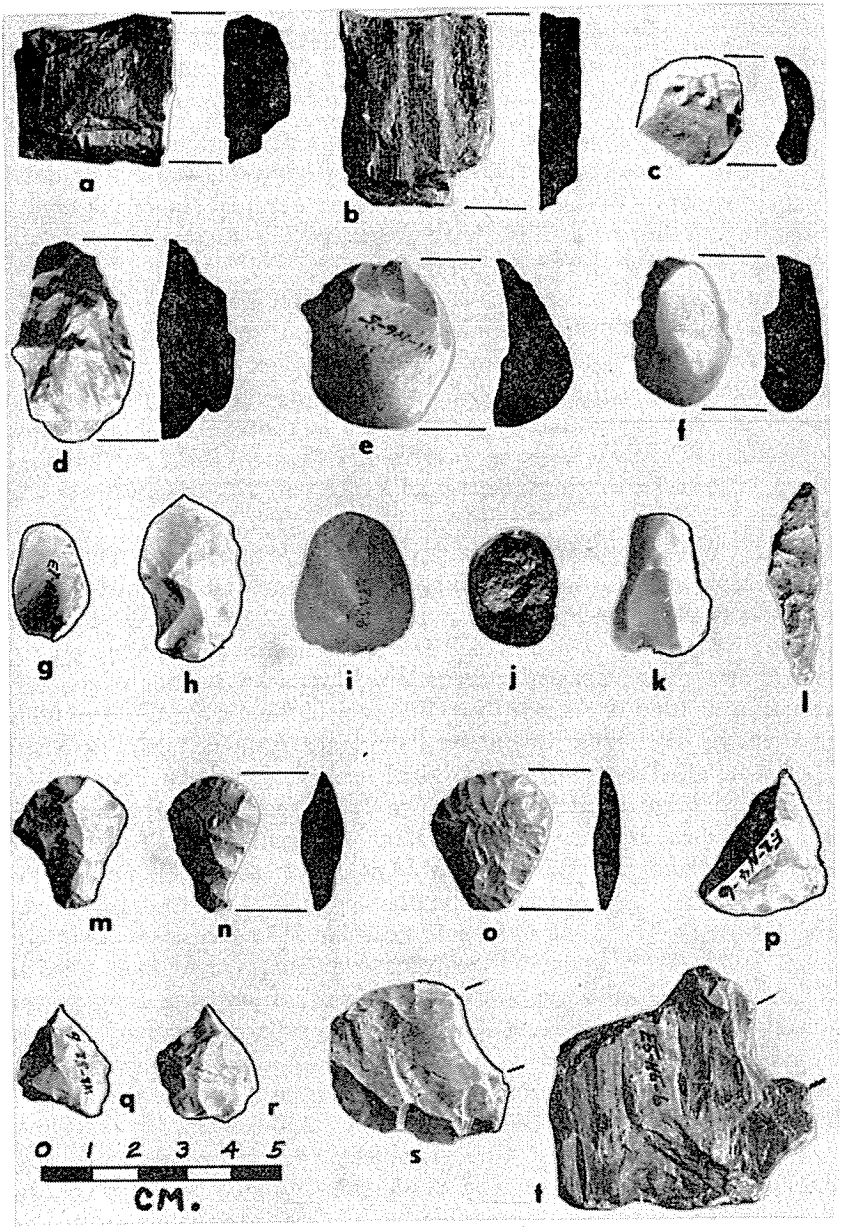

FIG. 17. Unifacial and small flake tools. End scrapers, a, b; "thumbnail" scrapers, c, f; thick unifacials, d, e; small and medium flake scrapers, g, h; "cortex" flake scrapers, i, j; drills, k, l; small stemmed tools, m, n; small ovate biface tool, o; gravers, p-r; spokeshaves, s, t. Profiles have dorsal face to the right.

sinuous. Two other objects are portions of small pebbles, irregularly ovate in outline with cortex at the base and similar obtuse unifacial beveling to produce mildly convex bits which are sinuous on end view. In each instance the cortex has been removed from the plane face by very thin flakes, so that in none of the three objects does the original cortex form part of the working bit of the tool. The fourth tool has a natural taper on the dorsum, worked off only at the blade margins. Two of the objects are made of tan chert, a third of hard sandstone, the fourth of petrified wood. Lengths are 3.5 to 4.5 cm., maximum widths 3.3 to 4 cm., thicknesses 1.8 to 2.5 cm.

4. SMALL FLAKE TOOLS: In contrast to the 38,000 chips and flakes found in the excavated squares, the 115 flakes showing retouch or use retouch is quite modest. Most of the latter are of small to medium size and show use scars rather than a modification of outline. Some of them show generally better workmanship than the large flaked tools and most reflect the same dependence on local raw materials.

(a) FLAKE SCRAPERS, MEDIUM SIZE (Fig. 17 h). Twenty-eight flakes of medium size (arbitrarily chosen as between 3.5 to 4.6 cm. in greatest diameter) show evidence of having been used on one or more edges. Flake shapes are unchanged from the original forms which were variously oval, elongate, triangular, leaf-shaped and irregular. Five oval or ovate flakes are nicely shaped and have use scars around the entire periphery. These use scars appear on the convex face, indicating that the margin of the opposite concave face formed the scraping or cutting edge. Materials include: petrified wood (8), tan local chert (10), brown granular quartzite (7), hematite (1), and quartz crystal (1).

(b) FLAKE SCRAPERS, SMALL SIZE (Fig. 17 g). The 35 smaller flakes in this category are much like those described above in shape and evidence of use. A size range of 2 to 3.4 cm. in greatest diameter defines the group. Materials include petrified wood (5), red or brown local chert (22), granular quartzite (1), gray waxy chert (1), other gray cherts thought to be of Central Texas origin (5), and novaculite (1). Most are within the range of 2 to 3 cm. in greatest diameter.

(c) SMALL END-SCRAPERS ON CORTEX FLAKES (Fig. 17 i, j). Thirty-one specimens are made on spalls flaked from pebbles or cobbles and bear the original cortex on their convex face. Most are oval in outline and slightly thicker at the proximal end. One is of petrified wood, 24 of tan or red chert, 1 of hematite and 5 of quartzite. The range of greatest diameter is 1.8 to 3.4 cm.; thickness of most is 3 to 6 mm., with a few at 10 to 12 mm.

(d) SMALL END-SCRAPERS WITH STEMS (Fig. 17 m, n). Four speci-

mens are chipped over most of their surfaces. They are ovate-acuminate or fan-shaped in outline with a small stem, which is broken off one of the specimens. They were shaped by small, carefully placed pressure flaking running from the margins on the convex face to a central ridge. The opposite or flatter face is flaked, but it is flattened at the bit end by use of the original spall scar or by careful shallow flaking, to produce a concavo-convex bit with minute serrations. One tool has these worn to a smooth arc, either in preparation or from use. The others retain a sharper cutting edge. All of these are of tan or brown local chert. Lengths range from 2.8 to 3 cm., widths from 1.7 to 2.4 cm. and thicknesses from 6.5 to 8 mm.

(e) SMALL END-SCRAPERS WITH STEEP BITS (Fig. 17 c, f). To some people, these two specimens would be known as "thumbnail" scrapers. One is an oval, small, flat pebble of tan chert (Fig. 17 f) with one face flattened by small percussion flakes. The opposite or dorsal face is convex from the natural curve of the pebble and is covered by the smooth cortex except for about 75% of the periphery, which has multiple steep flake scars to produce an obtuse angle with the edge of the plane face. The length is 3.2 cm., the width 2.2 cm., and the thickness is 11.5 mm. The second object (Fig. 17 c) is made from a thinner flake of tan chert, irregularly fan-shaped in outline. The scraping bit is opposite the percussion scar. The obverse face is steeply beveled at the bit end by tiny flaking. The converse face is sharply concave at the bit end, accentuating the cutting edge. The scraper is 2.2 cm. long, 2.3 cm. wide and 6 mm. in greatest thickness.

(f) SMALL BIFACIAL TOOLS: Two small tools are well finished bifacially. One (Fig. 16 m) is of petrified wood, wedge-shaped, with cortex base and with some shaping of the straight faces and edges. The terminal bit is arc-shaped and blunted bifacially as though used extensively. The dimensions are: length 3.4 cm., width 2.2 cm., greatest thickness 11.4 mm. The second tool (Fig. 17 o) of tan chert, is fan-shaped, thin, bifacially flaked with minute scars which produced a thin edge around the complete circumference. One face is convex, the other almost flat but shows mild rounding. The edges are minutely serrated but show little use polish or scarring. The length is 2.9 cm., the width 2.4 cm., the thickness 5 mm.

(g) GRAVERS (Fig. 17 p-r). Seven specimens of triangular to pentagonal outline have a small graver tip which is placed at the terminal projection of the flake in 6 instances, on the side in one. Four are flaked over all of the surface area bifacially. The others are partially flaked, unifacially in two instances, bifacially on the other. In two instances, the sharp graving projection seems to have been fortuitous,

but it is accentuated by fine pressure flaking on its lateral shoulders. The others show fine flaking to form the spur. Four of these objects may also have been used as side scrapers. One is made of petrified wood, 4 of tan and 2 of brown chert. Lengths range from 2.5 to 4.2 cm., widths 2.2 to 2.8 cm., thicknesses from 6 to 13 mm. The spurs project 2 to 3 mm. in all but one, which is 5 mm.

(h) DRILLS (Fig. 17 k, l). There are three specimens, two of which are broken across the middle of the bit. One of tan chert (Fig. 17 l) is slender, with a slight bulge near the center. It is quadrilateral in cross section, 4.4 cm. long, 1.1 cm. in greatest diameter and 8 mm. in thickness. The other two are of gray and waxy brown cherts of exotic origin, have expanded bases and broken drill stems (Fig. 17 k). Basal measurements are 1.5 and 2.1 cm. in width and 7 to 8 mm. in thickness. Present lengths are 2.8 and 2.9 cm.

(i) NOTCHES (Fig. 17 s, t). Three notched flakes may have been used as spokeshaves. Two of these are made of petrified wood and one is of waxy gray chert. They have crescentic arcs cut in one edge. The other edges are thinned like side scrapers. The objects of petrified wood are rectangular in outline, while the chert object is ovate. Sizes are 2.9 to 5.5 cm. in greatest diameter, 2.5 to 5 cm. in lesser diameter and 5 to 8 mm. in thickness. The crescentic bits are 11, 13 and 18 mm. in diameters.

F. GROUND AND USE-SMOOTHED STONES

There are 135 large stones from the Resch Site which show evidence of having been shaped for or by use. These were found at all levels, except the first 6 inches (Table 6). They consist of mortars, pitted stones, mullers, mauls or hammerstones, anvils and flat slabs. It is of probable significance that nearly half of these are pitted stones.

(a) MORTARS (Fig. 18 i-k): 3 specimens are of rough ferruginous sandstone, irregularly oval or rectanguloid in outline. One is 20 by 13 cm., 9 cm. thick, with a shallow depression on one face (Fig. 18 k). The bowl is oval in shape, 13 by 10.5 cm. and 1.5 cm. in depth. The second (Fig. 18 j) is a combination mortar and pitted stone, 21.5 by 19 cm. and 10.3 cm. thick. One face has an oval trough 16 by 11.5 cm., 1.3 cm. deep, with two pits in the bottom, 2.3 to 2.5 cm. in diameter. The opposite face has a trough, 17 by 14.5 cm., in which there are 13 circular pits, each 2 by 2.7 cm. in diameter. The third mortar (Fig. 18 i) is open to some question. It is 14.5 by 14 cm. and 7 cm. thick. One face is flat, and when seated on this face, the opposite is slanted, with a long trough which is open at the lower end. The trough (12 by 8 cm.) is distinctly ground, but may have served some other function than a true mortar.

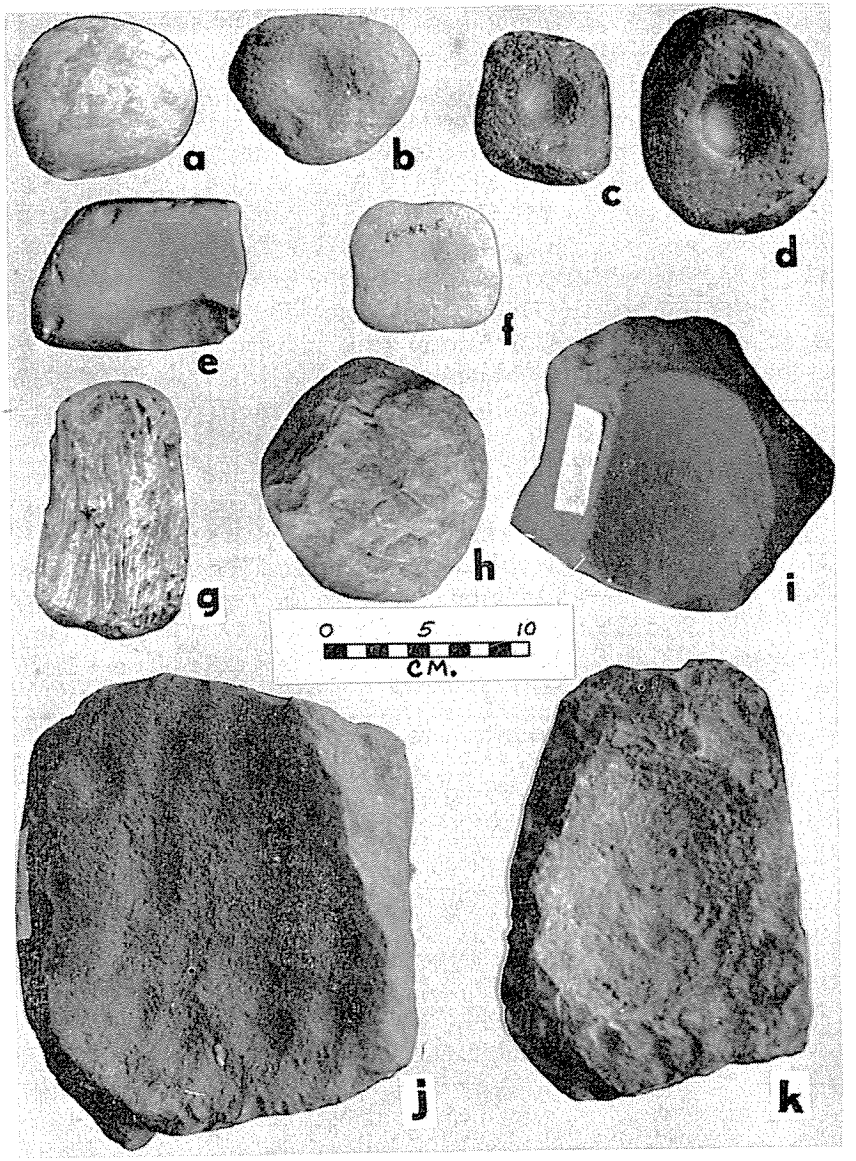

FIG. 18. Large ground stone objects. Mullers, a, e, f; pitted stones, b-d; hammerstones, g, h; mortars, i, k; combination mortar and pitted stone, j.

(b) PITTED STONES (Fig. 18 b-d): 63 specimens, most numerous of the large used stones. Forty-two are of dark gray to black coarse ferruginous sandstone, 19 of brown to black hematite, one of petri-

fied wood and one of tan chert. They vary in size from 16 by 12 by 6.5 cm. to 6.5 by 3.2 cm., but most are comfortably hand-size, 5.5 to 10 cm. in diameter. Shapes are generally those of the natural cobbles, with some alteration by pecking. In outline they are ovoid, rectangular, triangular, trapezoidal and pentagonal. Thirty-eight of the stones have a single pit on one face; 22 have a single pit on each face; one has 2 pits on one face; one has 1 pit on one face and two on the opposite, and the final stone has a single pit on one face and three on the opposite face. The final stone listed had broken through opposed pits and 2 new pits had been placed on the break surface. The pits are hemispherical craters, ranging from 2 to 6 cm. in diameter and 4 to 16 mm. in depth; most pits are rather uniformly 2.5 to 3.5 cm. in diameter and 10 to 15 mm. in depth. The majority of pits are smooth on the sandstone cobbles and highly polished on the hematite, but in 6 instances the pits are pecked out but not ground. Two of the sandstone and 8 of the hematite objects have one or both faces ground smooth and mildly convex, suggesting a combined pitted stone and muller. About a third of the objects show alteration of the edges by pecking or grinding; the latter could have resulted from intentional alteration or by use polish. Only two of the objects exhibit the trait, frequent on Archaic sites in northern Louisiana, of having depressed or ground-out areas on the lateral edges, as though to make the stones more comfortable to the fingers. Hard usage is indicated by the fact that 13 of the 63 stones are broken.

(c) MULLERS (Fig. 18 a, e, f): 29 stones were found which are thought to be mullers or combination mullers and hammerstones. Eight of these are hematite, 17 ferruginous sandstone, one petrified wood and 3 hard quartzite. In outline they are oval, ovate or rectangular with rounded corners. Diameters range from 4.5 to 11 cm., but most objects are 6 to 9 cm. long and 4.5 to 7.5 cm. wide, with a rather uniform thickness of 3.5 to 5.2 cm. One or both faces are ground flat or mildly convex, and half of the stones have one or both ends battered. A sandstone object, 8.4 by 5.9 by 3.7 cm. in measurements, and a slightly smaller hematite object are oval in outline with pointed ends which suggest a wide boatstone shape. Each has a flat face with a slight oval-shaped central concavity and a strongly convex opposite face (Fig. 19 d, e).

(d) MAULS, ANVILS AND HAMMERSTONES (Fig. 18 g, h): There are 31 stones of various sizes which show some evidence of battering, usually at the ends. Most are thought to have been heavy mauls or hammerstones, but many have flat faces which could have served as anvils. Eight of these are hematite, 0.5 to 2 kg. (1 to 4 pounds) in

weight. Two are spherical, and 6 are irregularly cuboidal or elongate. Ten of similar size are cherts, granite or hard sandstones. One of these is spherical, another is discoid, and a third is loaf-shaped. Eight are blocks of petrified wood (Fig. 18 g), with rounded corners and flat ends and measure 7 to 13.8 cm. in length, 4.8 to 7.8 cm. in transverse diameters. Three blocks of hematite, one of petrified wood, and one of sandstone are smaller, show battered ends and possibly were pecking stones or small hammerstones.

(e) FLAT SLABS: 9 specimens. One is a large, thick saddle-shaped slab of hematite, 25 cm. long and 19.5 cm. wide. It shows little indication of use, except that the concave saddle face is smooth and has shallow pits which might result from anvil use. Five other hematite and 3 sandstone slabs are smaller: 7.5 to 16.8 cm. in length and 6.3 to 10 cm. in width, 1.4 to 3.7 cm. in thickness. The largest of the hematite slabs is partially hoe-shaped, but one straight side may represent a break. The possible blade is thin but rounded, without evidence of sharpening. A smaller sandstone slab has a gently rounded end which is beveled and conceivably could have been used for sawing.

G. POLISHED STONE OBJECTS

Polished ornaments and problematical objects are notable by their scarcity, as are ground and polished celts.

(a) GROOVED AXES (Fig. 19 a, b): Two grooved axes were found during the excavation. One (Fig. 19 a) is a large, fully grooved axe of reddish hematite or limonite, well made but showing numerous breaks and scratches. In several places the thin outer layer has scaled off, as is often seen with hematite objects of some antiquity. The length is 13 cm.; the width 8 cm. at midbody, 7 cm. at the poll and 7.5 cm. just above the blade; the maximum thickness is 5.2 cm. The blade is rounded, blunt on profile and shows fractures. The poll is smoothly rounded but has use scars. The polished groove is 1.5 to 1.7 cm. wide and 4 to 5 mm. deep.

The second specimen is represented by the basal half (Fig. 19 b) which was broken into 8 pieces when found. It is of black, glossy hematite, well ground and nicely finished. The original shape was rectangular. The width is 7 cm. at midbody, 6 cm. at the base; the thickness is 2.5 cm. The existing fragment is 6.5 cm. long, projecting an original length of 12 to 13 cm.

(b) CELT (Fig. 19 c): One celt of brown hematite is chipped and partially ground, mostly near the blade. It is small: 8.1 cm. long, 6 cm. wide and 2 cm. in maximum thickness. The basal end is rough, as are the faces. The edges and bit are shaped by rough chipping and partial grinding; the blade edge has use blunting.

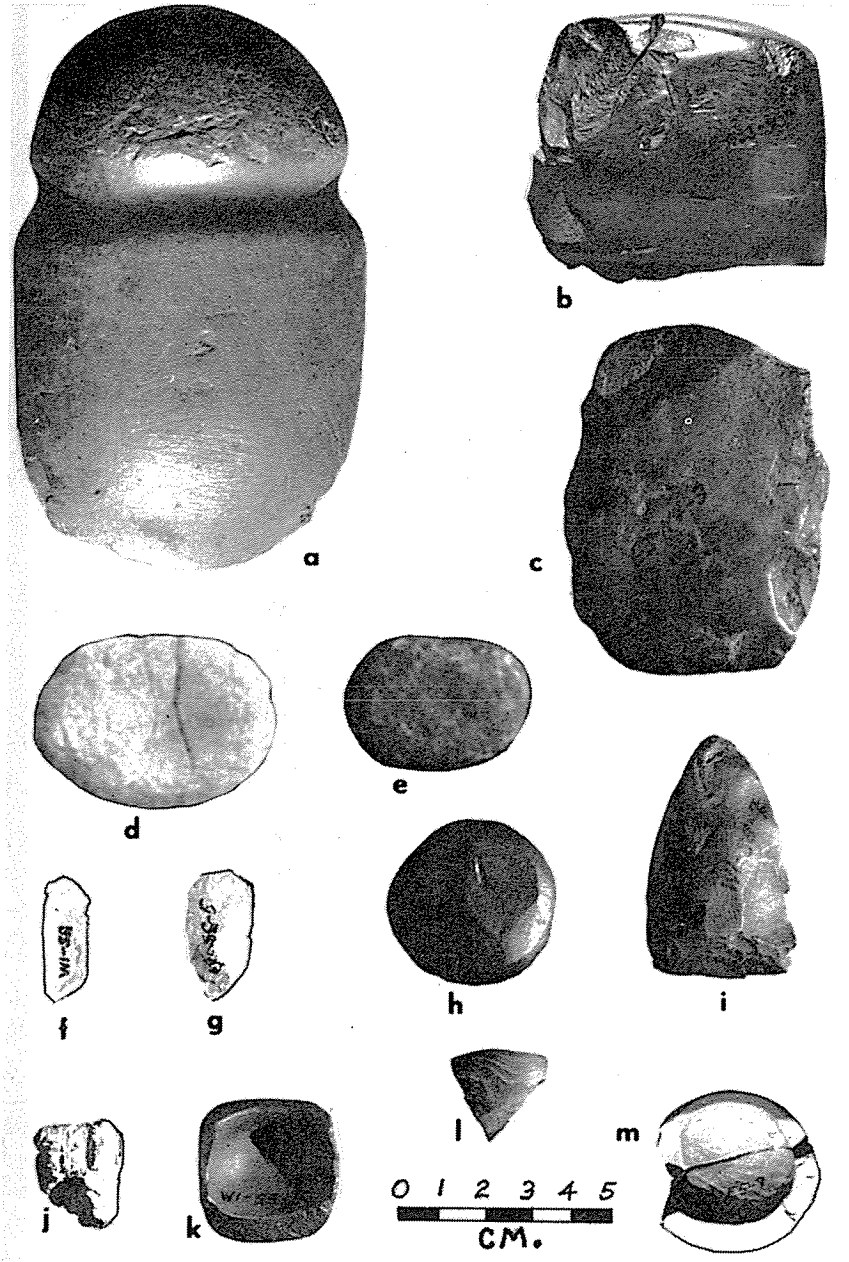

FIG. 19. Polished stone objects and exotics. Grooved axes, a, b; chipped and ground hematite celt, c; oval sandstone and hematite objects, possibly crude boatstones, d, e; quartz crystal and flake, f, g; polished and faceted hematite disc, h; ground hematite gouge, i; galena, j; stone cup fragments, k-m.

(c) GOUGE (Fig. 19 i): A beautifully shaped object of black hematite is outlined by chipping and is partially ground. It is modified triangular or ovoid in shape, with thin, ground edges and base; the faces are partly ground to a lenticular cross section. At the larger end there is a unifacial steeply beveled bit, which is cut straight across, producing a curved bit edge along the reverse face. Fine secondary flaking sharpens the bit; moderate use polish occurs on the obverse part of the bit and the reverse face is highly polished at the blade end. Length is 5.7 cm., width at bit is 3.4 cm., and maximum thickness is 1.5 cm.

(d) HEMATITE DISC (Fig. 19 h): A small circular disc of hematite is highly polished, with 5 flat facets on the obverse face. The converse face is shaped to a mild convexity by percussion chipping, then partially ground; the peripheral margin is also ground. The object is 3.8 to 3.9 cm. in diameter, 8.5 mm. in thickness. Presumably it was an ornament.

(e) STONE CUP FRAGMENTS (Fig. 19 k, l, m): There are 4 fragments of shaped and polished stone, two of which are from the same object and fit together. The shapes and smooth rims suggest small cups or stone pipe bowl fragments (no fragment shows a stem opening). The two fitted fragments (Fig. 19 m) are of a hard tan stone, probably derived from a geode, and form the base and about ⅓ the circumference of a small cup, approximately 4 cm. in diameter and 2.4 cm. high. The rim is incurvate and the lip almost flat. Wall thickness is 4 mm. just below the lip and 7 mm. at the base. It is smooth and undecorated. The break edges are worn and smoothed.

The second object (Fig. 19 l) is a fragment of banded limonite, with a smooth thin lip and polished surfaces and the breaks are sharp. The projected diameter is 3 to 3.2 cm.

The third of these objects is of red jasper (Fig. 19 k) and is similarly made but slightly smaller than the object of tan stone. Nearly half of the object is present, if it was symmetrical. It appears to be another small cup with squared sides which are partially rounded. One edge of the break is very thin, and the break may have occurred as a result of miscalculation during the drilling of the concavity. Exterior and interior surfaces are highly polished. The height is 2.6 cm. and the diameter is 3.2 cm. The thickness is 8.5 mm. at the base, 4 mm. at the lip and 2 mm. at the side walls.

EXOTIC MATERIALS

A small quartz crystal (Fig. 19 f) has been rounded and partically grooved by fine flaking at one end, presumably for suspension as a

pendant. The opposite end is natural. The length is 2.7 cm., the diameter 8 mm. A leaf-shaped fragment of quartz (Fig. 19 g) is 3 cm. long, 1.5 cm. wide and 8 mm. thick. It appears to have been roughly shaped to form a small scraper. Another flake scraper of quartz crystal has been mentioned. There is one unshaped nugget of galena (Fig. 19 j), 1.8 to 2.1 cm. in diameter.

Food Sources

Direct information about food sources of the inhabitants is meager. About 500 fragments of charred hickory, walnut and pignut hulls were found in 382 levels of 200 5 foot squares (Fig. 20 A). By vertical provenience the occurrence of these charred hulls was as follows: Level 3: in 46 squares; Level 4: 87; Level 5: 105; Level 6: 85; Level 7: 51; Level 8: 7, and Level 9: 1 square. Bone was minimal and fragmentary. Most of it showed as traces in the soil, but 45 fragments were sufficiently intact to save. Six of these could be identified as deer, one as bird. Additionally there were 9 deer teeth identified. Only two animal bones, both deer, were larger than 6 cm. in length.

Provenience and Distribution of Artifacts

Impressions during excavation and the recording of artifact provenience indicated that artifacts were scattered throughout the midden in all excavated areas, with minor concentrations (Fig. 3) in the central block. It also seemed that concentrations of artifacts were heavier over the lower end of the terrace than on the slopes or at the upper end. Good evidences of vertical distribution, using relative numbers of objects in the various levels, were also established. We have attempted to clarify these impressions and by various studies of horizontal and vertical provenience, to establish as clear a picture of aboriginal occupation as we can justify with the numbers of objects involved.

It is hoped by such studies to indicate patterns of aboriginal occupation during the various culture periods represented at the site, to note changes in time, and to note variations in activities—male or female—in various parts of the site. Our failure to reach these objectives to our satisfaction or to fully document our tentative conclusions can presumably be attributed to the nature of the occupation and of the soil, to the many factors which influence deposition and alter the original placement of objects, and possibly to some deficiencies in our study mechanism.

Theoretically, a site which was occupied intermittently or continuously for more than a thousand years should show a layering of

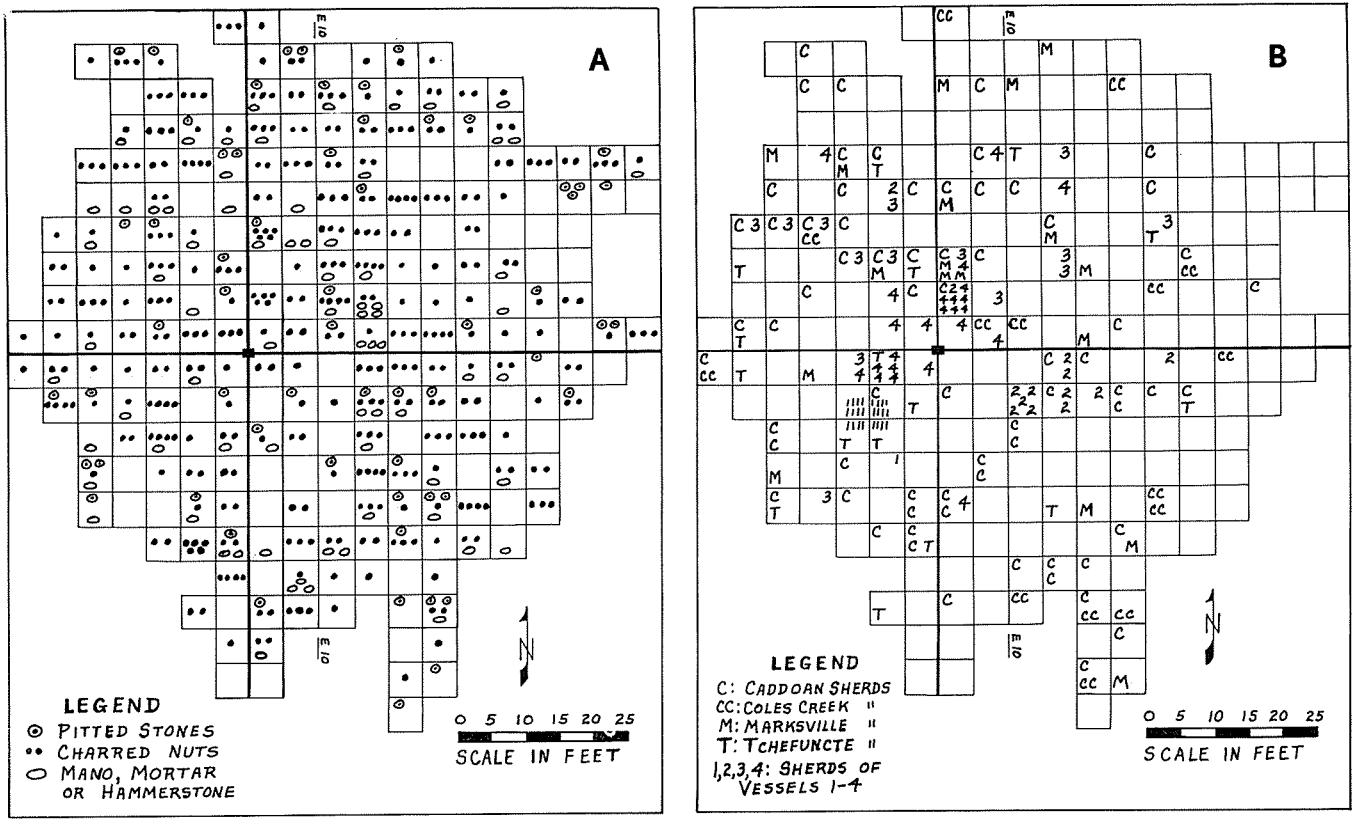

FIG. 20. Occurrence of certain objects by excavated squares in major block. A—charred nut hulls, pitted and other ground stones. B—vessels 1-4 and distinctive sherds.

occupational refuse, distributed to some extent in accordance with the living patterns or activities. Structures were built and destroyed, fires were made and covered, pots were broken and discarded, stone objects were fashioned or resharpened or lost, with the residues presumably available for study. If women cooked in certain areas, firebeds or firestones, ashes and charcoal should so indicate and sherds of broken pots or the stones for grinding seeds or the cracking of nuts should be nearby, especially if broken and discarded. If men sat in certain places to fashion or resharpen projectile points or stone tools, or to work bone, wood or leather objects, then a concentration of flakes and discarded or lost objects might so indicate. All of these indicators were present but seldom in such concentrations as to give a clear picture. We are forced to accept minimal conclusions.

The factors at this site which mitigate against this theoretical layering, structuring and clustering of residue are numerous. There are no evidences of large permanent structures or of heavy occupation; no burials were found. The soil is porous sand, easily washed by rain or overflow, and easily disturbed by human or animal activities. Vertical as well as horizontal displacement of objects is readily accomplished, and we found evidence of much tunneling by gophers and other animals. Human occupation and land clearing during the past century has certainly had some effect, and the light soil could as easily have been churned by aboriginal activities as by recent cultivation. At any stage of aboriginal occupation, objects left by previous inhabitants could have been found by adults or children and reused or at least dislocated.

A. Horizontal Distribution

The provenience of major artifact classes by excavated 5 foot squares in the central block is shown in Fig. 3, in relation to features like rock clusters, ash and charcoal concentrations and possible post molds. Disturbances due to previous excavations are indicated, chiefly in the southwestern sector of the block. The numbers of each of the three artifact classes—pottery sherds, projectile points and stone tools—are indicated in the square of origin. There is remarkable uniformity in the relatively thin artifactual residue. The 245 squares contained 2390 of these objects, averaging slightly less than 10 per square and slightly more than 1 per 6 inch level. Of these, 1387 were sherds, averaging 5.66 per square; 456 were projectile points, averaging 1.86 per square; and 547 were stone tools, averaging 2.23 per square. Only 20 of the 245 squares contained more than 10 sherds each; 9 of these squares were in the NE sector, 7 in the SE sector, 1 in the NW and 3

in the SW sectors. Only 2 squares, both in the NE sector, contained more than 5 projectiles each. Twelve squares yielded more than 5 stone tools each; 7 were in the NE sector, 4 in the NW, and 1 in the SW. Of the 31 squares in which these unusual numbers of objects were found, 21 are included in the 100 squares which surround the center stake, between the N25, E25, S25 and W25 lines. A further check of the total objects found in the 100 central squares shows that the major concentration of objects is in sherds. There were 633 sherds in these squares, an average of 6.33 per square in comparison with an average of 5.2 sherds per square in the remaining 145 squares of the central block. In the 100 squares around the center stake there were 191 projectiles, averaging slightly above the average of 1.83 for the remaining 145 squares. There were 256 stone tools, or 2.56 per square, which is somewhat above the average of 2.0 for the remaining 145 squares. It is revealing of the thin occupation that the sherds of Vessels 1 to 4, most of which were found within the 100 squares around the center stake, total 90 or one-seventh of the 633 sherds found in these squares. All of the sherds in these 100 squares would, therefore, be the equivalent of only 30 pottery vessels.

Another area of concentration appears in the northern tier of squares in the NE sector of the central block. Thirty squares lying between the N25 and N45 lines and between the 0 and E40 lines yielded 335 artifacts (11 per square), of which sherds average 5.7, projectiles 2.5 and stone tools 3.0 per square, indicating a concentration of lithics rather than sherds.

Plotting of the horizontal distribution of charred nut hulls, pitted stones and other ground stone tools (mullers, mortars, hammerstones, anvils) shows two interesting configurations (Fig. 20 A). There is an area of concentration around and east of the center stake, corresponding to the area of sherd concentration described above. There is also a band of concentration diagonally across the northern tier of squares in the central block, and a third minor band across the SW sector. All three bands suggest a NW-SE trending, almost paralleling the course of the terrace (Fig. 2).

Fig. 20 B shows the provenience by squares of the sherds from which Vessels 1 to 4 were reconstructed, also the horizontal provenience of the sherds identified as Tchefuncte, Marksville, Coles Creek and Caddoan. The sherds of Vessel 1 were almost undisturbed after it was broken, suggesting that it was covered with soil shortly thereafter (no burial or cache pit was in evidence). The sherds of Vessels 2 and 4 were moderately dispersed over areas of 100-250 square feet, with a few widely displaced sherds. The sherds of Vessel 3 were

scattered over half of the excavated block, as far as 60 feet apart. The preponderance of the recognized Tchefuncte sherds, also Vessel 1 and most of Vessel 3, are in the western half of the excavated block (Fig. 20 B and Table 5), near the stream. Marksville sherds are scattered but most are in the northern sectors. Coles Creek sherds, differing from Tchefuncte, are proponderantly in the eastern sectors of the block, further from the stream, while Caddoan sherds are more widely dispersed than are those of any other period. These proveniences suggest limited occupation, in time and extent, during the Tchefuncte and Coles Creek periods.

In order to divide the central block of excavations more evenly, the occurrence of objects in 4 quadrants (to distinguish from the sectors defined by the survey axes) was calculated after quadrating the block by using the E10 line as a N-S divider and the 0-0 line as E-W divider. Table 5 shows the relative occurrence of various groups of objects in the resulting quadrants, which contain 65, 70, 54 and 56 squares. It also compares the relative occurrence of the various objects or groupings in the 8 squares north of the N120 line (North area), the 19 squares east of the access road (East area) and the 13 squares encircling the excavation block (other areas). In the central block, it appears that the average of sherds, projectiles, chipped and ground tools, and flakes are fairly uniform in the 4 quadrants. The average number of sherds is slightly higher in the NE and SE quadrants. Dart projectiles and stone tools average slightly higher in the NE (heavier archaic occupation?), and flakes slightly higher in the NW. Arrow projectiles are more numerous in the SE and SW quadrants than in the northern tier, corresponding with the slightly higher yield of Caddoan and Coles Creek sherds in the southern quadrants. The larger numbers of Tchefuncte sherds in the western quadrants and of Marksville in the northern is again in evidence.

None of these variations, however, is as marked as the differences noted in the areas away from the major excavated block. The North area, most of which is 100 feet from the block, maintains a good sherd yield, but bone-tempered sherds are diminished and clay-tempered increased in relative proportions. No Tchefuncte sherds and only one each of Marksville and Coles Creek were found, but 10 Caddoan sherds were recognized. Dart projectiles hold up well, but chipped and ground stone tools are in small numbers and flakes are distinctly less numerous. The indications are of lighter occupation in the North area during earlier periods but of increased usage during Caddoan times.

The East area, across the access road, shows a general drop of about

TABLE 5

Distribution of Certain Artifacts
Major Excavation Block

	Northwest quadrant	Northeast quadrant	Southwest quadrant	Southeast quadrant	North area	East area	Other areas
Number of squares	65	70	54	56	8	19	13
Total sherds	317	412	312	337	50	54	44
Average sherds per square	4.9	5.9	5.8	6.0	6.2	2.8	3.4
Sand-tempered sherds	79	89	60	80	17	24	12
Bone-tempered sherds	113	117	113	132	8	19	10
Clay-tempered sherds	122	139	114	125	25	11	22
Tchefuncte sherds	4	2	8	3	0	1	2
Marksville sherds	8	5	2	3	1	4	0
Coles Creek sherds	3	4	1	7	1	1	2
Caddoan sherds	26	7	18	17	10	0	3
Dart projectiles	116	143	80	83	11	14	14
Average dart projectiles per sq.	1.8	2.0	1.5	1.5	1.4	0.7	1.1
Arrow projectiles	12	6	14	12	0	1	1
Chipped stone tools	134	154	72	78	8	16	9
Average chipped stone tools per sq.	2.0	2.2	1.3	1.4	1.0	0.8	0.7
Ground stone tools	30	39	22	36	2	3	3
Flakes	10934	9945	6409*	7699**	831	1212	1183
Flakes per square (average)	168	142	136	140	104	64	91

*From 47 squares in the quadrant. **From 55 squares in the quadrant.

50 percent in sherds, dart propectiles, chipped and ground stone tools and flakes, in comparison with the central excavated block. The absence of Caddoan sherds and the low yield of only one Coles Creek sherd and one arrow propectile, in comparison with 4 Marksville and one Tchefuncte sherds, indicates that the lighter occupation occurred during the earlier ceramic periods. This indication is enhanced by the preponderance of sand-tempered sherds over clay-tempered.

The 13 other squares surrounding the central block show nothing distinctive in a differential fashion, but a diminished yield of all artifacts and flakes again suggests the preference of the peoples at all times for the higher terrace rather than the slopes.

B. Combined Horizontal And Vertical Distribution.

A further study of pottery sherd concentration in the central excavated block, combining horizontal and vertical distribution, was made by constituting two artificial zones: an upper zone for which all sherds in Levels 1 through 5 were plotted in the squares from which they derived, and a lower zone comprising sherds from Levels 6 through 9, similarly plotted. This was checked by plotting sherds by square of provenience for each of the five major levels, 3-7. The purpose was to determine whether the several concentrations of sherds, previously noted, might be related to earlier or later occupations. Although the sherd counts by individual squares and levels were generally too sparse to be definitive, when combined with the zone groupings there were some clarifications of the clustering. The concentration of sherds immediately south of the center stake (Fig. 3) in the squares between 0-S15 and W10-E10 lines involved all major levels. By contrast, the concentration immediately north of the center stake (0-N15 and W10-E5) related largely to sherds from the upper zone, especially Level 4. Sherds of Vessel 4 were involved in this deposit. Another concentration east of the center stake, between lines 0-S10 and E15-E25, derived from the upper zone and especially level 3, and included sherds of Vessel 2. Two concentrations in the NE sector (N20-35, 0-E15 and N10-30, E25-40) had scattered sherds from the upper zone and major derivation from Levels 6 and 7.

All of these "concentrations" are relative and seem to result from the breakage of only a few vessels in each instance. With one exception, these sherd concentrations coincide with the areas in which charred nut hulls and ground stone tools (Fig. 20 A) are concentrated, but no close association is in evidence. The exception is the north-central concentration of sherds (N20-35, E-15) which derive from Levels 6 and 7 and with which a light residue of nut hulls and grind-

ing or pitted stones is associated. Ash and charcoal are missing. Except for the area immediately south of the center stake where the possible post molds suggest a structure, there is no good correlation of these various evidences of culinary and other domestic activities. The conclusion is almost inescapable that intermittent and sporadic brief camping in temporary shelters is represented, with the campsites at various locations on the preferred lower end of the terrace.

C. Vertical Distribution

Most of our data on vertical distribution are derived from use of the entire collection, plotted by vertical artificial levels (Table 6, Fig. 21, 22). Levels 1 and 2 are combined because of the paucity of artifacts and the disturbed nature of the soil in the plow zone. A few flakes found in the 6 inches below Level 9 (54-60 inch depth) are added to the totals from that level in the three involved squares; no other artifacts were found below 54-inch depth. The table and graphs therefore show Levels 1-2 and 3 through 9.

In view of the variations in horizontal distribution of certain objects in these squares outside of the central block (Table 5), the artifacts from these extraneous areas were plotted separately by excavation levels. Those from the North and East areas will be discussed later. The variations are minor and the numbers probably are not statistically significant, hence we include all areas in the single major study of vertical provenience.

Before examining the results of these studies, evidence should be recorded that pottery sherds were subjected to considerable vertical as well as horizontal displacement. Many of the sherds showed teeth marks of rodents, especially among the sherds tempered with bone or clay; sherds of Vessel 2 had been gnawed to an extent that adjacent sherds no longer touched. Moreover, sherds of Vessels 2, 3 and 4 were not only dispersed laterally (Fig. 20 B) but were found at depths which varied from 18 to 30 inches. Vessel 2, for example, derived largely from Level 3 (7 sherds) and Level 4 (4 sherds) but 2 sherds of this vessel came from Level 6. Vessel 3 had 6 sherds from Level 7, 4 from Level 4, inferred as its level of origin, but other sherds came from Levels 3, 5 and 6. Similar vertical displacement is noted of other sherds which formed portions of vessels. The sand-tempered urn, of which a fitted portion is shown in Fig. 6 b, had sherds from Levels 3, 4, 5 and 6; the assumed origin is Level 5. The three portions of sand and bone-tempered vessels, of flower-pot shape (Fig. 6 a, c, d), each had the greater number of sherds from Level 4 but others derived from Levels 3, 5, 6, 7 and 8. The incised sand-tempered vessel shown

in Fig. 6 g, h is represented by 2 sherds from Level 4 and one each from Levels 3 and 6. Three fitted Marksville Stamped sherds (Fig. 10 v) were found in Squares E1 N3 and W1 N30, 135 feet apart, but this is not serious because all were from Level 6. Sherds of a Coles Creek Incised vessel (Fig. 11 a, f) came from Levels 2, 3 and 6. Seven sherds of a single Caddoan bottle spout (Fig. 11 k) were found in Levels 1, 3, 4, 5 and 6 (2 each from Levels 4 and 6). Two sherds of the same Pineland Punctated vessel (Fig. 11 y, z) were from Levels 3 and 5.

These distressing vagaries in vertical provenience of sherds, with evidences of upward and downward displacement, inhibit the drawing of conclusions from any small number of sherds; they force reliance on large numbers and general trends rather than finer delineations. One can only hope that provenience of stone objects is more reliable, although there is no direct evidence for or against vertical displacement of non-ceramic items.

The provenience of all objects found at the site is shown in Table 6, by individual types, by classes of artifact types, and by excavation levels. The total number of artifacts, excluding flakes and unworked stones, is 2696, of which potsherds constitute 57%. From this Table we have drawn graphs of a number of types and classes in attempts to find signifiicant trends.

Fig. 21 A shows the changes in relative numbers of major artifact classes by excavation levels. Each horizontal bar shows the percentages of the total artifacts found at that level represented by sherds, dart points, arrow points, chipped stone tools and ground stone tools; the total number of artifacts from a given level is shown to the right of each bar. Objects of uncertain provenience and "polished and exotic objects" are not included. Notable trends are: (1) pottery sherds increase in relative proportions from the lower to the upper levels, at a fairly regular rate and largely at the expense of dart points and chipped stone tools. (2) Dart points and chipped stone tools are parallel in numbers at the various levels in their progressive decrease from bottom to top. (3) Ground stone tools show a similar relative decrease with time, interrupted in Levels 3 and 4. (4) Arrow points are missing from the lower levels and progressively increase in the upper levels, but only exceed dart points in Levels 1 and 2. Except for this progressive but incomplete replacement of dart points by arrow points, there are therefore no striking and sudden changes in the relative numbers of these artifact classes, but rather slow and progressive alterations. We shall look later at changes of types within these classes.

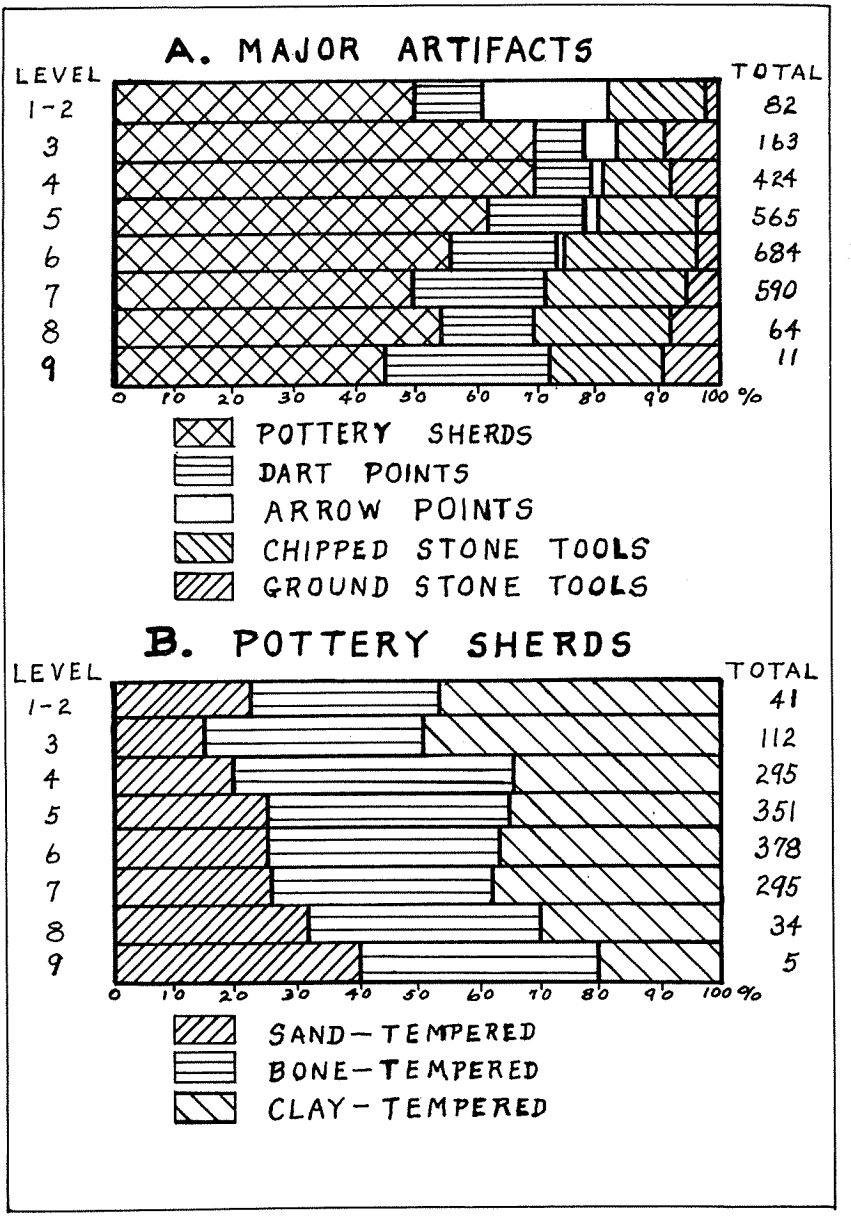

FIG. 21. Relative percentages, by levels, of major artifacts (A) and pottery tempering (B).

TABLE 6

Provenience of objects by excavation levels, Resch Site

	Excavation Levels									
	1-2	3	4	5	6	7	8	9	Uncertain	Totals
CERAMICS										
Total sherds	(41)	(114)	(299)	(352)	(383)	(297)	(35)	(5)	(15)	(1541)
Sand-tempered	9	17	59	89	97	77	11	2	3	364
Bone-tempered	13	40	135	141	143	105	13	2	7	599
Clay-tempered	19	55	101	121	138	113	10	1	5	563
Other temper	0	2	4	1	5	2	1	0	0	15
Other clay objects	0	0	0	1	0	0	0	0	0	1
Daub	0	0	1	1	1	2	0	0	0	5
Mud-dauber nests	0	0	0	1	0	2	0	0	2	5
PROJECTILE POINTS, DART										
Total dart points	(10)	(15)	(42)	(94)	(139)	(146)	(13)	(3)	(2)	(464)
Gary, *tiny*	1	4	7	17	22	14	1	0	0	66
Gary, *small*	3	4	15	36	51	47	4	0	2	162
Gary, *typical*	0	1	4	8	5	9	2	0	0	29
Gary, broken	1	0	3	5	6	4	0	0	0	19
Wells	0	0	0	0	3	2	0	0	0	5
Desmuke	1	0	0	2	0	3	0	0	0	6
Kent	1	2	2	3	18	15	0	1	0	42
Elam	1	0	1	2	0	4	0	0	0	8
Palmillas	0	0	0	1	6	7	1	1	0	16
Yarbrough	0	0	1	4	3	7	0	0	0	15
Yantis	0	0	0	0	0	2	0	0	0	2
Ellis	1	3	4	7	12	16	1	1	0	45
Bulverde	0	0	0	0	0	1	0	0	0	1

Table 6 continued

	Excavation Levels 1-2	3	4	5	6	7	8	9	Uncertain	Totals
Delhi	0	0	0	1	0	0	0	0	0	1
Sinner	0	0	0	0	1	0	0	0	0	1
Trinity	0	0	0	0	0	1	0	0	0	1
Spikes	0	0	1	1	0	1	0	0	0	3
Marshall	0	0	0	0	0	1	0	0	0	1
Concave base	0	0	0	0	0	0	1	0	0	1
Untyped and broken	1	1	4	7	12	12	3	0	0	40
Possible Lance Point	0	0	1	0	0	0	0	0	0	1
PROJECTILE POINTS, ARROW										
Total arrow points	(13)	(9)	(7)	(11)	(5)	(2)	0	0	(1)	(48)
Friley	9	7	1	4	1	0	0	0	0	22
Colbert	3	0	1	3	3	0	0	0	0	10
Alba	0	0	1	1	1	0	0	0	0	3
Bonham	1	1	0	1	0	0	0	0	0	3
Cliffton	0	0	0	0	0	2	0	0	0	2
Catahoula	0	0	1	1	0	0	0	0	0	2
Nodena	0	0	1	1	0	0	0	0	0	2
Untyped	0	1	2	0	0	0	0	0	1	4
THIN BIFACIAL TOOLS										
Total thin bifacials	(1)	(3)	(10)	(22)	(24)	(21)	(5)	0	0	(86)
Rectangular slabs	0	2	2	2	5	2	0	0	0	13
Pointed slabs	0	0	0	4	6	2	0	0	0	12
Oval biface	0	1	0	1	3	0	0	0	0	5
Flat oval biface	0	0	1	1	2	0	0	0	0	4

Table 6 continued

	Excavation Levels 1-2	3	4	5	6	7	8	9	Uncertain	Totals
Large ovate biface	0	0	0	0	2	1	1	0	0	4
Small ovate biface	1	0	3	3	0	4	1	0	0	12
Triangular biface	0	0	0	3	1	4	1	0	0	9
Stemmed biface	0	0	2	2	2	0	1	0	0	7
Untyped or broken	0	0	2	6	3	8	1	0	0	20
THICK BIFACIAL TOOLS										
Total thick bifacial	(9)	(10)	(27)	(44)	(72)	(79)	(7)	(1)	(6)	(255)
Elongate bifacials	5	2	7	9	13	15	3	0	0	54
Elongate end tools	0	0	1	0	2	5	0	0	0	8
Small bifacials	2	3	7	15	30	31	1	1	0	90
Pointed pebble tool	0	3	4	15	18	22	3	0	0	65
Pebble side-blades	1	0	4	1	4	4	0	0	0	14
Ovate "turtle-back" bifaces	0	0	0	0	1	1	0	0	0	2
Pebble choppers	1	0	1	1	2	0	0	0	0	5
Chipped celts	0	0	0	0	1	1	0	0	0	2
Irregular bifaces	0	2	3	3	1	0	0	0	6	15
THICK UNIFACIAL TOOLS										
Total thick unifacials	(2)	0	(4)	(6)	(7)	(9)	0	(1)	0	(29)
End scraper of petrified wood	0	0	1	1	2	4	0	0	0	8
Crude thick uniface	2	0	2	4	3	5	0	1	0	17
Possible gouges	0	0	1	1	2	0	0	0	0	4
SMALL FLAKE TOOLS										
Total small flake tools	(2)	0	(9)	(26)	(43)	(30)	(3)	0	(2)	(115)
Flake scrapers, medium	1	0	0	3	12	9	2	0	1	28

Table 6 continued

	Excavation Levels									
	1-2	3	4	5	6	7	8	9	Uncertain	Totals
Flake scrapers, small	0	0	4	15	12	4	0	0	0	35
Small end-scrapers on cortex flake	1	0	3	6	11	9	1	0	0	31
Small end-scrapers with stems	0	0	0	0	3	1	0	0	0	4
Small end-scrapers with steep bit	0	0	0	1	0	1	0	0	0	2
Small bifacial tools	0	0	0	0	1	1	0	0	0	2
Gravers	0	0	0	0	3	3	0	0	1	7
Drills	0	0	1	1	0	1	0	0	0	3
Notches	0	0	1	0	1	1	0	0	0	3
GROUND STONE TOOLS										
Total ground stone tools	(3)	(14)	(33)	(23)	(26)	(30)	(5)	(1)	0	(135)
Mortars	0	1	1	0	0	1	0	0	0	3
Pitted stones	2	7	18	9	14	9	4	0	0	63
Mullers	0	1	7	8	3	9	1	0	0	29
Hammerstones, mauls	1	2	5	4	9	9	0	1	0	31
Flat slabs	0	3	2	2	0	2	0	0	0	9
POLISHED AND EXOTIC OBJECTS										
Grooved axes	0	0	0	0	0	0	1	1	0	2
Ground celt	0	0	0	0	0	1	0	0	0	1
Hematite gouge	0	0	0	0	0	1	0	0	0	1
Hematite disc	0	0	0	0	1	0	0	0	0	1
Stone cup fragments	0	0	0	1	0	2	0	0	0	3
Galena	0	0	0	1	0	0	0	0	0	1
Quartz	0	0	0	2	0	0	0	0	0	2
Total specimens	81	165	431	582	700	618	69	12	27	2696
Flakes	4470	5592	7086	7869	7399	5269	618	98	0	38401

In Fig. 21 B the pottery sherds are examined for changes in tempering characteristics from bottom to top, presumably reflecting changes in time during the occupation of the site. Sherds of uncertain provenience and with tempering characteristics other than the three major ones—sand, bone and clay—are excluded. Again there are no sudden changes; bone tempering remains remarkably stable at 35 to 40% at all levels. The only significant trend is the slow but progressive diminution in sand tempering and the converse increase in clay tempering, especially in the three top levels. Between Levels 7 and 4, during major occupation of the site, bone tempering slowly increases and, overall, it is the most popular aplastic at the site.

In Fig. 22 the graphs show percentages by excavation levels of various artifact types within the classes of artifacts previously examined, as well as some of these classes. The bar graph for a given level expresses the percentage of the type or class at that level of the total number for all levels, hence shows changes in numbers from below upward. When compared, there is some evidence of relative popularity of certain types at the various periods reflected by vertical levels. The graphs as a whole show that the major occupation of the site is reflected in Levels 7 (36-42 inch depth) through Level 4 (18-24 inch depth). If we may safely use total sherds and stone flakes as indicators of expected artifact density at given levels, since these are objects which are present at all levels and in largest numbers, it would appear that a percentage of any type or class below 13% or above 25% at any level between 4 and 7 is evidence of significant alteration.

The rapid drop in numbers and frequencies of objects in Levels 8 and 9 suggests that these levels are largely below the occupation zone, and that some of the artifacts may have been carried down. However, the presence of most classes of artifacts, up to 2-3%, in Level 8 make it possible that the artificial dividing line between Levels 7 and 8, at 3½ feet, may have been slightly above the lowest occupation zone in some squares. Moreover, the occurrence in Levels 8 and 9 of Archaic objects like the two grooved axes, projectile point types like Palmillas, Kent and Ellis which elsewhere seem to be slightly earlier than Gary, thick chipped stone tools, and the broken base of a concave-base point indicates visits to the site by Archaic peoples before the major occupation started.

At the other end of the spectrum, there is a progressive diminution in number of artifacts in the upper three levels, 165 specimens in Level 3 and only 81 from Levels 1 and 2 combined, in comparison with 400-700 objects per level at Levels 4-7. The only exceptions are arrow

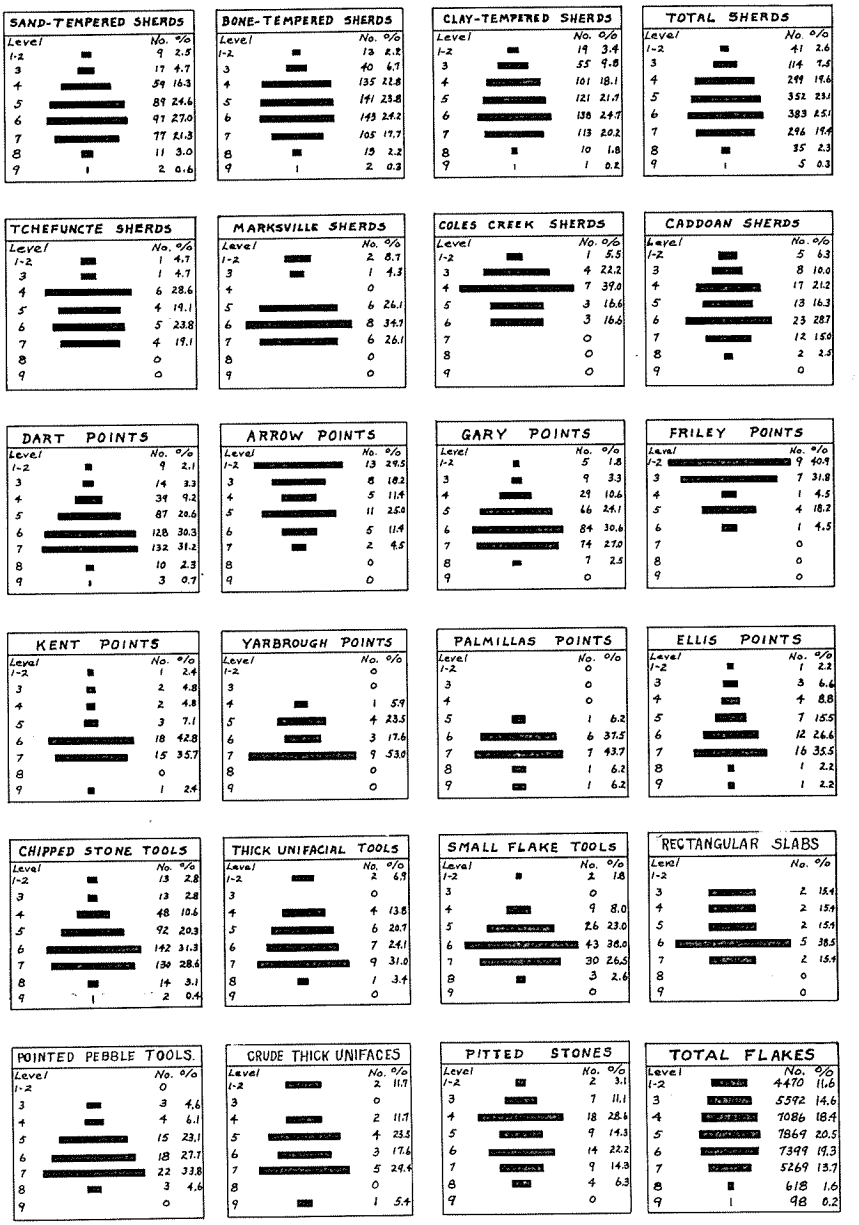

FIG. 22. Distribution of certain artifacts by levels at Resch Site. Each horizontal bar represents percentage at that level of the total of that artifact from all levels.

projectiles and, surprisingly, flakes; the latter diminish but at a slower rate. One might think of selective collecting from the site, but there is no history of such in recent years and amateur collectors seldom bother with crude tools. Even the wooded parts of the site show the same trends, with a deposit of virtually sterile soil over the top foot. We must conclude that the site was abandoned in early Caddoan times and covered with virtually sterile soil.

The bar graph (Fig. 22) for total pottery sherds follows the above trends, with some representation in Levels 9 and 8, a marked increase in Level 7 to peak in Level 6 and gradually fall in Levels 5 and 4, and finally a rapid fall in Levels 3 to 1. The trends for each of the three tempering techniques, sand, bone and clay, are remarkably similar to the total graph and to each other; minor variations are the slightly higher than average percentage for sand-tempered sherds in the lower levels and drop-off in the upper levels, the increase in bone-tempered sherds in Level 4, and the higher than average of clay-tempered sherds in Levels 3-1. These studies, however, corroborate the findings noted in Fig. 21 B that pottery sherds were present at all levels and that no striking change in tempering techniques occurred during the life of the site.

The graphs of vertical provenience of Tchefuncte, Marksville, Coles Creek and Caddoan sherds (Fig. 22) reflect the unhappy vertical displacement of sherds noted previously. From many stratigraphic studies elsewhere, deposition at this site would be expected in the order listed, with Tchefuncte oldest and therefore in lowest levels, and Caddoan most recent and therefore in the uppermost levels. The Marksville and Coles Creek graphs are gratifying, with Marksville percentages peaking in Level 6 along with high levels of dart points and chipped stone tools and before the rise in arrow projectiles; and with Coles Creek percentages peaking in Level 4, after the advent of arrow projectiles and the fall-off in dart points and heavy stone tools. Tchefuncte sherds are respectably represented in Levels 7 and 6 but the persistence in Level 5 and increase in Level 4, after Marksville peaks, can only be explained by mistyping or upward transport of sherds; we prefer the latter explanation. The real difficulty lies in the Caddoan sherd graph and the number of identifiable Caddoan sherds, 81, augments the difficulty. There is a lot of difference in the upward displacement of 6 to 12 Tchefuncte sherds and the downward displacement of 50 Caddoan sherds, well over half of the total number, from the expected Levels 3 and 4 down to Levels 6, 7 and 8. In order to eliminate the possibility of typing errors, we regraphed the unquestioned Caddoan sherds, choosing only bottle spouts and en-

graved sherds; with this maneuver the only significant alteration of the graph was the elimination of the two sherds from Level 8. There was still a peak in Level 6 and good representation in Levels 5 and 7. These sherds were well scattered (Table 5, Fig. 20 B) and there were no evidences of their being in cache or refuse pits. The numerous recounted evidences of vertical sherd displacement at this site preclude any firm conclusions, but it would indeed be surprising if rodents had the discrimination necessary to move Tchefuncte sherds upward and Caddoan sherds downward. This finding with respect to Caddoan ceramics at Resch Site emphasizes the significance of the Caddoan sherds found in Marksville period mounds at the Coral Snake (McClurkan, Field and Woodall 1966) and Jonas Short (Jelks 1965) sites. This also points to the need for further studies of Caddoan beginnings in the Sabine and Angelina drainages.

The inverse relationship between dart and arrow projectiles shown in Fig. 21 A is borne out by the percentage graphs in Fig. 22. However, total dart points are in larger percentage in Level 7 than are total sherds; the dart points peak at this level, in comparison with the sherd peak in Level 6. The Gary points more closely parallel total sherds in Levels 5 through 7 and persist in respectable numbers in the upper levels as arrow points come in. Separate graphs were made for the Gary *typical*, Gary *small*, Gary *tiny* and for the individual varieties (Table 4). These are not shown in Fig. 22 because the only variations from the graphs of Gary points occur in the Gary *typical* and in those varieties whose numbers are too small to give reliable results. The graphs for Gary *small* and Gary *tiny* are virtually identical at all levels, suggesting that the artificial dividing line between these two groups, which we established at a length of 3 cm., is of no real value and that they should be considered together as Gary *small*, with a range in length of 2 to 4.5 cm. Gary *typical* may be slightly earlier at this site, consistent with findings elsewhere that Gary points diminish in size with passage of time. The graph of Gary *typical* showed a peak of 31% in Level 7, with 17% in Level 6 and 27.5% in Level 5; there were no Gary *typical* in Levels 1 and 2. Possibly more significant is that 65% of Gary *typical* were made of petrified wood, compared with 40% of Gary *small* and 18.2% of Gary *tiny*. The small numbers of Gary *typical*, 29 total, interfere with complete reliance on these differences.

Graphs of the Gary varieties similarly show that those represented by sufficiently large numbers, like varieties *emory*, *kemp* and *kaufman*, show frequency graphs which are almost identical with each other and with the graphs for Gary points in Fig. 22; all are represented in

Level 8, increase in Level 7, peak in Level 6 and progressively drop thereafter. Varieties *emory* and *kemp* are so closely similar in range of size (Table 4), in vertical distribution in the midden, and in the materials from which they were made (35 and 33% of petrified wood, respectively) that, at this site, the distinction appears to be an artificial one. Variety *colfax* peaks in frequency in Level 7 and may therefore be slightly earlier; *runge, panna maria* and *hobson* peak at Levels 6, 5 and 4, respectively, but their numbers are small.

Further study of the individual dart point types shows that Ellis, Palmillas, Yarbrough and Kent types appear early and drop off rapidly above Level 6 (Fig. 22). These types are largely responsible for the peak percentage of total dart points at Level 7. Ellis type has a total percentile distribution more nearly resembling that of Gary type; the other three are confined largely to the lower levels. If there was an Archaic occupation before advent of pottery, these projectile point types were represented, especially since one specimen each of Palmillas, Kent and Ellis were from Level 9, where Gary was missing.

The arrow point graphs show that Friley, the predominant type, generally resembles the total arrow points in vertical distribution, although Cliffton and Colbert seem to be slightly earlier. The numbers are too few to draw firm conclusions.

The vertical distribution of chipped stone tools (Table 6, Fig. 22) is almost identical with Gary type projectile points, except for the presence of two of these tools from Level 9. Thin bifacial tools, often but improperly termed blades or knives (Table 6), follow a similar distribution, with a peak at Level 6; large ovate "blades" may be slightly earlier, as they are present in Levels 8 to 6 and none thereafter, but the numbers are small. The graph of rectangular slabs (Fig. 22) shows a peak at Level 6 but persistence to Level 3. The distribution of thick bifacial tools is similar to that of chipped stone tools in general, but the peak in frequency occurs in Level 7 rather than Level 6. The graph of pointed pebble tools (Fig. 22) shows a peak at Level 7 with slow declines through Level 4. Unless there was a larger pre-pottery Archaic occupation of this site than the excavation evidences and provenience studies indicate, most or all of these chipped stone tools, as well as dart points of late Archaic types, continued in use after the advent of pottery.

The small flake tools have a somewhat different distribution pattern (Fig. 22, Table 6). They are confined largely to Levels 5, 6 and 7 with peak incidence in Level 6. By contrast, ground stone tools (Table 6), represented in Fig. 22 by the graph of pitted stones, are distributed at all levels but peak at Level 4 and continue in significant num-

bers into Level 3. The polished and exotic objects are not included in Fig. 22 because of small numbers, but Table 6 shows the grooved axes to be in Levels 8 and 9, and the remainder to occur in Levels 7 through 5. There is a significant paucity of polished, ornamental, exotic or presumably ceremonial items at the site.

A study of the flake debitage by levels (Fig. 22, Table 6), with the horizontal distribution studies (Table 5) previously reported, shows a smooth pattern which is our best evidence of occupation density. The surprise is the upward shift of the graph, with the peak at Level 5 and large numbers of flakes in the upper 3 levels, findings which are inconsistent with the distribution of projectile points and other chipped stone artifacts. In the absence of artifact collecting from the site, we have no explanation for the difference in density of flakes and other objects in the upper levels.

In counting the flakes a separate count was made of petrified wood flakes, since many projectile points and tools at the site were made of this material; total flakes and flakes of petrified wood were recorded separately for each level and square. The overall percentage of petrified wood among the flakes is 21.2, but the significant finding in the flake study is the progressive decrease, level by level and almost mathematically exact, in the percentage of petrified wood flakes from the bottom to the top of the midden (Table 7). From frequencies of 30% at Levels 8 and 9 and 26.8% at Level 7, this material diminishes among the flakes to 19.8% by Level 4, and 16.2% in Levels 1-2. The large numbers involved and the straight line changes preclude this being an accidental finding and assure the reliability of its reflecting a change in preference on the part of the inhabitants, from petrified wood to local cherts, with the passage of time. We then tabulated the frequencies and percentages of petrified wood among the materials from which various objects were made, by levels (Table 7). Considerable variation is exhibited from level to level, especially when the numbers of objects is small, but the same general trend of diminishing use of petrified wood as a material for manufacture of projectile points and tools, from lower to upper levels, is shown.

Probably more significant than the level to level change in a given type of object is the evidence of variation between types of objects in the percentage of petrified wood, shown in the column on the right side of Table 7. The highest percentage occurs in dart points other than Gary type (46.5%) and in large chipped tools (44.5%); Gary points are next with 39.1% and the lowest frequencies occur in arrow points (30.4%) and small flake tools (16.2%). There is excellent correlation between these findings and the stratigraphic evidences, pre-

TABLE 7

Proportion of petrified wood to total materials among chipped objects and flakes, by levels. For each level the figures show total objects, objects of petrified wood, and (below) the percentage of petrified wood.

Objects	Excavation levels 1-2	3	4	5	6	7	8-9	Totals
Gary points	5/1	9/1	29/12	66/30	83/27	72/33	7/2	271/106
Percentage	20.0	11.1	41.4	45.4	32.5	45.8	28.6	39.1
Other dart points	5/1	6/3	13/8	28/16	56/23	72/33	9/4	189/88
Percentage	20.0	50.0	61.5	57.1	41.1	45.8	44.4	46.5
Arrow points	12/4	9/2	7/1	11/5	5/2	2/0		46/14
Percentage	33.3	22.2	14.3	45.4	40.0	0		30.4
Large chipped tools	12/4	13/7	41/21	72/31	101/46	109/45	14/7	362/161
Percentage	33.3	53.8	51.2	43.0	45.5	41.3	50.0	44.5
Small flake tools	2/0		9/0	25/3	43/6	29/8	3/1	111/18
Percentage	0		0	12.0	13.9	27.5	33.3	16.2
Total chipped objects	36/10	37/13	99/42	202/85	288/104	282/119	33/14	979/387
Percentage	27.7	35.1	42.4	42.0	36.0	42.2	42.4	39.5
Flakes	4470/734		7086/1401		7399/1692		716/215	
		5592/976		7869/1705		5269/1410		38401/8133
Percentage	16.4	17.4	19.8	21.6	22.9	26.8	30.0	21.2

viously discussed and shown in Table 6 and Fig. 22, that thick bifacial and unifacial tools and dart points reach peak numbers early (Level 7) and drop off in upper levels; that Gary points apparently persist longer and peak later than Palmillas, Yarbrough, Kent and Ellis; that arrow points are in higher levels and therefore are presumably later than Gary dart points; and that small flake tools peak at Level 6 and therefore presumably are popular at a later time than the thicker tools. A further individual check on materials from which the dart points, other than Gary type, were made shows the following percentages of petrified wood; Yarbrough, 66.7%; Kent, 61.9; Palmillas, 56.2; Elam, 50; Ellis, 28.8. Stratigraphic studies at other sites have shown Yarbrough, Palmillas and Kent to precede Gary type in time, even more clearly than the stratigraphy does at Resch Site (Fig. 22). The low percentage of petrified wood in Ellis type may result from technological reasons—it may have been more difficult to produce the typical corner notching with petrified wood than with cherts, and elsewhere local cherts seem to have been the favorite material for the manufacture of these points. A similar technological preference may apply to other types of objects at Resch Site, to account for the preferential use of petrified wood almost exclusively to produce the flat slabs, and of chert almost exclusively to make pointed pebble tools. A similar explanation is probable for the infrequent use of petrified wood to make small flake tools. Generally, however, it seems safe to assume that the earlier inhabitants of the site used petrified wood nearly as often as they did cherts, flints or quartzites in the manufacture of their tools, leaving many flakes of this material from the manufacture or resharpening of the tools, whereas later inhabitants showed an increasing preference for other materials.

We have applied this assumption as a check on the various areas at the site, divided as indicated in Table 5. The percentages of petrified wood among the total flakes are as follows: NE quadrant, 27.4; East area, 23.6; "other areas," 22.2; SE quadrant, 22; SW quadrant, 19.3; NW quadrant 18.5; North area, 17.4%. We do not have good indicators of other kinds for all of these areas, but we have noted that the NE quadrant has a higher yield of dart projectiles and chipped stone tools than others; that the East area seemed to have evidence of more occupation during earlier than later times; and that the North area showed the reverse, with more evidence of later occupation. These are ephemeral judgments but they do correlate with the flakes to indicate that, at this site, percentages of petrified wood among flakes, projectile points and most chipped stone tools are good indicators of relative age.

RADIOCARBON DETERMINATIONS

Samples of charred nut hulls and small wood charcoal were submitted to the Radiocarbon Laboratory, Balcones Research Center, University of Texas, through E. Mott Davis. The decision was made to use the charred nuts since they presumably were deposited during the aboriginal occupation. Each sample was made up of materials from several squares but identical levels, in most cases adjacent squares near the origin of grid (Fig. 20 A). Specimens from Levels 3 and 4 were combined to make an adequate sample; similarly specimens from Levels 7 and 8 were combined for an adequate sample from the lower levels. The specimens had been collected with a minimum of handling, labelled by square and depth, and carefully wrapped in foil until submission. Results were reported as follows (Radiocarbon 1968: 393-4)

Tx-482 Resch Site, Levels 3 and 4 2250±140, or 300 B.C.
Comment: date earlier than expected.

Tx-484 Resch Site, Level 5 2360±130, or 410 B.C.
Comment: earlier than anticipated from this level, which should not date before Marksville times.

Tx-481 Resch Site, Level 6 2150±100, or 200 B.C.
Comment: date consistent with occurrence of Tchefuncte sherds on this level, but by stratigraphy should be earlier than Tx-482 and Tx-484.

Tx-483 Resch Site, Level 7 and 8 1850±90, or 100 A.D.
Comment: too recent in view of dates from higher levels and indications of pre-Tchefuncte or Tchefuncte time range.

General Comment: dates are generally satisfactory in that the major occupation is on Tchefuncte and Marksville time levels, judging from trade sherds. Vagaries in distribution of sherds and of charred nut hulls from which dates were obtained are explainable by aboriginal churning of light sand midden and subsequent heavy gopher disturbance.

Other comparatively recent radiocarbon dates are pertinent to the Resch Site. Listed by periods, they are as follows:

Sand-tempered and Tchefuncte period: (1) Ambler (1967) states that a series of 27 radiocarbon dates, not published, was established from charcoal and shell from the Wallisville Reservoir near Houston,

demonstrating the introduction of sand-tempered plain pottery with Tchefuncte sherds by 150 A.D. and of incised sand-tempered pottery by 500 A.D. (2) The Jones Hill series from Polk County, Texas, included two dates from Zone II which contained abundant artifacts including plain sand-tempered pottery and Gary points, Tx-336 1410±190, or 540 A.D. and Tx-325 970±120, or 980 A.D. (Texas V, Radiocarbon 1967). (3) Panther Lake Site, Madison Parish, La., charcoal associated with Tchefuncte and Marksville ceramics, Gx-487 1770±190, or 180 A.D. (Radiocarbon 1966).

Marksville period: (1) Coral Snake Mound series, Sabine Parish, Louisiana, on Sabine River, Tx-265 1650±90, or 300 A.D. (Texas IV, Radiocarbon), Tx-442 (from base of primary mound) 1970±100, or 20 B.C., and Tx-443 (from within primary mound) 1770±80, or 180 A.D. (Texas VI, Radiocarbon Vol. 10, No. 2, 1968). (2) Ralph McKinney Mound, Caddo Parish, Louisiana, Bellevue Focus with Marksville sherds, Tx-480 2190±120, 240 B.C. (Radiocarbon Vol. 10, No. 2, 1968). (3) Canebrake site, Madison Parish, Louisiana, charcoal associated with Issaquena phase, Marksville culture, Gx-488 1390±115, or 560 A.D. (Radiocarbon Vol. 8, 1966).

Troyville (Deasonville) period: (1) Marsden site, Richland Parish, Louisiana, Gx-483 1390±85 or 560 A.D.; (2) Neely site, West Carroll Parish, Louisiana, charcoal from firepit associated with Deasonville ceramics, Gx-484 1480±85, or 470 A.D. (both from Radiocarbon, Vol. 8, 1966).

Coles Creek period: Balmoral site, Tensas Parish, Louisiana, from charcoal associated with late Coles Creek culture, Gx-485 970±85, or 980 A.D. (Radiocarbon, Vol. 8, 1966).

Caddoan period, Gibson Aspect: (1) Mounds Plantation, Log from burial with Alto ceramics, M-1446 900±100, or 1050 A.D. (Radiocarbon Vol. 8, 1966). (2) Report by Robert E. Bell, Caddoan Conference 1968, unpublished proceedings, that there is a total of 49 radiocarbon dates for the Gibson Aspect, early Caddoan, ranging from A.D. 900 to A.D. 1400.

SUMMARY AND CONCLUSIONS

The Resch site is a small occupation area of only a few acres on a minor stream in East Texas. Yet the residual artifacts show occupation during every known major culture period from Archaic to Caddoan. By direct evidence of radiocarbon dating from the site the occupation extended from 400 B.C. to 100 A.D., which spans the Tchefuncte and part of the Marksville periods of the lower Mississippi Valley, according to present concepts. The latter part of the site occupation has

materials from Troyville, Coles Creek and early Caddoan; numerous radiocarbon datings have established the latter at approximately 1000-1200 A.D. Moreover, if the Resch Site had pre-ceramic occupation in late or middle Archaic times, as seems likely from stratigraphic and technological evidences, the span of occupation at the site is somewhere between two and four thousand years.

The second point of concern is with density of occupation. All evidences, direct and inferential, are of light occupation at all times. There were no dense concentrations of ceramic or lithic objects; there is an average of only one artifact from each 9 to 10 cubic feet of midden; the yield of artifacts was no more than 1 to 2 per year of total occupation, if this had been continuous, from an excavated area of 7200 square feet or 1/6 acre. Even if there were 5 acres of equally occupied area, which is not the case, this would amount to only 30 to 60 sherds or stone objects left on the entire site per year of occupation, much less than one family would be expected to lose. There were no evidences of well-constructed houses or prepared firebeds, only 5 small pieces of daub and a like number of mud-dauber nest fragments, suggesting an absence of permanent habitations. No burials were found and there is a paucity of ornaments and ceremonial objects. The forced inference is of brief occupations by small groups, probably no more than family or extended family size, but returning time after time. The further inference is of seasonal visits to the site, never a permanent habitation, for a special purpose and by succeeding generations over centuries of time. Certain permanent natural attractions, seasonal in nature, are inferred.

This major attraction must have been a reliable food source. During most of the site occupation, these were foraging peoples, away from the seacoast or large lakes and therefore exploiters of forest economy. Even after pottery came in, horticulture or incipient agriculture was probably less important than natural food sources and evidences elsewhere indicate that only during Coles Creek-Mississippian-Caddoan times, which would be the last few hundred years of the site's occupation, did corn-bean-squash agriculture become the paramount way of life. For a foraging people, major food-gathering activities are hunting, trapping and netting of animals or birds, fishing, shellfish gathering, the digging of roots and tubers, and the collecting of seeds, fruits and nuts. Fish and shellfish could not have been the attraction at this site. Roots and tubers were never known to be a major food source in the Southeast, and opportunities for hunting or fowling were probably about the same elsewhere in the region as at this site—probably better for migratory waterfowl on the Sabine than here. But we do

have evidences that nut-gathering may have been the attraction at this site: (1) there is a variety of edible native nuts in the valley at present, including acorns, hickory nuts, walnuts, pignuts, native pecans and chinquapins (dwarf chestnuts). This variety must have been available during aboriginal times, as oak and hickory are the climax forest throughout the Southeastern uplands, replacing pines whenever conditions are favorable, and the number and variety now present suggest that this replacement along the small streams and dissected hills of this valley occurred many centuries ago. (2) The chief food residue in the midden is charred nut hulls, of hickory, walnut and pignut. (3) Pitted stones which we believe to relate to nutting (theories that they were capstones for fire drills or stone drills have no special application at this site; no drilled objects were found), are the most numerous ground stone objects at the site, distributed throughout the midden and equal in numbers to the combined total of mortars, mullers and hammerstones. Their number almost equals that of the thin blades, presumed cutting tools (63 versus 86).

The projectiles, cutting, chopping and scraping tools at Resch Site indicate that the peoples carried on their usual hunting activities during their residence at the site, as might be expected. Conditions were probably favorable for a variety of activities, as suggested in the discussion of flora and fauna of the area. But we suggest that autumnal nut-gathering, in an environment which was favorable for collateral hunting and gathering of other kinds, was the attraction which brought peoples to the same site for so long a time. The site is on one of the larger tributaries of the Sabine leading up into the rolling hills, on a favorably located high terrace immediately by the stream and at the level where the valley suddenly widens out and several smaller streams enter. If an occasional family lingered at the site, after horticulture was established, the sand soil was suitable for garden crops; it is possible that this happened in Caddoan times, as we have seen that evidences of Caddoan occupation were more widespread over the site than those of some other periods.

Who were the peoples who visited the site? Initially they were probably Archaic people, despite the finding of pottery sherds in the lowest midden levels. This is inferred because of the stratigraphic frequencies (Fig. 22) and identity of artifacts with those found in pre-pottery levels of sites like Yarbrough (Johnson 1962). Grooved axes, projectile point types Yarbrough, Yantis, Palmillas and Kent, and thick chipped stone bifacial and unifacial tools, all of which were established types by middle Archaic times, were found in the lowest midden levels or the subjacent sand. All of these peak in frequency

(Fig. 22) before Gary points and pottery sherds. Occasional visits to the site by mid-Archaic peoples, presumably as early as 2000 B.C., are suggested. The high frequency of other Archaic projectile types and tools in Level 7 indicates increased usage during late Archaic times (Table 8). The inventory of this late Archaic occupation (Table 6) corresponds to that of La Harpe Aspect.

When pottery-making peoples began to frequent the site, they were still using Archaic tool and projectile point types; they were making simple jars and bowls, usually undecorated except for occasional lip notching or infrequent incised and punctated decoration. These were flat or round bottomed, never conoidal-base vessels, and were tempered with sand, bone or clay, individually or in mixtures. As time passed, sand tempering became less frequent but these tempering traditions persisted in this valley down to the time of European contact. Deeper jars, tecomate-like constricted orifice vessels and "flowerpot"-shaped vessels were made later. These simple wares, which persisted for centuries as the basic culinary vessels, were similar to types called Bear Creek Plain of the lower Sabine and Angelina areas, if sand-tempered, and to the ware called Williams Plain, found through much of East Texas, eastern Oklahoma and into Arkansas and Louisiana, in clay and bone-tempered ceramics. The early pottery-making people of Resch site were still basically in a forest-exploiting economy of hunting and gathering, used the atlatl and dart, tipped the darts with stone points which had contracting stems and were made of local materials, cherts and petrified wood; rarely they had flints from central Texas or quartzites from Arkansas. Similar local materials were used to make a variety of crude tools and a few well-made thin blades (Table 8); a progressive preference for cherts instead of petrified wood was shown. Most of their tools apparently related to hunting

TABLE 8

Artifact types presumably associated with sequent occupations, Resch site

MIDDLE ARCHAIC

Projectile points: Yarbrough, Yantis, Palmillas, Kent and possibly Gary, Ellis.
Chipped stone tools, thin bifacial: large and small ovate, triangular bifaces.
Chipped stone tools, thick bifacial: elongate and small bifacials, pointed pebble tools.
Chipped stone tools: thick unifacial tools.
Small flake tools: small and medium flake scrapers, gravers.
Ground stone tools: grooved axes, hammerstones, possibly pitted stones.

LATE ARCHAIC—LA HARPE ASPECT

Projectile points: Gary, Wells, Desmuke, Ellis, Bulverde, Kent, Elam, Palmillas, Sinner, Trinity, Marshall; possibly Delhi, Yarbrough.

Table 8 (continued)

Chipped stone tools, thin bifacial: slab, large and small ovate, triangular and stemmed bifaces.

Chipped stone tools, thick bifacial: elongate bifaces and end tools, small bifaces, pointed pebble tools, pebble side blades and choppers, "turtleback" and irregular bifaces, chipped celts.

Chipped stone tools, thick unifacial: slab scrapers and other thick unifaces.

Small flake tools: small and medium flake scrapers, small stemmed and "thumbnail" end scrapers, gravers, drills, notched pieces.

Ground stone tools: mortars, mullers, pitted stones, hammerstones, flat stones, possibly ground hematite celt and gouge.

EARLY POTTERY AND TCHEFUNCTE PERIOD

Pottery types: sand-tempered Bear Creek Plain, clay and bone-tempered Williams Plain, Tchefuncte Plain, Tchefuncte Stamped var. *resch*, Alexander Pinched.

Projectile point types: Gary, Wells, Desmuke, Ellis, possibly Elam, Kent.

Chipped stone tools, thin bifacial: Harvey, Bronson, Bristol, flat oval, small ovate and stemmed blades.

Chipped stone tools, thick bifacial: same as for late Archaic.

Chipped stone tools, thick unifacial: same as for late Archaic.

Small flake tools: probably same as late Archaic.

Ground stone tools: probably same as late Archaic.

MARKSVILLE PERIOD

Pottery types: Bear Creek Plain, Williams Plain, Marksville Plain, Marksville Stamped, Marksville Incised variant.

Projectile point types: Gary, Ellis.

Chipped stone tools, thin bifacial: slabs, ovate bifaces, flat oval, small ovate and stemmed blades.

Chipped stone tools, thick bifacial: elongate, small and irregular bifaces, pointed pebble tools, pebble side blades, pebble choppers.

Chipped stone tools, thick unifacial: slab tools, possible gouges.

Small flake tools: small and medium flake scrapers.

Ground stone tools: mortars, pitted stones, mullers, hammerstones, flat stones.

Polished objects and exotics: small stone cups, galena, quartz, hematite disc.

TROYVILLE PERIOD

Pottery types: Williams Plain, Troyville Stamped, Churupa Punctated, Yokena Incised.

Projectile point types: Probably Gary; possibly Cliffton, Colbert.

Chipped stone tools, thin bifaces: slabs, flat oval, small ovate and stemmed biface.

Chipped stone tools, thick bifacial: elongate, small and irregular bifaces, pointed pebble tools.

Chipped stone tools, thick unifacial: possibly slab tools.

Small flake tools: small flake scrapers.

Ground stone tools: mortars, mullers, pitted stones, hammerstones.

Other objects: ocher lump?

COLES CREEK PERIOD

Pottery types: Williams Plain, Coles Creek Plain, Coles Creek Incised, Greenhouse Incised, possibly Canton Incised var. *darco*.

Projectile point types: Friley, Colbert, possibly small Gary.

Table 8 (continued)

Chipped stone tools, thin bifacial: small ovate and stemmed bifaces.
Chipped stone tools, thick bifacial: elongate, irregular and small bifaces, possibly pointed pebble tools.
Chipped stone tools, thick unifaces: possibly crude thick unifaces.
Small flake tools: small flake scrapers.
Ground stone tools: mortars, mullers, pitted stones, hammerstones.

CADDOAN PERIOD

Pottery types: Williams Plain, Smithport Plain, Davis Incised, Hickory Engraved, Pease Brushed-Incised, Broaddus Brushed, Pineland Punctated-Incised, Wilkinson Punctated, Canton Incised var. *darco*.
Projectile point types: Friley, Alba, Bonham, Catahoula, Nodena.
Chipped stone tools, thin bifacial, thick unifacial and thick bifacial all doubtful.
Small flake tools: small flake scrapers.
Ground stone tools: mortars, mullers, pitted stones, hammerstones all probable.

or grinding (seeds) or nutting; wood-working tools like adzes or gouges were rare, as were drills and gravers, and any manufacturing other than of basic tools was minimal. These people were attending to the business of food gathering and everyday living with few frills, even of ornamentation (other than red ocher) or ceremonial nature.

Into this drab basic technology ideas or items of pottery-making were introduced from the lower Mississippi Valley, presumably making their way across the coast to the Sabine River and up this stream to the site. Typical Tchefuncte pottery (Fig. 9, 10) with linear triangle stamping, drag-and-jab incising, nail pinching, ring and polypodal basal supports and extended bases, tempered with clay or sand, were brought in. The specimens available offer no clue to the site of manufacture of this ware, whether locally, on the coast, or in the lower valley, but sites of the Tchefuncte period are known on the lower Sabine.

By the next period, however, vessels with Marksville decoration appear, some of them made of pastes in the local fashion of bone tempering and use of clays with hematite impurities. Incising, stamping in bands outlined by deeply trailed lines, the use of serrated or "dentate" tools, and characteristic shapes are indicative of these wares (Fig. 10). Heavy trailed incising of large bone-tempered vessels may have started at this time or a little later. Archaic technology in manufacture of everyday tools and projectile points was unchanged, except for a more limited variety (Table 8); most of the points were Gary or Ellis types. Grinding and nutting tools increased in usage and probably exotic objects like quartz crystals and galena were brought in. The small polished stone cups were probably made at this time, if we may judge by customs elsewhere during this period; the placement

of these objects in the midden allows for this interpretation. The Coral Snake Mound, 75 miles downstream from Resch site, attests to the presence of people with Marksville culture located well up the Sabine River.

There are ephemeral evidences that the succeeding culture period in the lower Mississippi Valley, Troyville, was represented at Resch site. Sherds which were stamped with a straight bar instead of a notched tool (Fig. 10 k-n) and one sherd each of Yokena Incised and Churupa Punctated are types which are more often attributed to Troyville than to Marksville ceramic complex, although these decorative elements are present in both.

A major change now becomes evident at the site (Table 8), with the introduction of the bow and arrow and a rapid decrease in dart projectile points as well as chipped stone tools. We cannot say with certainty whether these occurred at the time of introduction of Troyville or of Coles Creek ceramics, in view of the small number of distinctive sherds and the vertical sherd displacement in the midden. We do know that the middle midden levels, 4 and 5, mark the peak of Coles Creek sherds, that arrow points are established at these levels, and that Archaic dart points and thick cutting-chopping tools are fading out. Grinding and pitted stones increase and the inference is of lessened dependence on hunting activities. Presumably agriculture had arrived, but the nature of occupation at the site, light and ostensibly sporadic, seems unchanged and the site was probably still used as a nut-gathering station.

The final occupation of the site was by early Caddoan peoples, of Alto Focus affiliation (Table 8). They frequented the site more than had the Coles Creek people and may have coexisted with them, if we may put any reliance on sherd stratigraphy. They were the best potters at the site, introducing the bottle and carinated bowl forms and, along with the Coles Creek potters, making jars with high and outward flaring rims. Decoration with a variety of techniques included the innovations of brushing and engraving. However, they maintained the bone, clay and sand tempering traditions, using them in this order of frequency. A lesser but still considerable number of vessels were plain and "flowerpot" vessels were still made. How much Archaic technology persisted in the manufacture of tools is conjectural, as the evidence at this site is unclear, but it was minimal if present. They were using the bow with arrows which were tipped with small flake points, but small Gary points may still have been used at times. There seems no doubt that the use of pitted stones and other ground stone tools was still in vogue, that nuts were still roasted, and there

is no evidence that their usage of the site differed from that of the former peoples.

The early Caddoan occupation of the site terminated its aboriginal occupation; thereafter it remained deserted until European settlement. Occupation of the valley continued, however, and the occupation now seems to have been in permanent small settlements by Caddoan peoples, with mound-building and burials in mounds and cemeteries. In succession, the Old Brown Place, the two sites on Jones Ranch, Resch Burial Mound, Susie Slade site and Henry Brown sites 1 and 2 show shifting but continuous occupation during middle and late Caddoan times. They shifted in use of the valley from seasonal visits to continuous occupation in small settlements but their pottery shows continuity with the Resch site in the use of bone and grit tempering in the pastes, hence we infer no advent of new peoples. Fully developed agriculture is to be assumed, with cessation of the annual round.

In conclusion, trends of significance which we infer at this site are: (1) usage of the site over thousands of years as a specialized area in the forest-exploiting economy, for the primary purpose of gathering nuts; (2) the persistence of Archaic tool and projectile point typology, and presumably of basic food-gathering techniques, for centuries after introduction of pottery; (3) the development of an areal ceramic tradition, beginning before the time of Christ, with simple vessel forms, flat or rounded bases, largely plain but a small amount decorated, made of paste tempered with sand, bone and clay, which tradition lasted long after introduction of more sophisticated ceramics; (4) introduction in sequence of the ceramic complexes of the lower Mississippi Valley, from Tchefuncte through Coles Creek, into this area of east Texas, presumably via coastal spread and up the Sabine River; (5) eventual replacement of Archaic traditions and technology by the bow and arrow, agriculture and small tool technology and (6) desertion of the site after early Caddoan times, as permanent settlements elsewhere in the valley with mound building, ceremonial activities and cemetery burial, centered around an agricultural economy replaced the seasonal round and dependence on forest exploitation.

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Rattlesnake Shelter: 41CX29

Aaron D. Riggs, Jr.

ABSTRACT

The author excavated a small shelter within the bank of an intermittent stream in northwestern Crockett County in the summer of 1968. Burned rocks, ash, flakes, scrapers, and a biface foliate were found. The author was unable to assign the artifact assemblage to a particular time period.

INTRODUCTION

The author is indebted to Mr. and Mrs. J. M. Barkes of Midland for the contour map. I am happy to thank the following people who made the excavation possible: Mr. Arnold E. Sommer of Midland for his companionship and assistance during the excavation; the O. W. Parker family for permission to excavate; and Mr. Burton Lanehart of Iraan for his interest and his maintenance of transportation equipment. Mr. C. S. Parker of Lubbock brought the site to the attention of the author. Dr. Joel L. Shiner, SMU Anthropology Research Center, offered encouragement in the preparation of the report.

In 1966, the Texas Archeological Society held its annual summer field school at the Dunlap Site, twenty-two miles southeast of Rattlesnake Shelter. A badly disturbed rockshelter, two burned rock middens in the draw below the shelter, and two other nearby shelters were tested. The results of the excavation have not been published.

Field work under the supervision of Dessamae Lorrain of Southern Methodist University was conducted at the Meadows Shelter, Walters Site, Chimney Shelter, and Rivas Site in November, 1966, and at the Sotol Site in May and June, 1967 (Lorrain, 1968:5).

The excavation of Rattlesnake Shelter was the fifth in a series of systematic tests conducted on the O. W. Parker Ranch in northwestern Crockett County, Texas. Previous archeological research reported sandals, knotted fibers, fire hearth sticks, scrapers, and projectile points from a shelter, Site 41CX10 (Riggs, 1968A:41). A midden excavation recovered Langtry projectile points and other artifacts at Site 41CX11 (Riggs, 1968B:76-82). An excavation of a ring midden which yielded an Ensor projectile point was discussed by Sommer at the Fourth Regional Archeological Symposium for Southeastern New Mexico and Western Texas. Riggs (1968C:2-9) reports a variety of projectile point types (including Plainview, Langtry, Pandale, Almagre, Castroville, Ensor, Frio, Perdiz, Bonham, and Toyah) from an apparently mixed context at Shelter 41CX12.

PHYSICAL SETTING

Northwestern Crockett County is desert plateau country modified by the action of the Pecos River and its tributaries in downcutting valleys through the resistant caprock of the Edwards Plateau (Lorrain, 1968:6).

The climate is mild. The January low average temperature is 38 degrees F., the July average high temperature is 95 degrees F. (Texas Almanac, 1966-67:117). The rainfall average at Ozona is 14.90 inches per year. The crisp, dry, warm days are followed by cool nights.

Plant life characteristic of deserts is common here. Vegetation on the plateau tops is dominated by sotol, lechuguilla, and significant amounts of sacahuiste, guajillo, and various grasses. The base of the caprock has hackberry, buckeye, and catclaw in dense growth where greater moisture is present. In the valley, the more common vegetation includes creosote bush, mesquite, screwbean, and cacti. Juniper and Texas mountain laurel provided shade at the edge of the shelter.

The fauna is diverse. Mammals commonly found in the area today include the white-tail deer, javelina, ringtail, skunk, fox, jack rabbit, ground squirrel, cottontail, and several species of small rodents. Numerous species of birds and reptiles are present in the area.

The present economy depends almost entirely upon the oil industry and on sheep and goat ranching.

RATTLESNAKE SHELTER

Rattlesnake Shelter, named for a former occupant, is a small, shallow rockshelter. It is near the head of a small tributary canyon of an intermittent stream which enters the Pecos River about three miles to the west. Maximum width is 16.0 meters, maximum depth is 2.9 meters, and maximum height of the ceiling is 1.9 meters. The western portion average ceiling height is .9 meter, considerably reduced by a projecting ledge. There was a small burned rock talus in front of the eastern portion of the shelter. The stream bank at the center of the shelter was bare sloping limestone bedrock. The ceiling was blackened from smoke. The floor at the center of the shelter is 1.4 meters above the present stream bed. Figure 2 is a cross-section of the shelter.

TECHNIQUE

A site survey report form was recorded with the Texas Archeological Research Laboratory, Austin, and assigned the Site Number 41CX29 as a means of identification.

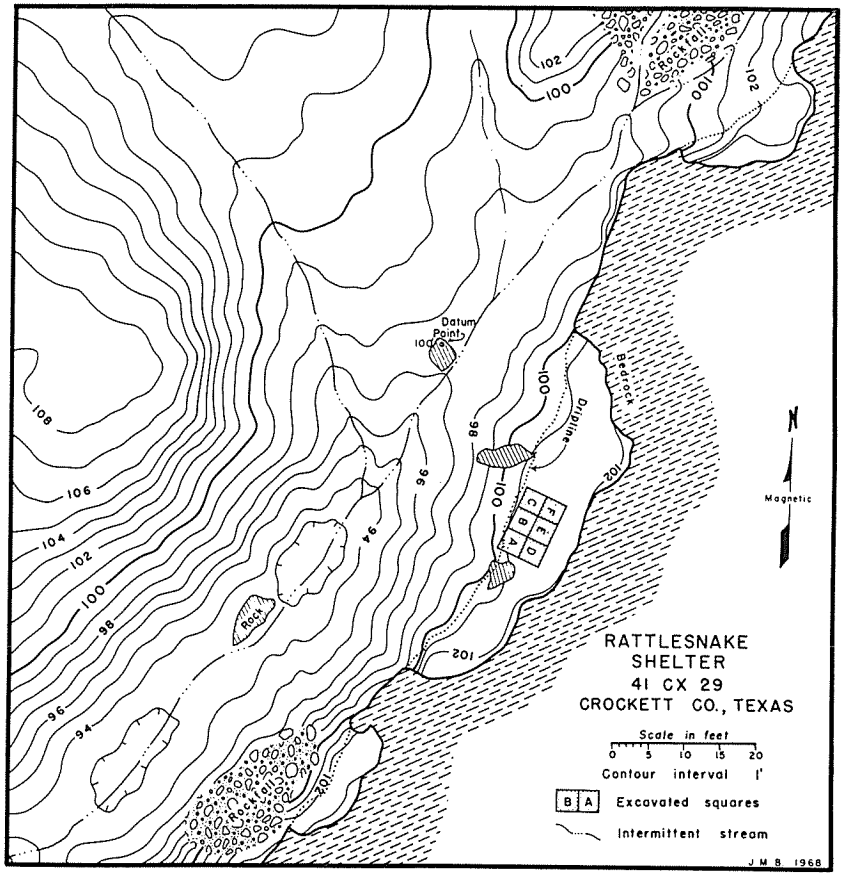

FIG. 1. Contour map of Rattlesnake shelter.

Photographs were taken of the site from several directions before and during the excavation.

A bench mark was established on the terrace across the intermittent stream from the shelter. A contour map (Figure 1) was prepared with the aid of a plane table and telescopic alidade. A grid system was established that would provide six squares one meter by one meter to test the fill in the eastern portion of the shelter. The western portion had a marked decrease in ceiling height and was not tested.

Excavation was conducted by picking the rocks free, removing larger rocks by hand, and passing the remaining fill over a one-quarter inch mesh wire screen.

Records were kept by square. The fill containing artifacts was less than twenty centimeters in thickness and was thoroughly mixed as

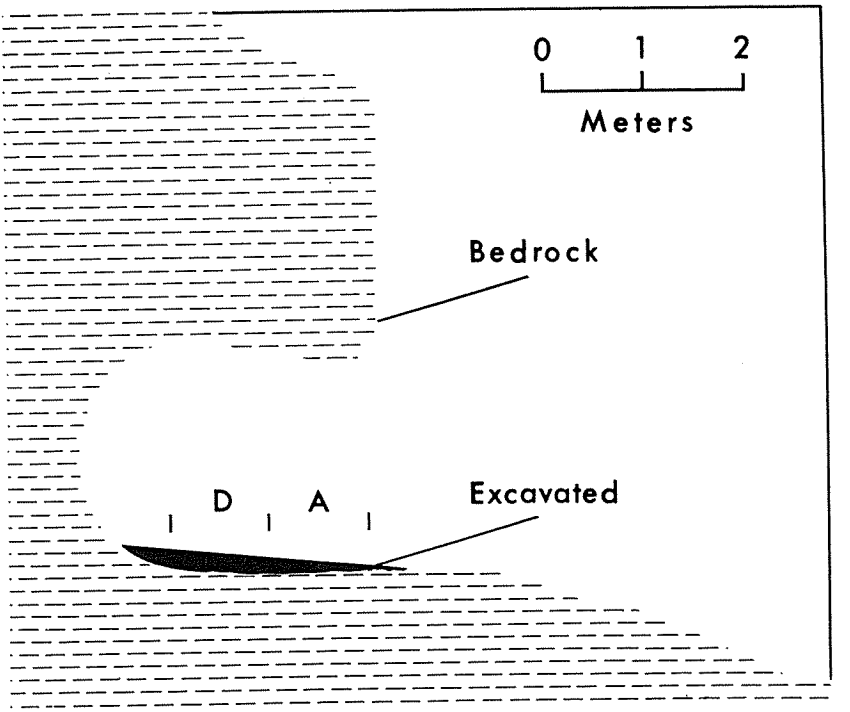

FIG. 2. Profile of Rattlesnake shelter.

attested to by the presence of fresh goat and sheep pellets from top to bottom of the fill. Squares were assigned alphabetical letters and plotted on the contour map.

Artifacts were washed and labeled by site number and assigned catalog numbers.

The bedrock floor was brushed clean, checked for usage, and photographed.

THE FILL

Towards the rear of the shelter there were two layers making up the fill. Lying on the bedrock with no cultural debris was a 20 cm. layer of light limestone dust and spalls mixed with goat and sheep dung. This layer was topped by a thin layer of compacted goat and sheep dung. Near the back line of the outward squares the two zones or layers graded into one layer of dark limestone dust and spalls, goat and sheep dung, ash, burned limestone fragments, and lithic material. Figure 3 is a profile photograph of the east wall of squares A and D.

FIG. 3. Profile of east wall.

ARTIFACTS

Six squares of one meter by one meter were excavated. Thirteen specimens of lithic material were recovered from Square A, 33 from square B, 19 from square C and 3 from square D. Squares E and F were sterile. Artifacts are combined for description due to the limited sample and lack of stratigraphic differences in provenience.

Although the specimens were not measured, their sizes can be ascertained from the illustrations.

In addition to the 68 lithic specimens, the excavation uncovered one mussel shell and one small fragment of a long bone of a small animal. The bright red berries of the Texas mountain laurel were scattered throughout the shelter, most likely, the results of rodent action.

CHIPS (11 specimens; Figure 4, A).

Provenience: A (1), B (5), C (5).

These represent flaking debris of local brown and gray chert. Four have some of the cortex layer remaining. A chip is too small to be made into a tool.

FLAKES (22 specimens; Figure 4, B).

Provenience: A (4), B (11), C (5), D (2).

These appear to be unused remnants of flaking debris of a size suitable for making into tools. Twelve have some of the cortex layer remaining. They vary in size and shape, most are relatively broad and thin.

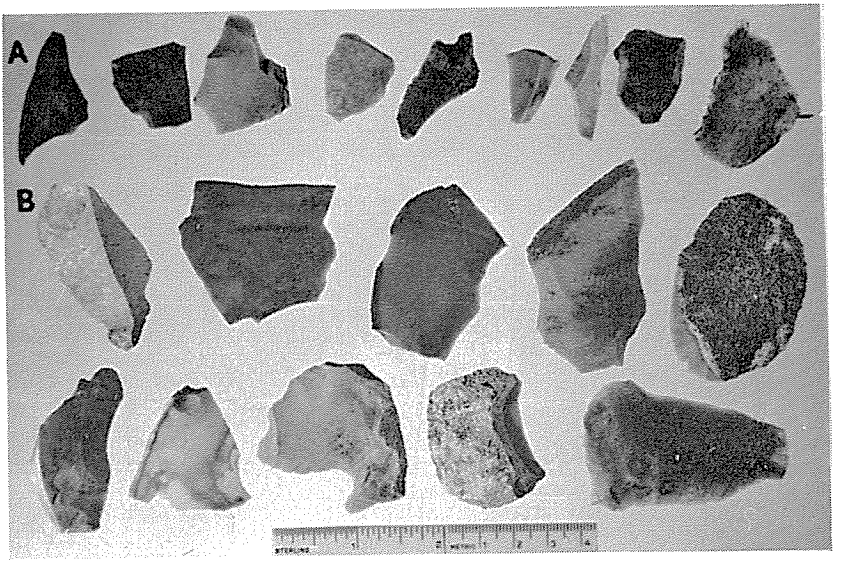

FIG. 4. a, Chips; b, Flaking debris.

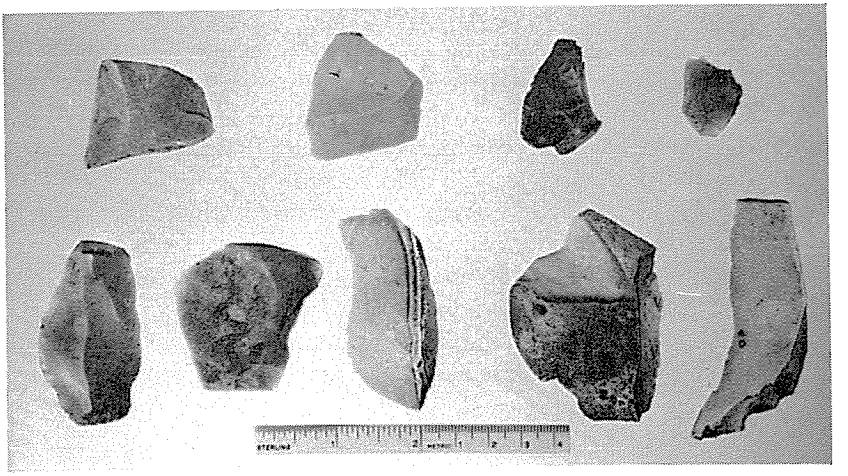

FIG. 5. Use retouched flakes.

The material is local chert. Representative specimens are illustrated.

USE RETOUCHED FLAKES (9 specimens; Figure 5).

Provenience: A (2), B (6), C (1).

These are of the same size and shape as the unused remnants of flaking debris. They differ only in that one or more lateral edges have

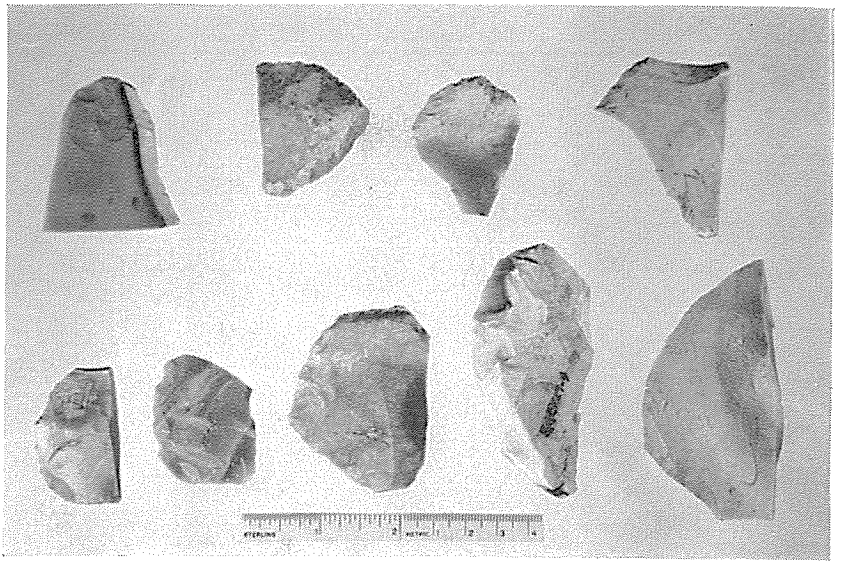

FIG. 6. Retouched flakes.

been dulled from use. The marginal use retouch (fine flaking along the edge) is uneven. Three have some cortex layer remaining.

RETOUCHED FLAKES (9 specimens: Figure 6).

Provenience: A (2), B (3), C (3), D (1).

These are flakes with obverse retouch on one or more lateral edges to form straight or convex scraping bits. Three are on cortex flakes. One has some inverse retouch, but, not on the scraping edge.

OVERSHOT FLAKES (2 specimens; Figure 7, A and B).

Provenience: C (2).

An overshot flake is one that turns into the core instead of going parallel to a face. The result is that the flake cuts the biface or core into two parts. One (Figure 7, A) may be a ruined biface. The other (Figure 7, B) appears to be a thinning flake struck from a bifacially worked specimen.

RETOUCHED BLADES (3 specimens; Figure 7, C-E).

Provenience: A (1), B (1), C (1).

Three relatively long and narrow, thick, cortex retouched blades were uncovered. Each has a lateral edge obversely retouched to form a convex scraping bit. Two (Figure 7, D and E) have a wide flat edge composed of a long narrow flake scar opposite the retouched edge. One of these (E) has basal truncation.

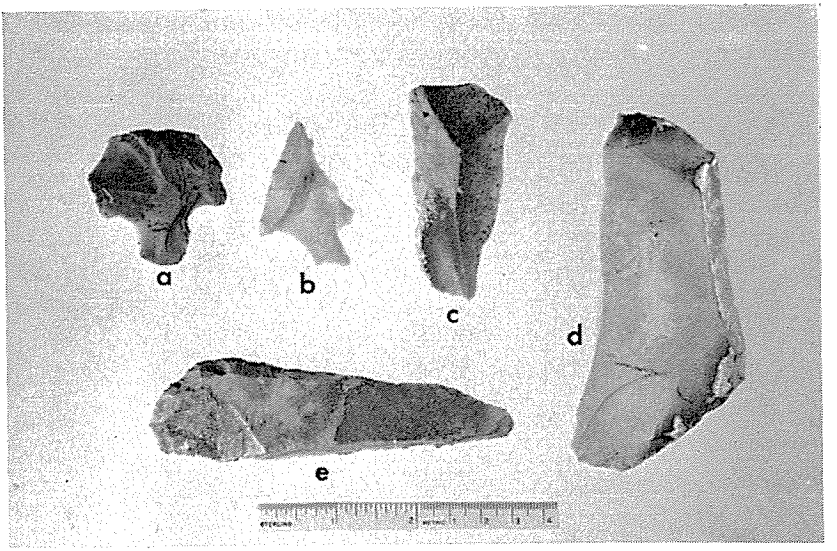

FIG. 7. a, b Overshot flakes; c-e Retouched blades.

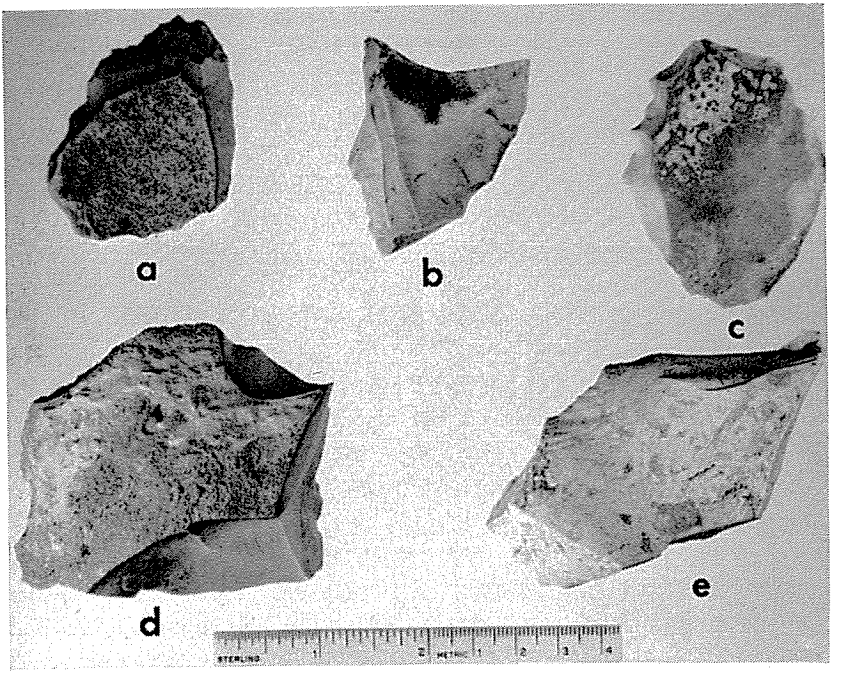

FIG. 8. a-c, Denticulates; d, e Notches.

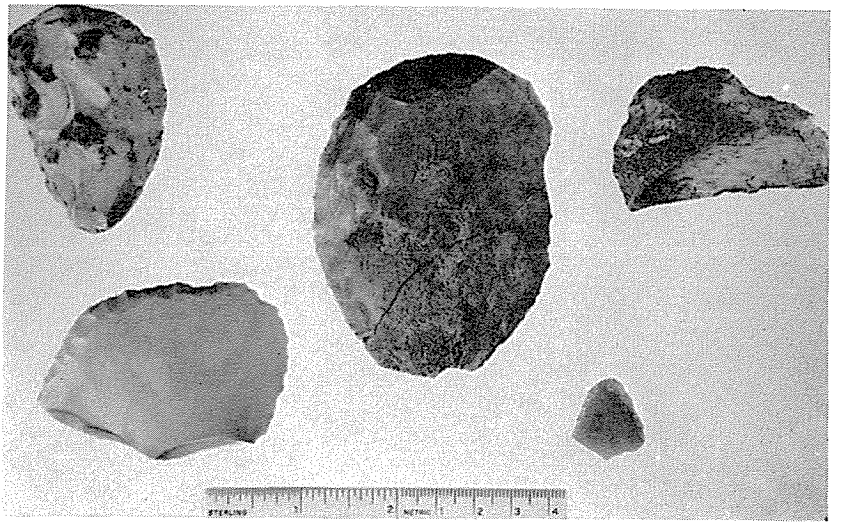

FIG. 9. Scrapers.

DENTICULATES (3 specimens; Figure 8, A-C).
Provenience: A (1), B (2).

These have coarsely toothed bits. Two (Figure 8, A and B) are made by obverse unifacial retouch. One (Figure 8, C) has alternating retouch.

NOTCHES (2 specimens; Figure 8, D and E).
Provenience: B (2).

These are small concave scrapers made by steep obverse retouch on large flakes. Each has a flat edge opposite the scraping edge. They are of a size for scraping arrow or dart shafts. One specimen contains some of the cortex.

MULTIPLE EDGE SCRAPER (5 specimens; Figure 9).
Provenience: A (1), B (2), C (2).

All have a convex bit made by striking the edge of the ventral face and removing flakes from the dorsal face. One is on a cortex flake. All have fine flaking along the lateral edges. One is produced from a large chip.

GRAVER (1 specimen; Figure 10, A).
Provenience: A (1).

This is a flake scraper with small finely retouched graver points suitable for engraving or incising. The graver points were formed by obverse retouching a chance point formed by an edge fracture.

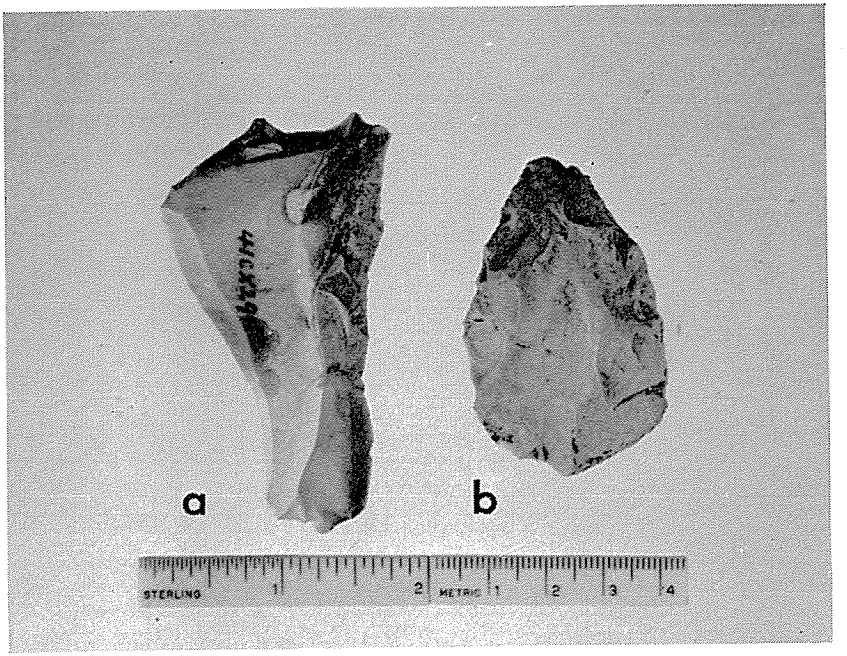

FIG. 10. a, Graver; b, Biface foliate.

BIFACE FOLIATE (1 specimen; Figure 10, B).
Provenience: B (1).
This is a leaf-shaped biface having a convex base. It may have served as a knife or may be an unfinished tool.

DISCUSSION

Previous archeological investigations on the O. W. Parker Ranch had produced a mixture of cultural material from the lower Pecos River area with that from central Texas and a smaller amount from the South Plains.

Rattlesnake Shelter, indicating a limited amount of use, offered the possibility of being an unmixed cultural occupation. This may or may not have been the case.

Few chronological changes have been reported for chipped stone artifacts other than projectile points. It is not because the other artifacts are considered unimportant, but, simply because of the limited available information about them. Each archeologist has classified scrapers and knives somewhat differently. The terms used in this report follow that of SMU as the artifacts were sent there for analysis.

None of the lithic material excavated can serve, at least at the present time, to identify a culture or to assign the artifact assemblage to a particular time period.

Excavation indicates a limited amount of occupation in the east end of the shelter near the drip line. Nearly all of the occupational debris was recovered from the front row of squares. This could be the result of periodic cleaning of the shelter either by the occupants or by stream flooding.

The lack of perishables, either animal or vegetal remains, is suggestive of periodic flooding of the shelter by the adjacent stream. This periodic flooding, or the fear of its happening, could account for a limited use of the shelter.

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Midland, Texas

Two Prehistoric Cemetery Sites in the Lower Rio Grande Valley of Texas

ABSTRACT

Under this heading, data from two prehistoric cemetery sites in Cameron and Hidalgo Counties, Texas, are presented. The papers were written separately. Part I deals with salvage archeology conducted at the Floyd Morris Site (41 CF 2) in Cameron County; this paper was authored by Michael B. Collins, Thomas Roy Hester and Frank A. Weir. The second paper reports additional materials recovered from the Ayala Site (41 HG 1) in Hidalgo County; an earlier report on this site was published by Campbell and Frizzell (1949), while the present paper (Part II) was prepared by Thomas Roy Hester and Frederick Ruecking, Jr. Part III was written by Hester; it discusses the Floyd Morris and Ayala Sites in relation to the known prehistoric burial practices along the lower Texas coast and in the Rio Grande Valley.

PART I:
THE FLOYD MORRIS SITE
(41 CF 2)
A PREHISTORIC CEMETERY SITE
IN CAMERON COUNTY, TEXAS

MICHAEL B. COLLINS, THOMAS ROY HESTER, AND FRANK A. WEIR

INTRODUCTION AND SITE DESCRIPTION

In June of 1966, while leveling his field to improve irrigation, Mr. Floyd A. Morris of Harlingen exposed several human bones, and recognizing their possible importance, notified Mr. Bob Dickson of KGBT-TV, Harlingen. Mr. Dickson informed the Department of Anthropology, The University of Texas, of the finds, and a crew of three students (Frank A. Weir, Gentry Steele, and Michael B. Collins) was dispatched under the auspices of the Texas Archeological Research Laboratory to salvage a portion of the site. Excavations were conducted from June 8 through June 12, during which time 11 burials were salvaged, 7 highly disturbed burials were investigated, and 7 miscellaneous features were recorded.

It is the feeling of the authors that in southern Texas the oversimplified scheme which proposes an Archaic stage characterized by the use of dart points followed by a Neo-American stage characterized by the use of arrowpoints is in need of revision. However, it would be inappropriate to initiate such revision in the present descriptive paper, and therefore we have adhered to the cultural definitions for southern Texas as presented by Suhm and others (1954) and MacNeish (1958).

Cemeteries seem to be an important element in certain prehistoric cultures of the Texas coast and the lower Rio Grande Valley. Some of these sites include Ayala (Campbell and Frizzell, 1959; Hester and Ruecking, this issue), Caplen (Campbell, 1957), Oso (A. T. Jackson, field notes), Odem (Jack Hughes, field notes), Jamaica Beach (excavated by the Houston Museum of Natural Science), Dietz (Hester, 1969a), and one on Matagorda Island (Martin, 1929). Unfortunately, most of these sites had been badly disturbed before subsequent investigation and research could be carried out by professional archeologists. Additionally, few of these sites have produced much archeological data. Only through the investigation of several additional such sites will it eventually be possible to place this burial practice into some cultural perspective. As this paper indicates, many of the preferred locations of cemeteries are the slight elevations that will be destroyed by future land-leveling. We feel that there is a need for a systematic archeological survey and testing program in those areas of the lower Rio Grande Valley where extensive irrigation improvements are planned.

The Floyd Morris site is located 2 miles north of Harlingen (in Cameron County) on the Briggs-Coleman tract. It occupies a portion of a low, sandy-clay ridge about one-fourth mile long (north-south) and 500 feet wide. Originally, the ridge extended perhaps six feet above the surrounding land surface, but at present, it has been lowered about three or three and one-half feet. An elongate, shallow depression extends from southeast of the ridge past the south end and along the east side; evidently this depression is a remnant of an old stream meander and the ridge is an associated dune. At the present time, the ridge is under cultivation and an irrigation canal follows the course of the depression. A north-south property line at the top of the ridge divides it into two halves; only the eastern half was being leveled and evidence of aboriginal use of the locality was exposed in the lowered area for a distance of about 600 feet north-south and from 100 to 300 east-west.

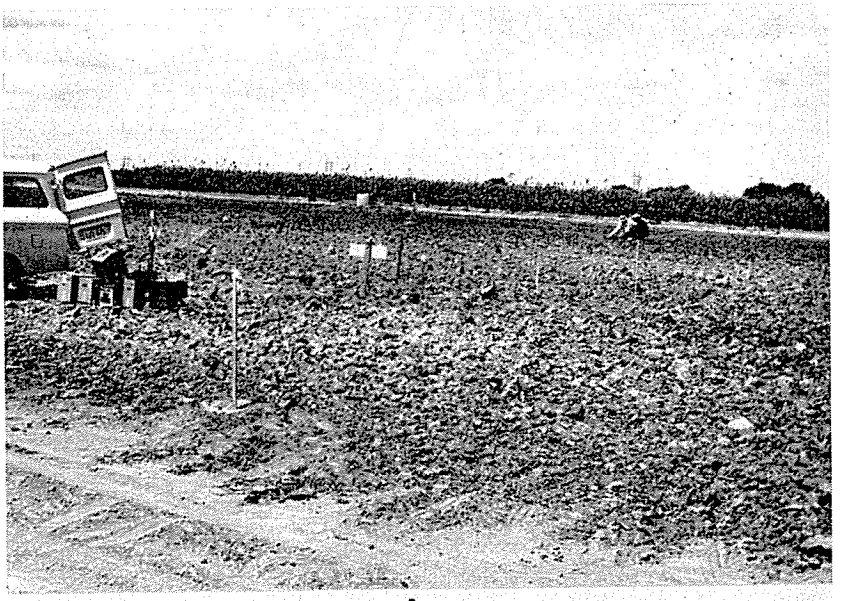
In order to level the eastern portion of the ridge, Mr. Morris was removing fill from the higher (west) side of his field and spreading some of it over the lower (east) side and disposing of the remainder in a depression west of the ridge. In the west half of the field, where more fill had been removed, the exposed soil consisted of dark-colored clay with a limited amount of sand, but in the east half of the field, the exposed deposits were light-colored sandy clays. No bedding was evident in the excavation walls, suggesting that the material was of aeolian derivation.

The occupational features, particularly the burials, were completely disturbed in the west half of the field due to the removal of more overburden and only one burial on the east was entirely below the level of the disturbance. The machinery used in leveling included a "chisel" and a "buggy." The chisel was the ground-breaking device, and consisted of several narrow, chisel-like teeth spaced about one foot apart. The buggy was a large scoop which removed the broken top soil. The field was broken by two right-angle passes with the chisel which resulted in severe disturbance of those features in the plow zone, but, as can be seen in Figure 1 b, small undisturbed sections of the features remained in blocks of soil outside the path of the blades. From these undisturbed blocks, we were able to determine orientation of the skeletons in several of the disturbed burials.

Certain of the recovered human bones exhibited various degrees of mineralization and encrustation with calcium carbonate. Although it is possible that irrigation has contributed to the mineralization and precipitation of the encrustation, field observations led to the formulation of an hypothesis that the bones with the greater amount of adhering calcium carbonate were of greater age. The field observations were as follows: (1) within a given burial, each bone exhibited about the same amount of mineralization and encrustation; (2) horizontal location within the site seemed to have no correlation with mineralization and encrustation; and, (3) one feature, Burial 11, consisted of the well-preserved, non-mineralized, skeletons of three individuals buried at the same time; the interment of these individuals caused the disturbance of a previous burial, the bones of which were heavily mineralized and encrusted. If this hypothesis is tenable, then perhaps a considerable period of time is represented by the recovered burials, and intermittent use of the cemetery is implied. It is conceivable that an elevation such as the ridge at the Floyd Morris site was a preferred burial area that maintained its desirability over a long period of time.

FEATURES

The features are grouped below into three categories: burials, disturbed burials, and miscellaneous features. Burials are those accumulations of human bone for which at least some burial data could be recorded. Disturbed burials are those accumulations of human bone that seem to represent burials but from which no burial data could be derived. Miscellaneous features include accumulations of animal bone, a possible midden, and other evidences of occupation. The



A

B

FIG. 1. A, general view (to the southwest) of the Floyd Morris Site. The planted field in the background has not been lowered to the extent that the broken ground in the foreground has. The nature of the ground after breaking and prior to removal can be seen in the foreground. B, Burial 7, looking west. Note furrows left by chisel; scale is one foot.

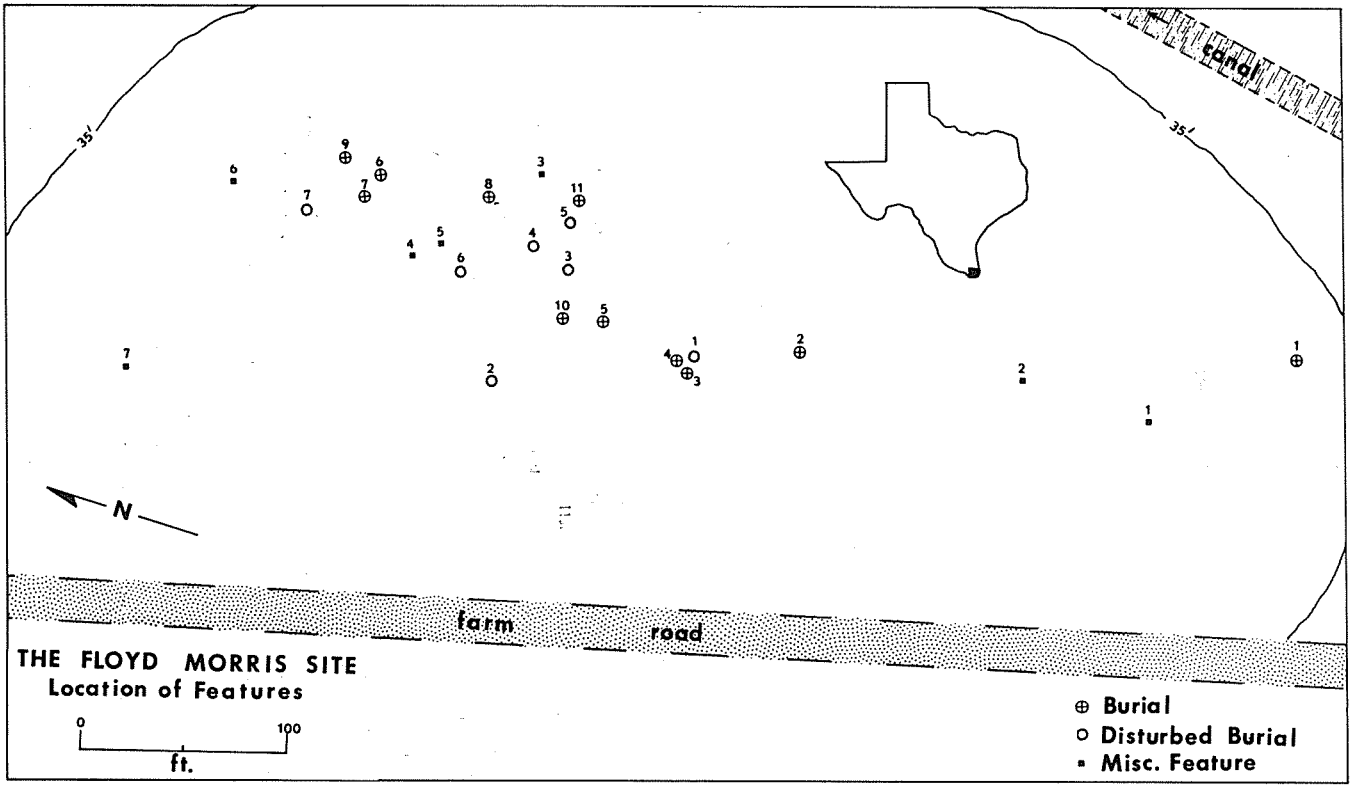


FIG. 2. Plan of the Floyd Morris Site, showing the location of features. Burials, disturbed burials, and miscellaneous features are indicated. The 35′ (above sea level) contour line is shown.

recovered skeletal material was badly fragmented and otherwise poorly preserved. For this reason, few osteometric data were obtained, and only general osteological observations are reported for each burial. See Fig. 3 for sketches of burial positions and Fig. 2 for location of features within the site.

THE BURIALS

BURIAL 1. This badly disturbed feature consisted of a fragmentary right femur shaft, a humerus shaft, and skull fragments, plus a few miscellaneous bone fragments. Those bones found in place were in a light-colored sandy clay and suggested that the skeleton had been flexed (the humerus was near the femur), but the exact position was not determined. These bones were moderately mineralized and encrusted.

BURIAL 2. This fairly complete burial (Fig. 3 a) occurred in light-colored sandy-clay soil. Dark-colored soil immediately surrounded the bones, and delineated the lower portion of the burial pit. Evidently, the burial pit was oval and measured about 1.1 feet, east to west, at the elevation of the bones. The skeleton was complete except for the skull and fragments of the long bones which were removed by the chisel. The body had been tightly flexed and rested on its right side with the head to the north; the left arm was folded around the left leg such that the humerus was above the femur and tibia and the radius and ulna were beneath the leg bones, that is, between the legs. Skull fragments and small unidentified bone fragments were found in the loose soil above the skeleton. None of the bones in Burial 2 were mineralized or coated with calcium carbonate.

The individual was an adolescent, approximately 15 years old at the time of death, no deciduous teeth are present. Sex was not determined, however, the bones appear to be moderately robust for an individual of age 15.

BURIAL 3. This multiple grave contained 2 adult individuals in a fair state of preservation (Fig. 3 b). Individual 3 A lay east of and slightly beneath individual 3 B. Both were very tightly flexed on their left sides with pelves to the north and skulls to the south. The skull of 3 A was removed, and that of 3 B was severely damaged, by the machinery. The pelvis of each individual was at a slightly lower elevation than the skull; evidently, the bodies originally rested at a slight inclination. The soil in the vicinity of Burial 3 was dark clay whereas that immediately surrounding the bones was darker, almost black. These bones were not mineralized and lacked mineral encrustation. There were no associated artifacts. Due to accidental mixture of

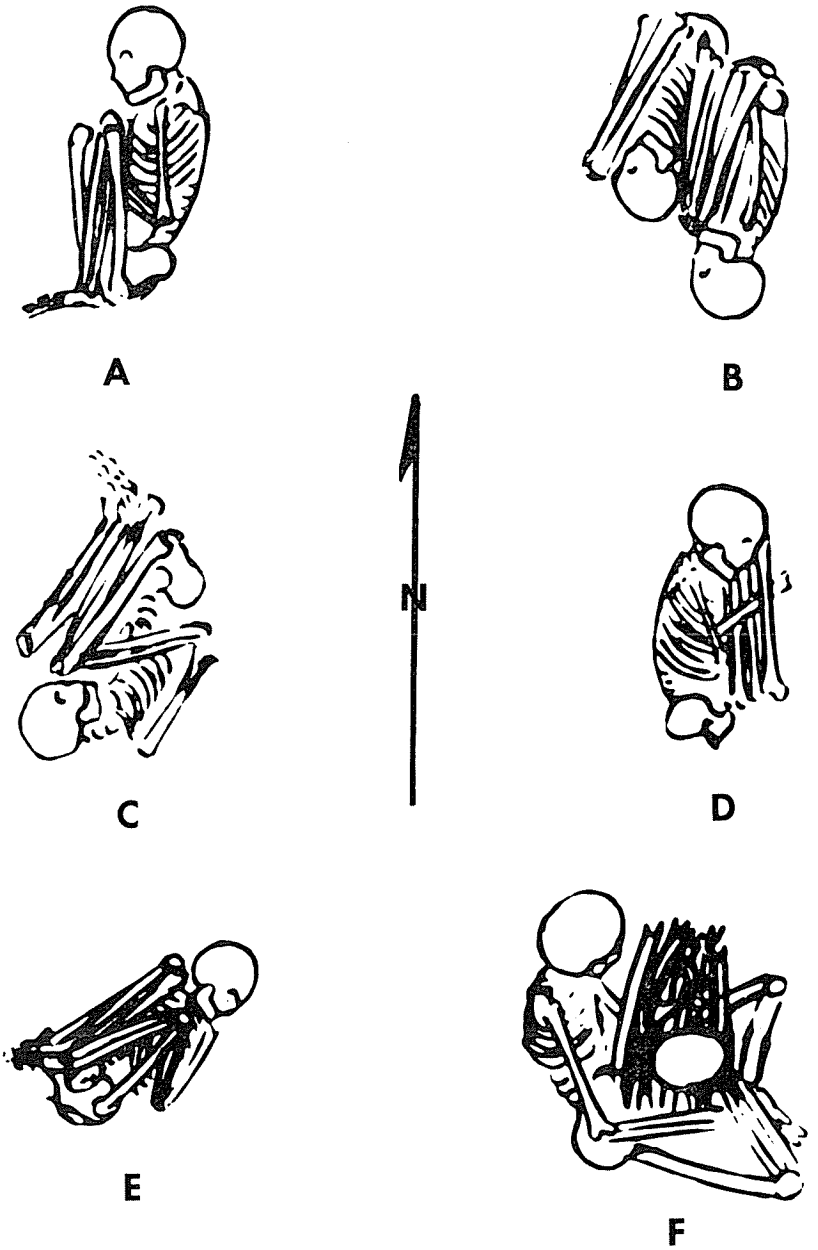


FIG. 3. Various burial positions at the Floyd Morris Site. a, Burial 2; b, Burial 3; c, Burial 6; d, Burial 5; e, Burial 8; f, Burial 11.

the bones in the laboratory, individuals 3 A and 3 B were not kept separate, however, it was possible to determine that each was an adult and that one was male and one was probably female. The posterior, distal right humerus shaft of one individual exhibits an area of cortical thickening approximately 7 cm. in length.

BURIAL 4. This poorly preserved skeleton of an infant lay 3 feet north of Burial 3 at approximately the same elevation. It was 2 feet west of Disturbed Burial 1 and at a slightly lower elevation. Fill was dark clay. Only shaft and rib fragments were present and these were in such bad condition that burial orientation and details about age (other than infancy) and other characteristics of the individual could not be determined. The bones lacked mineralization and encrustation. A complex artifact or artifacts accompanied these bones. Present were perforated canine teeth and *Oliva* tinklers in a semicircular pattern suggestive of a necklace (see Fig. 4). These objects were on top of and between the bones as though they had been placed on top of the body at the time of burial.

BURIAL 5. This poorly preserved burial (Fig. 3 d) occurred in light-colored, clayey sand. A slightly darker fill around the bones in an area 2.0 feet north-south by 1.5 feet east-west apparently represented the lower portion of the burial pit. The skeleton rested on its left side and was very tightly flexed with the skull to the north, facing east. The bones were completely crushed by the land-leveling equipment, and skeletal data are lacking. There were no associated objects.

BURIAL 6. This burial (Fig. 3 c) occurred in light-colored clayey sand, no burial pit visible. The skeleton was tightly flexed and rested on its back but was twisted slightly to the left, giving the impression of having been placed on its left side. The head was to the south and faced west. There were no associated artifacts. The heavily mineralized bones were badly disturbed by the chisel and no restoration was possible. The individual was an adult, cranial synostosis in a stage indicating an age of 20 years at death; robusticity is suggestive of a male, but determination was impossible. The partially restored calvaria yielded a maximum length measurement of 181 mm. and a maximum width of 132 mm., (cranial index, 72.1—dolichocranic). Pathology includes cortical thickening of the anterior, distal left tibia shaft and of the anterior distal right tibia shaft as well as near the midpoint of the medial right tibia shaft.

BURIAL 7. This badly damaged burial (see Fig. 2 b) occurred in light-colored clayey sand; no burial pit was visible. The skeleton was flexed with the head to the north and appeared to be resting on its right side. The bones were heavily mineralized and encrusted with calcium

FIG. 4. Burial 4, with associated tinkler and perforated canine teeth. North is to the right.

carbonate. Two tubular bone beads were recovered from soil matrix around the bones, and, although their exact position in the grave remains unknown, they are considered valid associations. The individual was an adult and appeared to be a male.

BURIAL 8. This burial (Fig. 3 e) occurred in light-colored clayey sand just beneath the depth reached by the chisel blades; however, the skull was crushed and the long bones slightly displaced by the weight of tractors. The skeleton, that of an adult female, was tightly flexed on its back and partly twisted to the right. The skull was to the east and was facing up. There were no grave associations.

BURIAL 9. This badly preserved burial occurred in light-colored, clayey sand. The bones were heavily coated with calcium carbonate and mineralized. The skeleton appeared to have been flexed and seems to be that of a young adult, probably female.

BURIAL 10. This accumulation of very fragmented human bone was almost entirely removed from plow-loosened soil, however, a few fragments remained in undisturbed light-colored fill. The bones were badly fragmented and scattered, precluding observations on burial form and osteological determination of the individual's characteristics. The bones were heavily mineralized and encrusted with calcium carbonate. Two large disc beads (one of stone and one of shell) were found with the small bone fragments that lay immediately above the *in situ* fragments and probably were associated with the skeleton.

BURIAL 11. This complex feature consisted of two interments at the same location (Figs. 3 f, 5). The first interment was that of one individual (designated 11 A) and the second interment, which caused the disturbance of the first, involved three individuals (11 B, 11 C, and 11 D). The skeletal remains of individual 11 A were highly mineralized and consisted of a frontal bone and a few fragmentary post-cranial bones, most of which were disinterred by the land leveling operation. The cranial fragment and some of the post-cranial fragments were found in the undisturbed soil between chisel marks, but were observed to be out of proper anatomical relationship. In removing fill from around these fragments in an attempt to determine something more about 11 A, the skull of individual 11 B was encountered at a depth of 0.5 feet below the deepest penetration of the chisel blades. The bones of individual 11 B were not mineralized or encrusted. As this constituted the only opportunity to investigate a burial which had escaped destruction by the plow, an attempt was made to locate the burial pit by scraping a level surface at the base of the plow zone and another at the level of the skull of 11 B. Neither of these scraped surfaces revealed any change in the homogeneous, light-colored clayey sand which might be construed as indicating the burial pit. However, the knee joints of individual 11 B were located and found to extend up to the plow zone near the *in situ* bones of 11 A. The spatial relationship of the bones of individual 11 A to those of 11 B, the greater amount of mineralization and encrustation of the bones of 11 A, and the fact that 11 A seemed to have been disturbed prior to the land-leveling, would seem best to be explained by the proposal that interment of individual 11 B postdated that of 11 A and that it caused the disturbance of 11 A.

Also interred with individual 11 B were a bundle burial and either

FIG. 5. Burial 11. Skull of individual 11 B is at top of picture, bundle burial 11 C can be seen resting on the abdominal region of 11 B, and three skull fragments of individual 11 A are at the bottom of the picture near the right knee of 11 B.

a newborn child or a fetus. Individual 11 B (a young female) rested on the back with the shoulders and upper back slightly elevated and

with the legs loosely flexed and spread apart. The skull was to the southwest and was inclined forward and turned to the left, facing west; the arms were placed along the sides of the body and were slightly flexed at the elbows such that the hands rested between the thighs and above the pelvis.

Resting on the abdominal region and between the arms of 11 B were the closely spaced, disarticulated bones of an adult male (11 C). Present were the calva, severed right and left distal radii, left clavicle, several rib fragments, and shafts of the following bones: right and left femora, right and left humeri, right and left fibulae, right and left ulnae, and left and right radii severed at the distal ends (it is not certain whether these radii shafts belong with the two distal radii, but probably they do). All of these bones were coated with a dark substance and a red pigment. The long bones of 11 C were arranged in a general east-west pattern and rested directly on the ribs of 11 B. The calva and mandible rested on the long bones. Numerous shell and bone beads rested among the bones of this bundle burial.

Beneath the skull of 11 C and between the innominates of 11 B were the remains of either a newborn or a fetus (11 D). The position of the bones did not offer a solution to the problem of whether or not the individual was unborn—the body may have been inter-uterine or laid on the abdomen of 11 B at the time of burial and settled between the innominates (see below).

Individual 11 A, represented by a fragmentary frontal bone, a distal humerus shaft, rib fragments, and miscellaneous shaft fragments, appears to have been an adult; robusticity of certain long bone fragments and the massiveness of the supra-orbital torus indicates the male sex. The distal humerus shaft is slightly smaller than would be expected from the apparent robusticity of the other bones, and is possibly of an additional individual, although it and the other bones of 11 A are all equally heavily mineralized and coated with calcium carbonate.

Individual 11 B consists of the well-preserved remains of a young female. Although the various age criteria are not consistent, the age at death appears to have been between 14 and 18 years, probably about 15 or 16 (all skeletal maturation other than complete eruption of the 3rd molars indicates an age of about 15 years). As none of the long bones exhibits fusion of both epiphyses, length measurements were not made. The bones are gracile and delicate. Abnormalities include the following: (1) loss in life of the first right mandibular molar and subsequent resorption of the alveolous; (2) extensive apical caries of the first left mandibular molar; and (3) caries of the maxil-

lary right first molar crown, left canine, and left first molar. Also, the root sections of the third maxillary molars are not fully developed.

Individual 11 C, the bundle burial, was an adult male exhibiting complete synostosis of all vault sutures; age probably exceeded forty years. The long bones are robust (see above for list of recovered bones) as are the calva and mandible. Skeletal anomalies include a lesion (cortical thickening without visible periostitis) near the midpoint of the medial side of the right tibia shaft, and slight osteoporosis in the calva in the vicinity of bregma. As mentioned, definite human alteration of the radii in the form of grooving and snapping was observed. Also, all of the bones are coated with a dark substance (asphaltum?) and red pigment and there is a small burned area at the proximal fracture of the right ulna. There are certain other attributes of the skeletal material that are probably the result of human alteration, but the evidence is less concrete. The two recovered severed distal radii are well-preserved which gives evidence that the immediate burial environment would allow survival of bone extremities. Also, the basal and facial regions of the skull include bones (particularly the temporals) whose absence is not explainable as non-preservation (see Fig. 6 a). It is not known what treatment these bones received, but it appears that some activity prior to burial has resulted in destruction of the lower and facial portion of the skull as well as the ends of the long bones. The mandible also exhibits post-mortem alteration which may include intentional, human activities. All teeth, except the roots of the right second premolar and first molar, have been extracted and there is no evidence of alveolar resorption. The anterior alveoli from the left premolar to the right second premolar have been destroyed by the removal of a large section of bone; the resulting depression is scooped-out and slopes anteriorly (Fig. 6 b). The cause of this alteration of the mandible is uncertain—it may have been aboriginal or it may have occurred during excavation. The altered surface is fresher in appearance than the rest of the bone, but not as fresh as one or two other bones broken at the time of excavation.

Individual 11 D was represented by skull fragments, including orbital segments, distal and proximal femur fragments, right and left distal tibias, distal humerus, rib fragments, vertebral bodies and processes, calcaneus, fragmentary clavicle, incomplete innominate and incomplete scapula.

This skeletal material was studied by Dr. Robert M. Malina, physical anthropologist at The University of Texas at Austin. His statement follows:

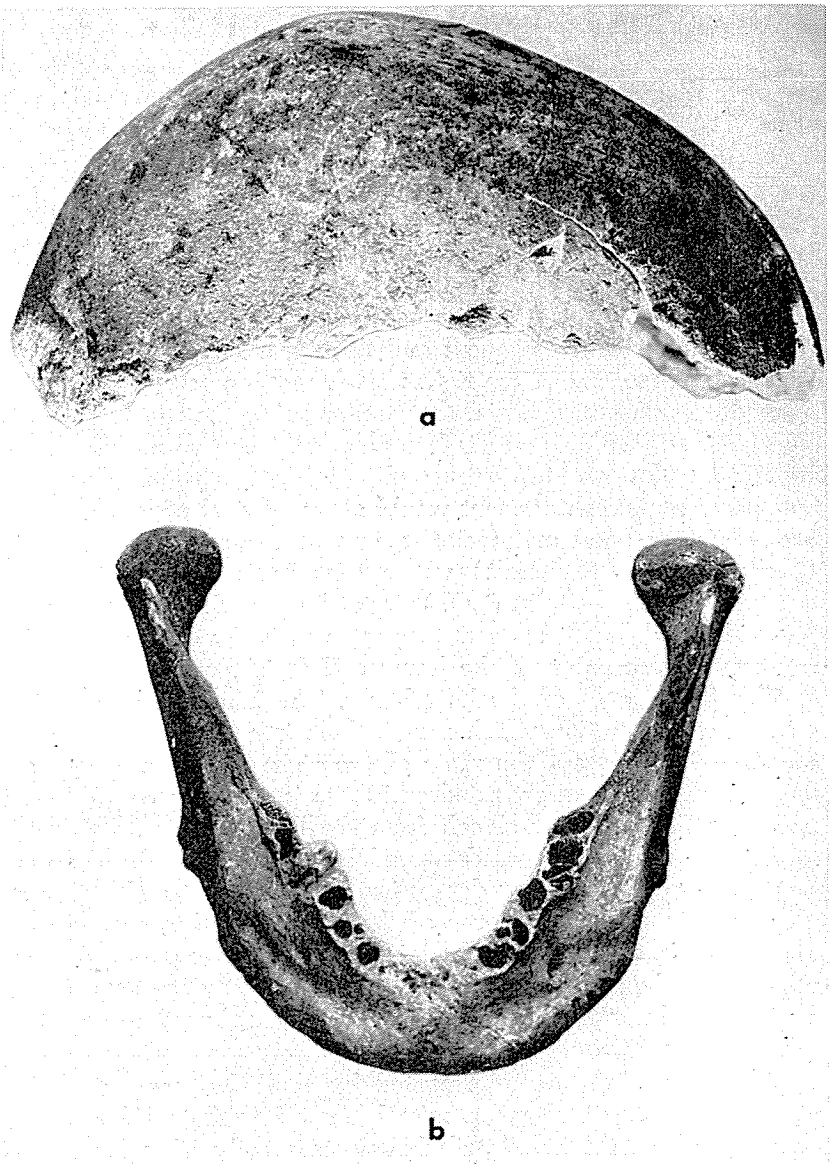


FIG. 6. Skeletal materials from Burial 11 C. a, Skull, possibly altered post-mortem (length: 188 mm.); b, mandible, with possible post-mortem modification (maximum width: 128 mm.).

Based upon estimated orbital size and estimated femoral and tibial lengths, the burial appears to represent an individual in the age range of birth to six months, perhaps closer to the lower end of the range.

1. estimated femoral length, 75-80 mm.; $\overline{X}$ 78.84, s.d. 7.23 for 64 Indian Knoll infants, newborn to 0.5 years.
2. estimated tibial length, 65-70 mm.; $\overline{X}$ 69.28, s.d. 6.33 for 65 Indian Knoll infants, newborn to 0.5 years (Johnston, 1962).

The possibility that individual 11 D might represent a newborn infant coupled with the unusual burial situation in which it was found presents an intriguing question. Ruecking (1955: 132) has noted that if a Coahuiltecan mother (the Carrizo cluster of the Coahuiltecan linguistic group was present in Cameron County in early historic times) died during childbirth, the woman's body "was buried along with the child, even if the child were alive and well." While no concrete evidence exists that the burials at this site are Coahuiltecan, it is possible that this tradition (of interring a newborn infant with its dead mother) may have been present in prehistoric times.

Associated with Burial 11 were 402 bone and shell artifacts (in addition to the altered human bones of 11 C described above). These included 299 tubular bone beads, 18 *Marginella* shell beads, and 85 *Noetia* shell beads. The exact provenience of each of these specimens was not recorded, however, certain beads were in positions which would indicate something of their placement at the time of burial. These placements could either reflect locations of individual adornment during life or represent the placement of offerings in the grave. Both tubular bone and *Noetia* shell beads were found in the waist region of individual 11 B, possibly indicative of an ornamented waist band. One of the tubular bone beads was of human bone and was found resting on the crest of the right innominate along with 6 *Noetia* shell beads. Among the bones of 11 C were 29 tubular bone, 1 *Marginella* shell, and 17 *Noetia* shell beads. Beneath the skull of 11 B was a concentration of tubular bone beads including 4 which were in line as though strung; evidently, these represent a necklace. Among the bones of individuals 11 B and 11 C were 265 tubular bone beads, 17 *Marginella* shell beads and 62 *Noetia* shell beads for which specific locations were not recorded.

DISTURBED BURIALS

DISTURBED BURIAL 1. This feature consisted of the bones of an adult collected from a small area of disturbed soil 2.5 feet south of Burial 4 and 2 feet east of Burial 3. The skeleton rested at a slightly higher elevation than those of Burials 3 and 4 and was completely disturbed. No burial position was determined and no artifacts seem to have been

associated. The bones were free of mineral replacement and encrustation.

DISTURBED BURIAL 2. This feature was 14 small fragments of human bone found in the plow zone; one complete phalange was also collected.

DISTURBED BURIAL 3. A few fragmentary bones of an adult human plus some animal bone fragments and a lump of burned clay were collected from the loose soil of the plow zone. All bone was heavily mineralized and encrusted. Evidently, there were no objects associated with the skeleton.

DISTURBED BURIAL 4. This feature consisted of heavily mineralized and encrusted human bone fragments, evidently of one adult, found in the plow-loosened soil; no associated artifacts were found.

DISTURBED BURIAL 5. A very few heavily mineralized and encrusted human bones which had been badly scattered by the plow were collected from this disturbed feature. No skeletal data were derived, nor were any associations noted.

DISTURBED BURIAL 6. This feature consisted of a few fragments of human bone found in disturbed soil. The bones were moderately mineralized and seemed to be of an adult.

DISTURBED BURIAL 7. A few small scattered human bone fragments occurred at this location in the loosened soil; none yielded any osteological data.

MISCELLANEOUS FEATURES

In Fig. 1, the locations of seven miscellaneous features are indicated. Most of these consist of localized concentrations of burned and/or mineralized animal bone fragments (mainly deer). At Miscellaneous Feature 7, a considerable quantity of ash and charcoal were mixed with loose soil and a small shell disc bead was collected from the surface.

CHIPPED STONE ARTIFACTS

TORTUGAS DART POINT (Fig. 7 b: 1 specimen)

Description: The specimen is triangular, with convex lateral edges and a straight base; it is not beveled. Length is 42.5 mm., maximum width (at the base) is 24 mm., and it is approximately 7 mm. in maximum thickness. This specimen was collected from the site by the landowner, and its exact provenience is uncertain.

Discussion: While the Tortugas type is generally considered Archaic in age (Suhm and others, 1954: 482), it is possible that projectile points of this size persisted in southern Texas until the Neo-American

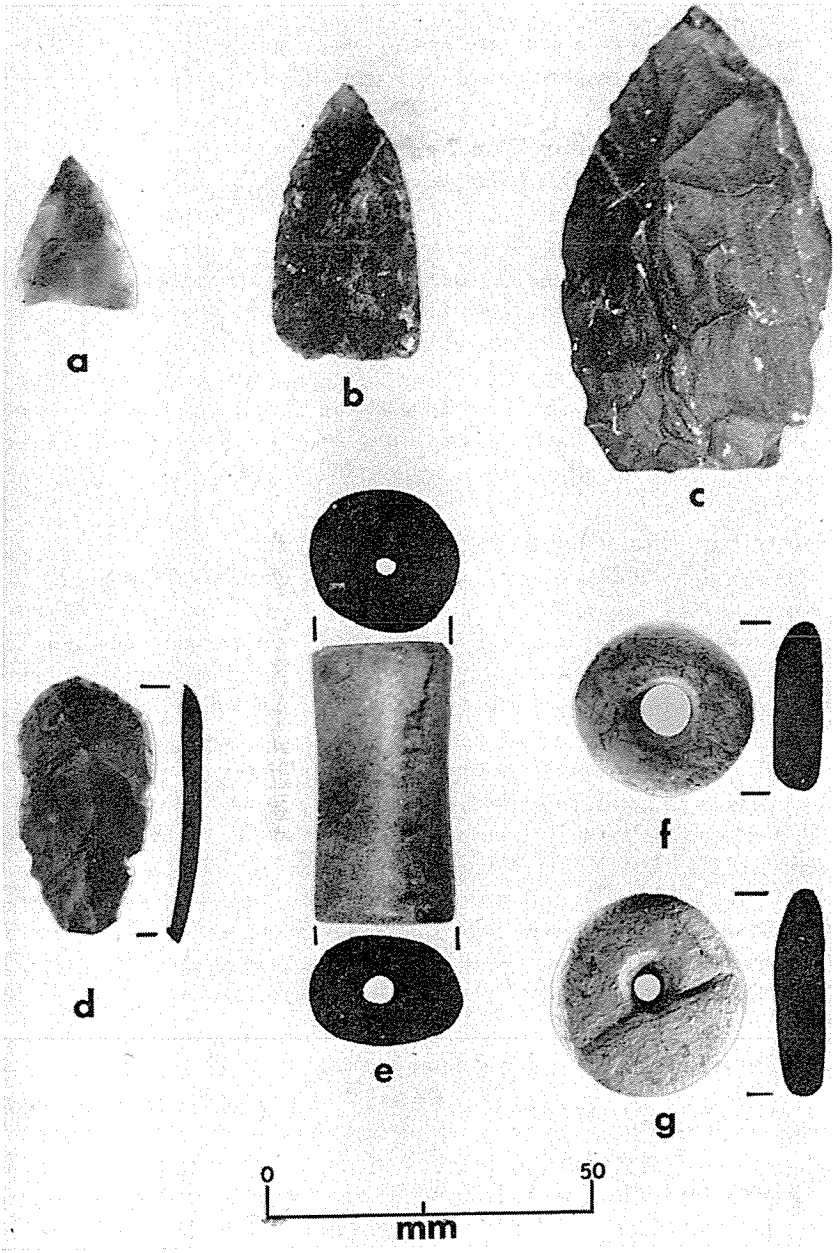


FIG. 7. Miscellaneous stone and shell artifacts. a, Matamoros dart point; b, Tortugas dart point; c, triangular knife; d, unifacial end scraper; e, tubular jadeite bead; f, stone bead; g, shell bead.

period. There are numerous specimens of this size in collections from large Brownsville complex sites in Cameron County (A. E. Anderson Collection, Texas Archeological Research Laboratory).

MATAMOROS DART POINT (Fig. 7 a: 1 specimen)

Description: A small, triangular dart point made from a light gray translucent flint; the base of this specimen is slightly concave, and the lateral edges are slightly convex. The left blade edge is alternately beveled. It is 23 mm. in length, with a maximum width of 19 mm. (at the base), and a maximum thickness of 6 mm. The specimen was recovered from the plow zone above Burial 9.

Discussion: Matamoros and other triangular projectile points are common on sites of the Brownsville and Barril complexes (MacNeish, 1958: 189). They are also found on sites of the South Texas Archaic, present in adjoining counties (Weir, 1956: 66).

TRIANGULAR "KNIFE" (Fig. 7 c: 1 specimen)

Description: This crude trianguloid biface was found by the landowner at the site, and the exact provenience is uncertain. It has convex blade edges, and a straight base (one corner of which is damaged); it measures 70 mm. long, with a maximum width (near midsection) of 43 mm., and a maximum thickness of about 8 mm.

Discussion: Specimens of this sort have not previously been reported from Brownsville complex sites, and are not found in the Brownsville complex collections of A. E. Anderson (Texas Archeological Research Laboratory). However, Anderson did collect from several Archaic sites in the Cameron County area (which he termed the "Cayo Culture") and a few specimens similar to the one described here were found. Triangular knives are a common feature in South Texas Archaic sites found in adjacent counties (Weir, 1956: 65).

END-SCRAPER (Fig. 7 d: 1 specimen)

Description: The specimen is a roughly trianguloid biface thinning flake, with a plano-convex cross section. The distal end is convex, while the striking platform remains at the proximal end. The distal end has been slightly retouched, producing a cutting or scraping edge on the convex face; the flat face is unmodified. The specimen is 39.5 mm. long, with a maximum width of 21 mm. and a maximum thickness of 3.5 mm. It was found on the surface.

Discussion: Similar specimens are present in the A. E. Anderson

collection of Brownsville complex artifacts (Texas Archeological Research Laboratory). Hester (1969a) has reported unifacial endscrapers from Kleberg and Kenedy Counties further up the Texas coast but they are usually smaller than the specimen described here.

GROUND STONE ARTIFACTS

Jadite Bead (Fig. 7 e: 1 specimen)

Description: A large tubular bead, fashioned from gray-green jadeite, was found at the site by the landowner. Burial 1 and Miscellaneous Feature 1 were later removed by heavy machinery from the area where the jadeite specimen was found. It is 43 mm. long, with the perforation extending the entire length and averaging 5 mm. in diameter. The maximum thickness of the specimen is about 15 mm. The maximum width of 22 mm. occurs at each end and the minimum width of about 20 mm. occurs at midsection. The specimen is highly polished.

Discussion: Both jade and jadeite beads occur in the Huastecan area of Mexico. Ekholm (1944: Fig. 54) has illustrated a number of jade beads found with burials at the Las Flores site. Most of these are less than an inch long, though one is almost one and one-half inches in length. Ekholm (p. 487) states: "All of the 132 jade beads . . . were found with burials at Las Flores. They usually accompanied a greater number of shell beads in combination with which they had apparently formed necklaces. They are made of jade of various colors and qualities . . . ."

MacNeish has reported jadeite objects from the Brownsville complex (1947: 7): "Two jadeite objects have also turned up in Brownsville complex sites one, a large spherical bead 1 inch in diameter; the other, a small celt-like object 1 inch long. These undoubtedly came from Mexico, and probably from the Huasteca . . . Pavon informs me that they are seen in the Huasteca sites. This contact, moreover, does not seem to have been entirely from the Huasteca to the Brownsville people since the finding of *Oliva* shell beads, the shell disc beads and discs, and the typical Brownsville variant 1 type of projectile point in Huasteca sites may indicate the reverse as well."

Disc-Shaped Stone Bead

Description: This specimen is described in the section on Shell Artifacts (below). It was found with a similar disc-shaped bead (made of conch shell) and was associated with Burial 10.

BONE ARTIFACTS

Human Bone Artifacts (Figs. 8, a-d, w-x: 4 specimens)

Description: Under this heading, four artifacts made from human bone are described. A number of tubular bone beads, many of which appear to be fashioned from human bone, are discussed in the following section.

All four specimens occurred with Burial 11 C (bundle burial). One is a human radius, with the distal and proximal ends missing (Fig. 8, w-x). It is 153 mm. long, with a maximum diameter of 15 mm. The distal end shows evidence of having been severed and smoothed, while the proximal end is broken. There is an asphaltum "plug" in the distal end of the specimen, and the exterior surface exhibits remnants of red and black pigments. Another radius shaft fragment was also found. It, too, is fragmentary (95 mm. long); the proximal end is broken, while the distal end has been severed, and the cancellous interior reamed out. The two modified radii appear to represent one individual.

Two severed distal ends of radii were found, as well. Though they have clearly been cut from the shaft, the cut ends have not been smoothed. One specimen is the distal end of a right radius; it is 54 mm. long, with a maximum diameter of 33 mm. The other specimen is from a left radius, and is 53.5 mm. long (estimated), and has a maximum diameter of 32 mm. It is suggested that both specimens are from the radii of a single individual, and that they are probably the distal ends of the modified radii described above. Traces of a reddish pigment are present on the exterior surfaces of both artifacts.

Discussion: Hester (1969a; 1969b) has described in detail numerous human bone artifacts from the southern Texas coast (Kleberg and Nueces Counties). Most were fashioned from long bone shafts, and were generally recovered with burials; the specimens described above were briefly noted. Isolated specimens were also reported from Zapata County (near the Rio Grande) and from the northeastern coast of Tamaulipas, just below Brownsville.

Tubular Bone Beads (Fig. 8, e-v: 301 specimens)

Description: A large quantity of tubular bone beads were recovered from several burials; these are discussed below by burial.

A total of 299 tubular bone beads were associated with the skeletons in Burial 11. Twenty-nine bone beads were found with Burial 11 C. One was quite large (29.5 mm. long, with a maximum diameter of 21 mm.), and is made from human bone. The interior has been reamed out, and the walls average about 3 mm. in thickness. Twenty-

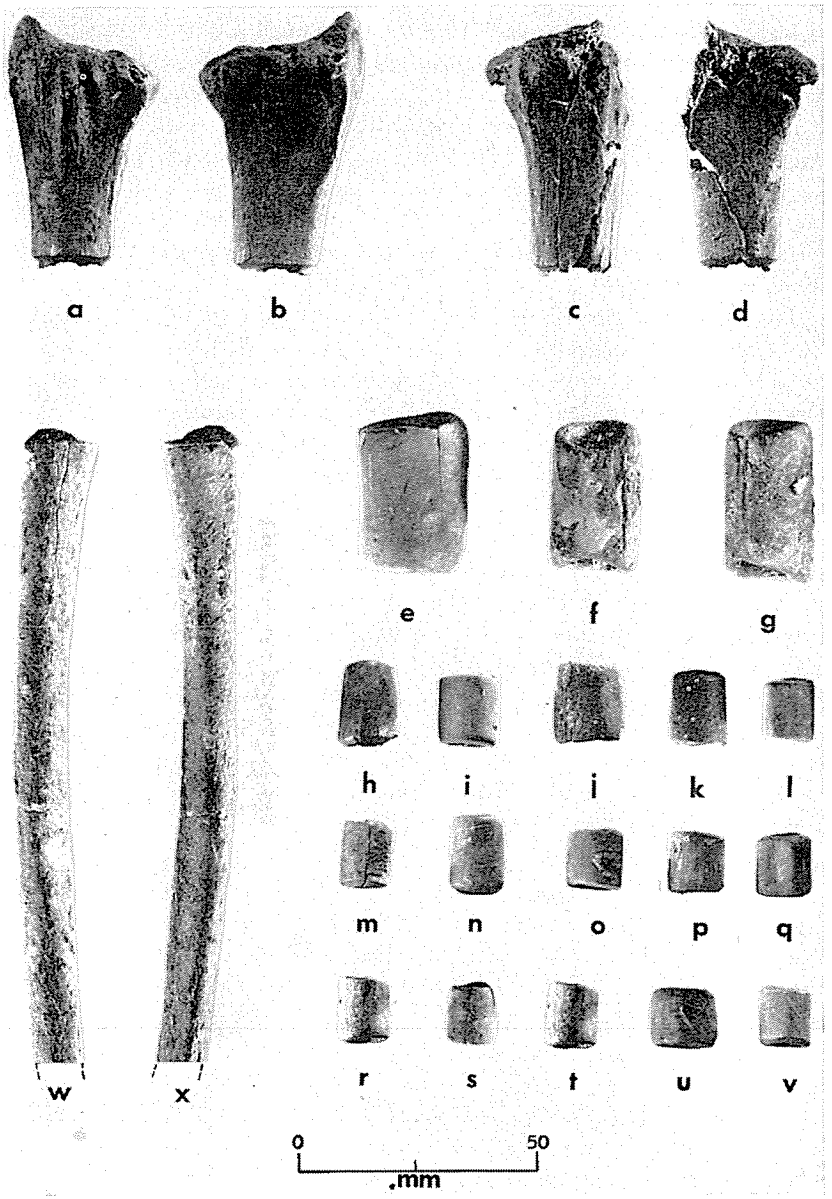


FIG. 8. Bone artifacts. a-d, severed human distal radii (both sides of each are shown); e-g, tubular beads made from human bone; h-v, miscellaneous tubular bone beads; w-x, human radius, severed at the distal end, and plugged with asphaltum (both sides are illustrated).

three others are made from mammal long bone (some of them may be of human bone), and most of these bear traces of a blackish substance, perhaps asphaltum. Transverse cross-sections vary from almost round to ovate, and a number have trianguloid cross sections. None is decorated, though two have shallow transverse notches near one end, where initial attempts to sever the bone may have been made. These 23 specimens range in length from 7.5 mm. to 19 mm., and in maximum diameter from 8 mm. to 14 mm. One other bone bead from the burial is made from bird bone; it is 11 mm. long, with a maximum diameter of 6 mm.

Two hundred and sixty-five bone beads were found with Burials 11 B and 11 C (together). Four of these are definitely made from human bone; the interiors have been reamed out and smoothed. Length ranges from 24 mm. to 33.5 mm., maximum diameter is from 18.5 mm. to 22 mm., and wall thickness varies from 4.5 mm. to 5.5 mm. Two hundred and fifteen others appear to be sections of mammal long bones, and a number of them may be of human bone. Cross sections are often oval, though trianguloid transverse cross sections are also common. Most are undecorated, but several bear remnants of black and red pigments. The exterior surfaces are usually well-polished, although some are now badly eroded. "False starts" (initial attempts at cutting the bone), in the form of slight transverse notches near one end, are present on several. Length varies from 10 mm. to 19 mm., while the maximum diameter is from 8.5 mm. to 14 mm. and the wall thickness is from 1.5 mm. to 3.5 mm. (the interiors are often enlarged and smoothed). Most of these specimens are around 13 mm. long, with maximum diameter of 11 mm.

One group of 46 bone beads with Burials 11 B-11 C are noticeably smaller than the remainder. These are probably fashioned from the long bones of birds or very small mammals. Transverse cross sections are generally oval; a few are trianguloid. There is a range in length from 8.5 mm. to 14 mm., in maximum diameter from 4 mm. to 8 mm., and in wall thickness from 0.5 mm. to 2 mm. None is decorated.

There were five bone beads found scattered through Burial 11; two of them may be made of human bone. Two have trianguloid transverse cross sections, and the others have ovate cross sections. Length ranges from 10 mm. to 15 mm., and maximum diameter is from 9.5 mm. to 14 mm.; they are undecorated.

Two bone beads were recovered from Burial 7. One has an elliptical cross section, while the other is triangular. The first specimen is 13.5 mm. long, with a maximum diameter of 11 mm., and the second is 11.5 mm. long, and 9.5 mm. in maximum diameter.

Discussion: Tubular bone beads have been found associated with burials in Cameron County (A. E. Anderson Collection, Texas Archeological Research Laboratory) and at the Ayala Site in adjoining Hidalgo County (Campbell and Frizzell, 1949: Pl. 12). They are also occasionally found at other localities along the Texas coast (Campbell, 1956: 15, 35; 1957: 460; and Hester, 1969a).

Perforated Canine Teeth (Fig. 9, e-f: 18 specimens)

Description: These are canine teeth of the coyote (?) which have been biconically perforated near the root end. All of the specimens occurred with Burial 4, and all but two were arranged in a circular pattern (Fig. 4). It is probable that these were components of a necklace. Two of the perforated canines were found *in situ* within *Oliva sayana* shell tinklers, where they apparently functioned as clappers (Fig. 9 b-c).

Length ranges from 27 mm. to 35 mm., and maximum width averages around 19 mm.

Discussion: Perforated canine teeth have been noted previously in the Brownsville complex (Anderson, 1932: 20; A. E. Anderson Collection, Texas Archeological Research Laboratory) and have been found at sites along the central and southern Texas coast (Suhm and others, 1954: 127; Hester, 1969a). At the Ayala Site (initially described by Campbell and Frizzell, 1949), Frederick Ruecking, Jr. found 12 perforated canines associated with a burial; other artifacts found with the burial include *Oliva sayana* beads, conch shell disc beads, and rectangular bone pendants. Data gathered on the other burials at the site suggests that the interments were made by peoples of the Brownsville complex (Hester and Ruecking, this issue).

SHELL ARTIFACTS

Disc-Shaped Beads (Fig. 7 f-g: 2 specimens)

Description: Both of these specimens are rather large, thick, disc-shaped beads; one is fashioned from conch shell, and the other is made from a hard, white limestone. The conch shell specimen has a maximum diameter of 31 mm. and a maximum thickness of 7.5 mm. The biconical perforation is near the center and is about 4 mm. wide. The other bead (limestone) has a maximum diameter of 27 mm. and a maximum thickness of 8 mm.; the perforation (biconical) is about 8.5 mm. in diameter. Both specimens were found with Burial 10.

Discussion: Disc-shaped beads (made from conch shell) are found on both Brownsville and Barril complex sites (MacNeish, 1958: 190).

Some are also found further up the Texas coast, though they are generally smaller (Campbell, 1956: 34; Hester, 1969a).

Marginella Apicina Shell Beads (Fig. 9 r-w: 18 specimens)

Description: These are tiny univalves (*Marginella apicina*), the spires of which have been removed to facilitate stringing. Most of the specimens are badly fragmented, and two or three bear faint traces of a reddish pigment.

Sixteen were found with Burials 11 B- 11 C (together), and single, isolated specimens were found with Burial 11 B and with Burial 11 C. They range in length from 9.5 mm. to 12 mm., and in maximum diameter from 7 mm. to 9.5 mm.

Discussion: A. E. Anderson found *Marginella apicina* shell beads with several burials in Cameron County (Texas Archeological Research Laboratory collections). Hester (1969a) has reported a burial at site 41 KL 45 (in Kleberg County) which was accompanied by 180 *Marginella apicina* beads, two of which were stained with a reddish pigment. Cecil Calhoun, who found the site, recovered artifacts attributable to both the Brownsville and Rockport complexes.

Noetia Ponderosa Shell Beads (Fig. 9 i-q: 85 specimens)

Description: Most of these small pelecypods (*Noetia Ponderosa*) are rather badly eroded; a few bear remnants of a reddish pigment. Sixty were found with Burials 11 B and 11 C (together). Forty-two of these bear perforations at the beak (umbo); 16 others are perforated about 2 mm. to 5 mm. behind the umbo, and two have perforations at the umbo as well as single perforations further back on the shell.

Eight of these shell beads were found with Burial 11 B; six were found on the right innominate. Five of these were perforated at the umbo, and the other three were perforated just behind it.

Burial 11 C yielded 17 *Noetia ponderosa* beads, some of which were inside the cranium, while others were near the fetus cranium. Thirteen of these are perforated at the umbo, three were drilled just behind the umbo, and one has two perforations.

The shell beads from these burials range in length from 9.5 mm. to 19.5 mm., and in maximum width from 11.5 mm. to 23 mm.

Discussion: Perforated *Noetia ponderosa* are present in the A. E. Anderson collection of Brownsville complex artifacts (Texas Archeological Research Laboratory). Hester (1969a) has noted *Noetia ponderosa* beads from site 41 KL 13 in Kleberg County, also on the southern Texas coast.

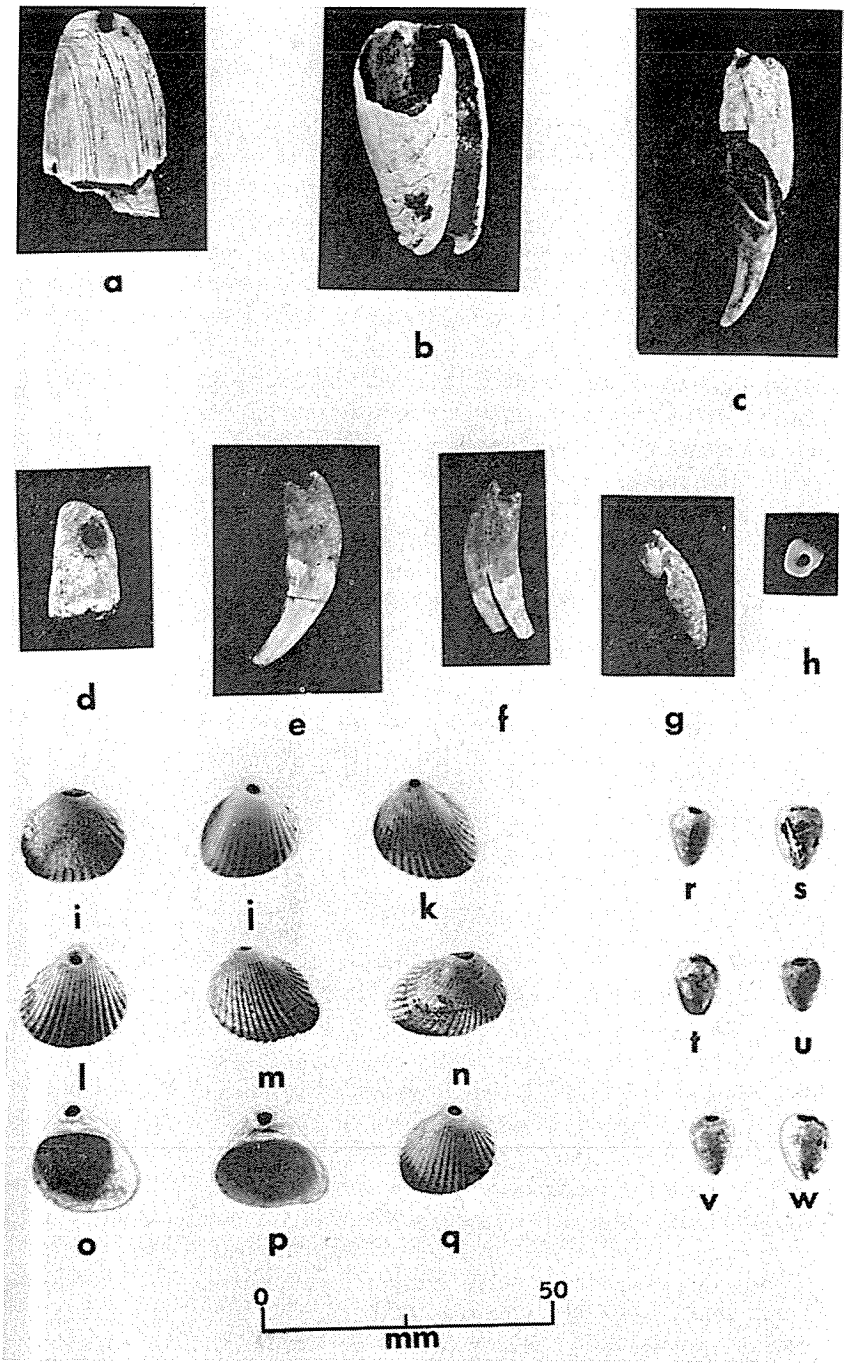


FIG. 9. Shell and bone artifacts. a, *Oliva sayana* tinkler; b, c, *Oliva sayana* tinklers, with *in situ* canine teeth; d, fragment of *Oliva sayana*; e-f, perforated canine teeth; g, human tooth, possibly modified; h, shell bead; i-q, *Noetia ponderosa* shell beads; r-w, *Marginella apicina* shell beads.

Oliva Sayan Shell Artifacts (Fig. 9 a-d: 5 specimens)

Description: All of the specimens are fragmentary, and no measurements were possible. Four of the specimens are tinklers which bear single perforations near the anterior end of the shell. As already mentioned, within two of the tinklers, perforated canine teeth (which functioned as clappers) are still in place. The fifth specimen is a longitudinal fragment of an *Oliva sayana* shell; it, too, may have been a tinkler. It was found in place with Burial 4; a perforated canine lay on part of the fragment. However, it is believed that this is an accidental association, since this particular canine was one of several forming a circular pattern around the upper part of the burial.

All of the specimens were found with Burial 4.

Discussion: *Oliva* shell tinklers are common in the Brownsville complex (Anderson, 1932: Pl. 7; MacNeish, 1958: 191). In nearby Hidalgo County, *Oliva sayana* tinklers were found associated with a burial at the Ayala Site (Hester and Ruecking, this issue).

MISCELLANEOUS REFUSE

During the course of the work at the site, several forms of non-artifactual debris, as well as some historic Anglo-American artifacts, were recovered from the surface. The non-artifactual debris includes scattered snail shells, a few mussel shell fragments, several burned clay lumps, two small shark's teeth, and the tooth of a peccary. The peccary has ranged into the area in only very recent times (Ernest Lundelius, personal communication). The recent historic artifacts include glass and crockery fragments.

SUMMARY

Salvage excavations were carried out at the Floyd Morris Site (41 CF 2) in Cameron County in June, 1966. The investigations at the site, conducted by students from the Department of Anthropology, The University of Texas at Austin, revealed a number of burials and miscellaneous features (most of which had been damaged by land-leveling processes). Several of the burials were accompanied by grave goods, including tubular bone beads, shell beads, shell tinklers, perforated canine teeth, disc-shaped beads, and modified human bones; also, the bones in a bundle burial exhibited coatings of black and red pigments. Most of these artifacts are attributable to what has been termed the Brownsville complex (MacNeish, 1958: 191). Several artifacts (none of which was in place) were found that may represent earlier, Archaic activities at the site. Of particular interest was the recovery of a tubular jadeite bead, which may be intrusive from the Huastecan area of Mexico.

Apparently, the high elevation (35 feet above sea level) on which the site is located, was favored for burials at different periods in time. Burial was probably intermittent, since the interments differ from one another in skeletal orientation and position, and since various degrees of bone mineralization are present. Although less clear, the presence of various artifact forms seems consistent with this proposal. Additional evidence for intermittent burial is the non-patterned arrangement of the burials; i.e., they are apparently scattered randomly over the elevation, and are not grouped in a particular area.

This site is the second cemetery site to be reported for the lower Rio Grande valley (the Ayala cemetery was reported by Campbell and Frizzell, 1949). Though the burial goods at these two sites are suggestive of Brownsville affiliation, MacNeish (1947, 1958) has not mentioned the use of cemetery areas by this culture. While the investigators noted some indistinct patches of midden debris at the site, no concentrated occupational area was located. Evidently, if local groups responsible for the burials resided nearby, their burial and habitation areas were separate; or, if the burials were associated with migratory groups, the groups apparently occasionally took advantage of the elevation for interment but did not reside at the site for any length of time.

By the time the University of Texas crew arrived at the Floyd Morris site, much of it had been disturbed. Only 18 burials (and disturbed burials) were recorded, but widely separated occurrences of human bone on the surface indicated the presence of many more skeletons, leading the senior author to believe that perhaps as many as 75 to 100 burials were once present in the site area. Many of these had been nearly totally destroyed, and lack of time did not permit investigation of other known burials. Also, the land owner reported that in a previous leveling of this same field, a few human bones had been removed.

Two cemeteries have thus far been reported in this region, Floyd Morris and Ayala. As we have already stated, the Floyd Morris site was badly disturbed, and lack of time and funds prevented more extensive salvage operations. The other cemetery, Ayala, was investigated twice (Campbell and Frizzell, 1949; Hester and Ruecking, this volume), but unfortunate circumstances prevented extensive, careful work. It is evident, therefore, that other cemetery sites in the area need to be located and systematically excavated. Only then will it be possible to determine the cultural affiliations and temporal positions of the peoples responsible for these sites.

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PART II
ADDITIONAL MATERIALS FROM THE AYALA SITE, A PREHISTORIC CEMETERY SITE IN HIDALGO COUNTY, TEXAS

THOMAS ROY HESTER AND FREDERICK RUECKING, JR.

INTRODUCTION

In 1949, T. N. Campbell and J. Q. Frizzell reported a number of burials and associated artifacts from the Ayala Site (University of Texas designation: 41 HG 1) near McAllen in Hidalgo County, Texas (Fig. 1). They described 11 burials (containing 15 individuals) from the site, noting that most of the skeletons appeared to have been in a flexed position, though good orientation data were lacking. Numerous artifacts were associated with the burials, including *Oliva sayana* shell beads, disc-shaped beads made from conch shell and tubular bone beads, some of which had encircling grooves. The association of these artifacts with the burials suggested that the interments were made by peoples of the Brownsville culture (MacNeish, 1947: 6) during the Neo-American period. However, the burials had intruded into a thick midden which apparently represented earlier, Archaic occupations. Gouges, a triangular knife, a trianguloid dart point, and other Archaic-style materials were found in the midden debris surrounding the burial pits.

In June and December of 1952, Frederick Ruecking, Jr., then a student at The University of Texas, returned to the Ayala Site to obtain additional data. He conducted limited excavations at the site, and the artifacts and field notes resulting from this work are stored at the Texas Archeological Research Laboratory at Austin. The purpose of this brief paper is to present the data obtained by Ruecking in 1952. Then, by utilizing the information provided by Campbell and Frizzell (1949), the archeology of the Ayala Site is summarized.

THE SITE

The Ayala Site has previously been described by Campbell and Frizzell and a portion of their description is presented here: "The Ayala site has a distinctive physiographic location. It lies on high ground which rises about 15 feet above a former channel of the Rio Grande (the Sardinas Resaca, Fig. 1). This old channel has a width of approximately 2,500 feet at the Ayala locality, and it is now used as a floodway. According to Mr. Ayala, the records show that the Rio Grande occupied this channel in the latter part of the eighteenth

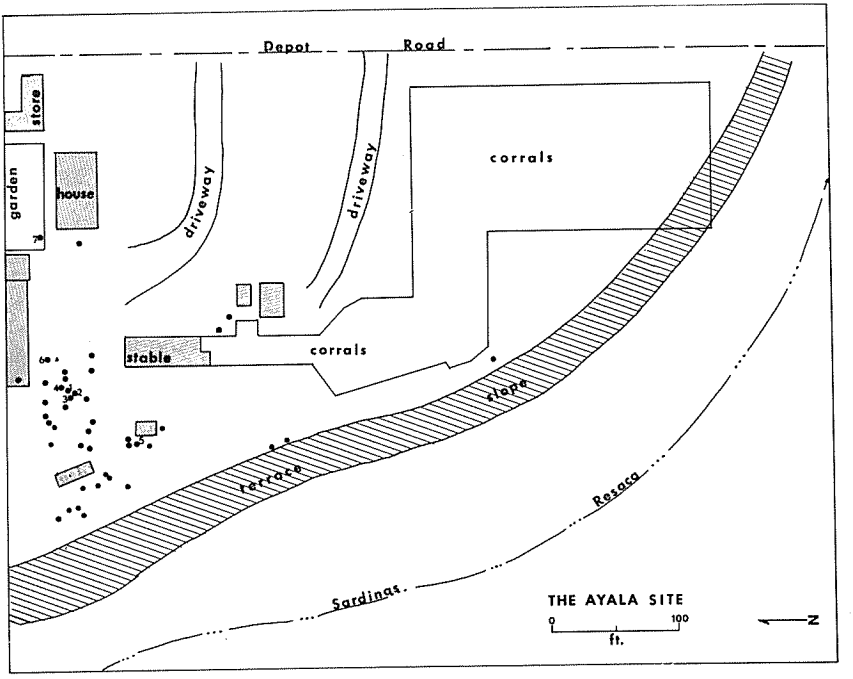

FIG. 1. Plan of the Ayala Site, showing the location of burials. Burials 1-7 are numbered, while the other burials are indicated by darkened triangles.

century, when the area was first settled by Europeans. Today the Rio Grande is six miles south of the Ayala site. The site is now sparsely covered by large mesquite trees, and there is no record of its ever having been under cultivation." Ruecking's maps of the site area show that a number of farm buildings and other structures occupy much of the site area. The main concentration of burials seems to be on the Ayala property, though Mr. Ayala told Ruecking that a few burials had been found on the property just north of his.

BURIALS AND ASSOCIATED ARTIFACTS

Burials were first discovered at the site in July of 1948, when a sewer trench was dug by the Ayalas. These burials were subsequently investigated by Jack Frizzell. In 1952, Ruecking returned to the site for further excavations. A grid was established, and several units were opened. However, Ruecking's endeavors were seriously hampered by workmen employed by the landowner. They were digging haphazardly in the hope of finding a "treasure cave" which was believed to exist on the property and Ruecking spent much of his time

trying to document many of the discoveries made by the untrained laborers.

In discussing the burials recorded by Ruecking, it should be pointed out that it is difficult to determine the exact number of burials excavated, either by Ruecking or by the untrained workmen. Ruecking's specimen catalog lists five burials (Burials 1, 2, 3, 4, and 6), yet a sketch of a "Burial 7" also appears in the notes. Complicating the situation further are plans of the Ayala Site on which the locations of 44 burials are indicated (Fig. 1). Apparently, Ruecking was unable to correlate the burial data obtained by Campbell and Frizzell with his own. Furthermore, no horizontal plan of burials appears in the 1949 report by Campbell and Frizzell, so again we cannot tell if some of the burials noted by Ruecking duplicate those recorded in 1949.

Ruecking's Burial 1 (an adult) was discovered by untrained workmen and was badly disturbed before it was recorded. It was located about five feet below the surface (see Fig. 1). A number of artifacts were associated. An antler beam fragment (Fig. 4, c), 230 mm. long and with a maximum diameter of 27 mm., was present though it exhibits no apparent modification. A large trianguloid pendant was also found (Fig. 4 a-b). It is fashioned from conch body whorl, and is 163.5 mm. in length. The proximal end is 108 mm. wide, while the distal end is 31 mm. in width. Two perforations, about 5 mm. in diameter and spaced 10 mm. apart, are present 3 mm. from the distal end. One lateral edge is convex and the other is slightly concave and recurved. Numerous tiny, closely-spaced notches (averaging 1.5 mm. in length) are present along both lateral edges, and the proximal edge. Specimens similar to this have been noted by MacNeish (1958: 191).

Two *Oliva sayana* tinklers (Fig. 2 n-o) were associated with Burial 1. About one-third of the shell (posterior or spire end) has been removed, and the edges have been smoothed; they range in length from 42 to 49 mm., and in maximum diameter from 21.5 to 23 mm. At the anterior end of each specimen, a transverse notch has been cut and a single perforation made near the center of the notch. On one specimen, two closely-spaced perforations are present on the body whorl about 31 mm. from the anterior end. These tinklers are common in the Brownsville complex (MacNeish, 1958: 191). A carnivore canine (coyote), with a hole at the root end, was also found. It is 38 mm. long, with a maximum diameter of 9 mm. At the Floyd Morris Site (41 CF 2) in nearby Cameron County, tinklers have been found with what are probably Brownsville culture burials; carnivore canines

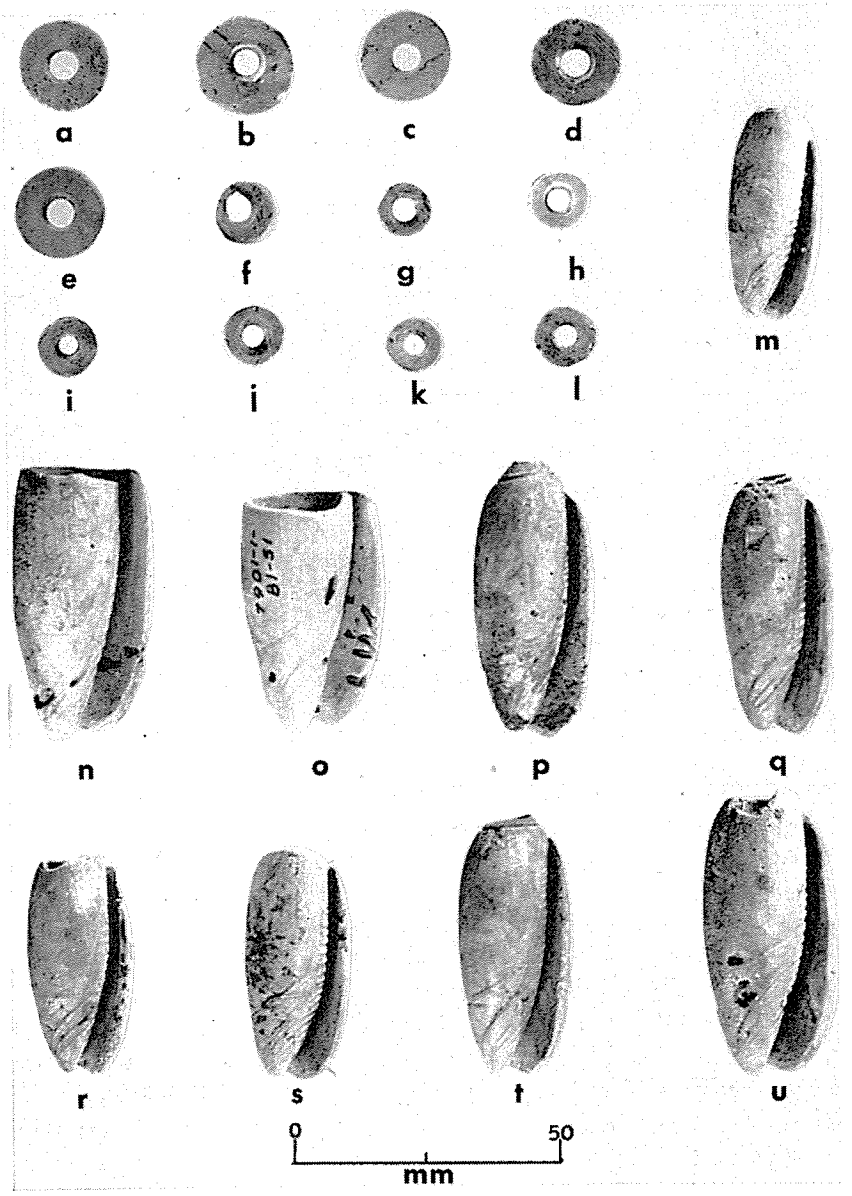

FIG. 2. Shell Artifacts. a-l, disc-shaped conch shell beads; m, p-u, *Oliva sayana* shell beads; n-o, *Oliva sayana* shell tinklers.

were found *in situ* within two of the tinklers, where they apparently served as clappers (Collins, Hester and Weir, this issue).

Other bone artifacts were also found with Burial 1. These include 22 small tubular bone beads (animal or bird bone), averaging 10 mm. in length, and about 5 mm. in maximum diameter. All are undecorated, though slight cut marks are present on several. A rectangular bone object (possibly a pendant) was also recovered. It is 62 mm. long, with a maximum width of 23 mm. and a maximum thickness of 1.5 mm. There is a small biconical perforation at one corner and one face is decorated with incised lines (see Fig. 3 x). These incised lines contain remnants of a black pigment, which under microscopic examination appears to be asphaltum. A "ladder" motif, composed of two parallel incised lines crossed transversely by short incised lines, is the basic part of the design. Using this ladder motif, two rectanguloid figures (with one long side missing from both) have been executed. One of these figures has been placed with the other (see Fig. 3 x). This design element (one rectangle with an open side fitting within an identical, but larger rectangle) occupies approximately two-thirds of one face. Just above it is another incised line design, much more poorly executed, and part of which seems to be missing since the specimen is broken at that end. This design is box-like (almost square) with the ladder motif employed on three sides. Within this is a similar parallel-line design, though the short transverse notches are missing. While not apparent to the naked eye, microscopic examination revealed faint traces of asphaltum within the incisions. We would like to point out that a search of the literature failed to yield other specimens from the Texas coast exhibiting asphaltum placed in incised designs. However, Cecil Calhoun (1967, personal communication) has recently found an antler tine fragment at 41 NU 11 (Nueces County) which bears an incised zig-zag line filled with asphaltum.

A trianguloid dart point (Fig. 3 a) was found at the same level as the burial (No. 1), though it seems to have been associated with the Archaic midden surrounding the interment. It is crudely made from a gray flint and has a concave basal edge and concave lateral edges. It measures 34 mm. in length, has a basal width of 27 mm. and a maximum thickness of 6.6 mm. Another projectile point was noted by Ruecking as having been found at the same location, but it is not now available for study.

Burial 2 was found just south of Burial 1 at a depth of about 5 feet. It, too, was removed by untrained workmen, and no other data are available. No artifacts seem to have been associated with it.

Burial 3 was excavated carefully by Ruecking. It was located just west of Burial 1 about 40 to 49 inches below the surface. Though the

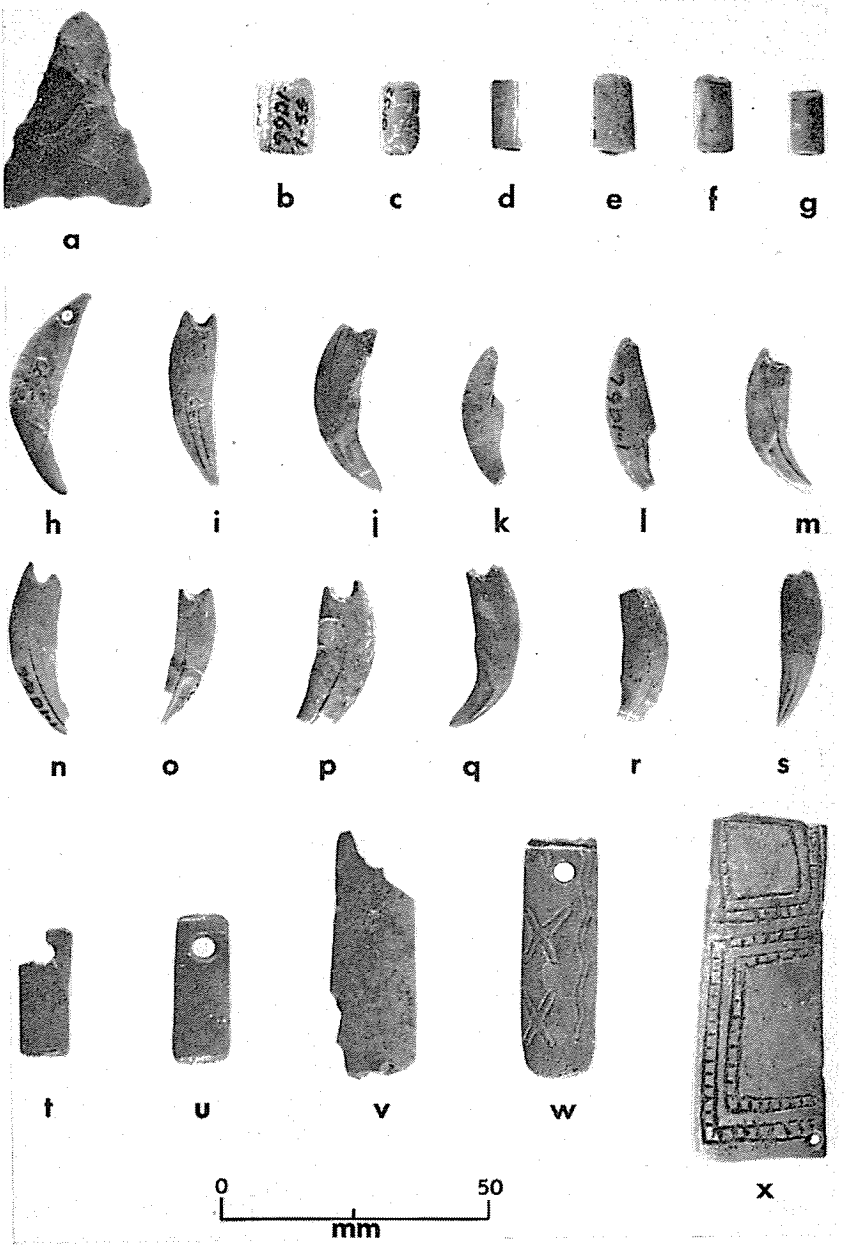

FIG. 3. Stone and Bone Artifacts. a, trianguloid dart point; b-g, tubular bone beads; h-s, perforated canine teeth; t-v, rectangular bone pendants, undecorated; w, rectangular bone pendant, incised; x, rectangular bone pendant, incised lines filled with asphaltum.

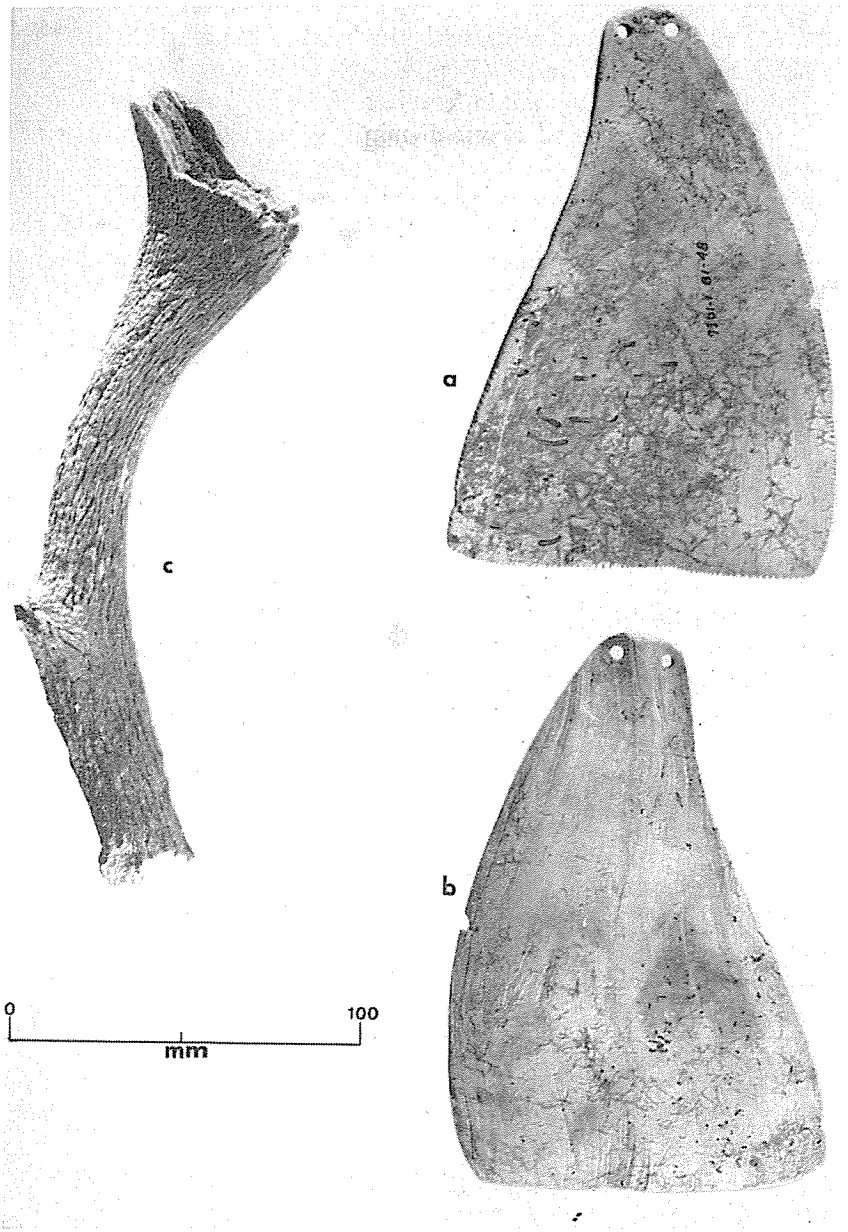

FIG. 4. Antler and Shell Artifacts. a-b, both sides of conch whorl pendant; c, antler beam fragment.

skeleton (that of an adult) was fragmentary, it seems to have been flexed, and oriented east-west, with the head to the west. Seventy-six tubular animal bone beads (Fig. 3 b-g) were associated with the burial; they average 10 mm. in length, and 5 mm. in maximum diameter, with the bone wall about .5 mm. thick. Slight cut marks are present on several of them, while on one specimen there are two encircling grooves (see Campbell and Frizzell, 1949: Plate 12, I). Five disc-shaped beads (probably of conch shell) were also found with the burial. They vary in diameter from 9 mm. to 11 mm. and in maximum thickness from 2 mm. to 4 mm. (Fig. 2 a-l). At a depth of 59 inches, well below the burial, and within the Archaic midden, a projectile point (evidently a triangular dart point) was recovered, but is not available for study.

Burial 4 was located just north of Burial 1 at a depth of about 5 feet below the surface. Apparently, the skeletal material was not articulated, but the burial may have been disturbed since it was uncovered by the untrained laborers.

Burial 5 is also quite perplexing. Skeletal fragments of an adult and a juvenile are present but no sketch map or other documentation exist for the burial, and therefore the relationship of the two individuals within the grave is unknown. The burial is said to have been found about 5 feet below the surface, circa 75 feet southwest of Burial 1. It is possible that this burial (like several others at the site) was uncovered by the laborers working for the landowner; it may have been so badly disturbed that Ruecking was unable to accurately record it.

A number of artifacts were apparently associated with Burial 5. Seven *Oliva sayana* shell beads (with the spire tips removed) were found (Fig. 2 m, p-u). They range in length from 37 mm. to 50 mm., and in maximum width from 16 mm. to 27 mm. Also found were 12 carnivore canines (coyote), all of which had been perforated at the root end (Fig. 3 h-s). Six disc-shaped shell beads (conch) ranging from 10 mm. to 18 mm. in maximum diameter and from 2 mm. to 3.5 mm. in maximum thickness, were also associated (Fig. 2 a-l). Four rectanguloid bone pendants were among the grave goods with Burial 5. Three of the specimens (Fig. 3 t-v) are nicely shaped and polished, but are undecorated. They range in length from 23 mm. to 45 mm., in maximum width from 9 mm. to 15 mm., and in maximum thickness from 1.5 mm. to 2.0 mm. The fourth bone pendant (Fig. 3 w) bears two incised "X"-shaped designs on one-half of one face, while two parallel meandering incised lines extend the entire length of the oppo-

site half of the face. This specimen is 42 mm. long, 13 mm. at maximum width, and is 2.5 mm. thick.

Burial 6 was found about 25 feet northeast of Burial 1 at a depth of about 32 inches below the surface. Adult cranial and postcranial materials are present, but the orientation of the skeleton(s) is unknown. A sketch does exist for Burial 7, which was excavated by Ruecking. It was found about 125 feet east of Burial 1, in a garden. It, too, seems to have been located about 32 inches below the surface. According to Ruecking's notes, no grave goods were found; a grave pit could not be delineated. Near the burial, though probably not associated with it, a mostly complete turtle shell was found. While it seems most probable that the turtle remains represent food refuse in the midden, it should be noted that Campbell has recorded a turtle shell rattle found with a burial at the Caplen Site on the northern coast of Texas (1957: 461).

SUMMARY AND CONCLUSIONS

During 1952, Frederick Ruecking, Jr., carried out limited investigations at the Ayala Site in Hidalgo County, Texas. Several burials were excavated and/or recorded by Ruecking. His plan of the site and its environs (Fig. 1) shows the location of 44 burials, but descriptive data concerning most of these are lacking. Burial goods accompanying the skeletons included: *Oliva sayana* beads and tniklers, tubular bone beads, disc-shaped conch shell beads, a large triangular conch whorl pendant, a large antler beam fragment, incised bone pendants and perforated carnivore canines. Combining these and other data with the information recorded by Campbell and Frizzell (1949), the following table has been prepared to summarize the burial traits manifested at the Ayala Site:

Two reports have now been contributed concerning the archeology of the Ayala Site, but even more work should be done at this important site. Though laborers employed by the landowner damaged much of the site, a good deal of it is apparently still intact, and careful, methodical work is desperately needed at the site.

Most of the burial goods listed in Table 1 are common in the Brownsville culture (MacNeish, 1958: 190-192; A. E. Anderson Collection, Texas Archeological Research Laboratory), but such items as rectangular bone pendants (especially with incised decorations) and the association of red ochre with burials are heretofore unrecognized traits.

The burial goods at the Ayala Site are clearly suggestive of Brownsville affiliation. However, we still do not know the exact temporal

TABLE 1.

Burial Traits at the Ayala Site. Names in parentheses indicate the persons who recorded each trait.

I. BURIAL PITS: circular in outline, 4 to 5 feet deep; single or multiple interments. (Campbell and Frizzell; Ruecking)

II. BURIAL POSITION: flexed, with forearms crossed or hands adjacent to face; some may represent secondary interments (Campbell and Frizzell; Ruecking)

III. BURIAL GOODS:
- a) red ochre (Campbell and Frizzell)
- b) *Oliva sayana* tinklers (Ruecking)
- c) *Oliva sayana* beads (Campbell and Frizzell; Ruecking)
- d) disc-shaped conch shell beads (Campbell and Frizzell; Ruecking)
- e) tubular bone beads, some decorated with encircling grooves (Campbell and Frizzell; Ruecking)
- f) deer antler beam fragment (Ruecking)
- g) large trianguloid conch whorl pendant (Ruecking)
- h) perforated carnivore canines (Ruecking)
- i) incised rectangular bone pendants (Ruecking)
- j) undecorated rectangular bone pendants (Ruecking)

range of some of the shell and bone artifacts characteristic of that culture. It is conceivable (and probable) that shell and bone artifacts used in Neo-American (Brownsville) times in this area could have also been present during the Archaic. So it is tenuous at best to say flatly that the Ayala cemetery is entirely attributable to the Brownsville culture. While it is possible that these peoples took advantage of the high elevation now known as the Ayala Site for interments, it is also quite possible that the Archaic peoples to whom is attributed most of the midden at the site (Campbell and Frizzell, 1949) may be responsible for some of the burials. There is no evidence of any historic aboriginal groups using the site for burial purposes. It is probably accurate to say that several stages of burial activity, occurring at different periods in time, are represented at the site. Unfortunately, we have such meager data from the site that we can say little more. Ruecking believes that the lower levels of the midden are attributable to Archaic occupations, based on the small quantities of artifacts (none now available for study) that he saw from these levels. He does not recall seeing any artifactual debris in the upper parts of the midden which would indicate a Brownsvillean occupation. This suggests that if most of the burials are attributable to the Brownsville complex (as indicated by associated grave goods), then the habitational area is located somewhere away from the cemetery.

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PART III
THE FLOYD MORRIS AND AYALA SITES: A DISCUSSION OF BURIAL PRACTICES IN THE RIO GRANDE VALLEY AND THE LOWER TEXAS COAST

THOMAS ROY HESTER

In Parts I and II, burials and associated artifacts from the Floyd Morris Site and the Ayala Site have been described in detail. Both sites are large cemeteries; the burial goods are suggestive of the Brownsville complex (MacNeish, 1947, 1958), but occupational areas attributable to this complex were not found. The similarities of the burial goods and other burial traits at the two sites are pointed out in Table 1.

I would like to thank Dr. Dee Ann Story, Executive Director, Texas Archeological Research Laboratory, and Mr. Harry J. Shafer, of the Texas Archeological Salvage Project, for reading various drafts of this paper, and for providing helpful and constructive criticisms regarding it.

Appreciation is also expressed to Dr. T. N. Campbell and Mr. James E. Corbin of The University of Texas, and Mr. Michael B. Collins, of the University of Arizona, for information and suggestions supplied by them on certain aspects of this paper. Mrs. Lynda Hester typed the manuscript.

CEMETERIES ON THE LOWER TEXAS COAST

Other cemeteries are known on the lower Texas coast from the Corpus Christi area southward. In Kleberg County, the Dietz Site cemetery has been known for several decades, having first been excavated by Clyde T. Reed in 1927 (1937: 218-221). The site is located near Cayo del Grullo southeast of Kingsville. Reed excavated 21 skeletons, one of which was accompanied by two tubular stone pipes. Also associated with many of the burials were segments of human long bone which had been made into tube-like artifacts. E. B. Sayles, in his archeological survey of Texas, found other human bone artifacts at the site (collections stored at Texas Archeological Research Laboratory). These unusual human bone artifacts have been described in detail (Hester, 1969a; 1969b). No occupational area was found around the cemetery, though several are in the general vicinity (Hester, 1969a).

In Nueces County, several cemeteries are known. Site 41 NU 2 (on Oso Creek) was investigated by The University of Texas in 1932 (Jackson, 1933); 39 burials containing 93 individuals were excavated but burial goods, mainly traingular mussel shell pendants and a bone tube made from a human femur, were rare. Several areas of occupation were noted around the perimeter of the cemetery. Upstream from 41 NU 2, William Stanton (personal communication) has located two additional cemeteries. One of these, 41 NU 29, has yielded over 65 burials; occasional burial goods were found, including a stone pendant, three large triangular objects made from bison scapula and decorated with drilled pits, and a multi-perforated bone flageolet-like object. Across the creek from this site, Stanton and others have found several burials at site 41 NU 37. The cemetery area is almost totally devoid of occupational refuse, though a large campsite is adjacent to it on the north.

In San Patricio County, Jack Hughes (1951) excavated a cemetery site near Odem. Prior to his work, nearly 50 burials had been removed from the site. He found at least 10 poorly-preserved skeletons, but again burial goods were rare. Associated with one of the burials was a corner-notched arrow point with a finely-serrated blade; the landowner found two Scallorn arrow points and a small side-notched dart point with burials he unearthed at the site. There was no midden debris in the cemetery area, but a large campsite is located a few hundred yards to the north.

With this brief examination of cemetery sites on the lower coast, it is quite evident that the Floyd Morris and Ayala Sites have very little in common with them. While bone beads of human bone were

found at Floyd Morris, they bear little resemblance to the human bone tubes found at the Dietz Site; but, the fact that this unusual trait is present at both sites may be significant.

BURIAL PRACTICES IN THE INTERIOR OF SOUTHERN TEXAS

A number of burials have been excavated in the interior of southern Texas, but in most reported cases these have been single interments without associated artifacts (Cason, 1952: 239; Davis, 1961: 5; Hester, 1964a: 2; 1964b: 1, 2; Nunley and Hester, 1966: 244; Mardith Schuetz, personal communication). The burial reported by Cason (1952: 239, 240) was found at the Castillo Site in Zapata County, and was accompanied by numerous tubular bone beads, and a bone tube fashioned from a human ulna. A cremation has been briefly noted by Hester (1964a: 2) from the Minus Site in Dimmit County; a disc-shaped stone bead and fragments of an engraved mussel shell were associated.

In mid-western Coahuila, Avelyra Arroyo de Anda and others (1956) have reported the site of Cueva de la Candelaria, a shaft cave in which numerous burials have been placed. The burials were accompanied by a variety of flint, bone, antler, shell and wooden artifacts. Artifact forms shared by Cueva de la Candelaria with the Floyd Morris and Ayala Sites include: (1) *Oliva sayana* tinklers (2) a triangular conch whorl pendant (3) numerous tubular bone beads (4) *Marginella apicina* shell beads; and, (5) disc-shaped conch shell beads. Many of the disc-shaped conch shell and *Marginella apicina* "beads" were bound together with cordage into rattle-like objects.

We have seen that in southern Texas, large cemetery sites are located along or relatively near the coastline, while inland, single random burials are generally found. An exception to this is the shaft cave of Cueva de la Candelaria, where the roving bands in midwest Coahuila seem to have returned frequently to dispose of their dead. The presence of Brownsville-like artifacts at this site would seem to indicate some trade contact between the Brownsville peoples and the groups in midwest Coahuila, perhaps through intermediary groups. It has been previously suggested (MacNeish, 1958: 190), based on data supplied mainly by Sayles (1935: Table 5) and Ekholm (1944: Fig. 52), that the peoples of the Brownsville complex traded their abundant shell artifacts rather widely.

BURIAL PRACTICES IN THE RIO GRANDE VALLEY

Earlier reports have only briefly mentioned the burial practices in the Cameron and Hidalgo Counties area. In 1933, A. E. Anderson of Brownsville prepared a brief manuscript (unpublished: on file at

the Texas Archeological Research Laboratory) on the burial customs of the Rio Grande delta. He prefaced his report by indicating that his data were unsatisfactory, due to his "neglect in making intelligent observations . . . and in part to the usually scattered and fragmentary nature of the burials." Anderson distinguished two types of burials, which he termed "bone burials" (secondary or bundle burials) and "body burials" (primary inhumations). In the "bone burials" only the skull, mandible, long bones (and sometimes the pelvis) were interred. The arrangement of the bones varied; in some instances, the skull was placed on top of the other bones, while other times, the skull was set on the bottom of the grave pit, and the long bones were placed vertically around it.

His "body burials" were often found lying on the back extended full length, or flexed on the side. Anderson also states (p. 2) that "group burial, of two or three individuals in one grave, is not uncommon."

Two cremations were also noted by Anderson. In each instance, the postcranial skeleton was thoroughly charred, but the skull was not.

As for the placement of the burials, Anderson observed that "lone burials seem to have been the custom, or at least they predominate . . . the point of a hill commanding a good view seems to have been desirable" (p. 3). Banks of old river channels (resacas) were also favored burial areas.

Anderson found only one possible cemetery during his long collecting activities. This was located on the banks of a horseshoe-shaped resaca on the Reparo Ranch in Cameron County. Some eight or nine individuals were buried in an area about 25 to 30 feet square. One incised shell ornament, circular and perforated near the center, was found.

Only about ten percent of the interments excavated by Anderson contained burial goods. He describes these only in general terms: "Shell, stone, and occasionally bone [tempered?] pottery and asphalt are the lasting materials encountered in the graves. Ornaments are more likely to be found in a child's grave than in an adult's."

Though not mentioned in his manuscript, Anderson did uncover a burial exposed by ditch-digging on 14th Street in Brownsville (Texas Archeological Research Laboratory collections). The burial, which seems to have been that of a child, was accompanied by numerous *Marginella apicina* shell beads. Briefly, other burials of note that were found by Anderson in the area include: (1) a burial on the Fresnos Resaca in Cameron County which contained a perforated shell ornament with a human face (?) carved on it in low relief; and (2) a

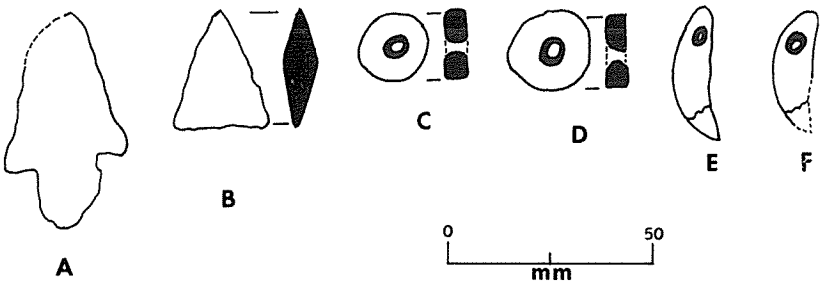

FIG. 1. Artifacts from the Rio Hondo Cemetery Site. a, Stemmed obsidian projectile point; b, Triangular projectile point; c, d, Conch shell disc-shaped beads; e, f, Perforated canine teeth. (artifacts drawn from sketches by T. N. Campbell, 1956).

burial containing two individuals (a female and a juvenile) in which the skeletons were flexed on the left side, with the skulls directed to the south, and the hands placed on front of the faces.

In 1935, J. Alden Mason reported burials excavated by Anderson which contained intrusive Huastecan-like pottery. Also in 1935, a local newspaper (the Harlingen *Valley Morning Star*) reported that a number of skeletons were uncovered by road construction near the Hidalgo and Cameron Counties boundary, north of the Arroyo Colorado. The article states "Bones, many of which are in a semi-petrified state, are being unearthed by a big plow pulled by a tractor. Plowing thus far has covered about half an acre. Groups of bones are scattered over this area. One fairly complete skeleton has been uncovered, and a large number of stray bones, including several skulls and other separate bones. The burial ground is located on a large knoll, and graves are about one to two feet deep."

In 1956, a local school teacher, Dick Harris, investigated a cemetery near Rio Hondo uncovered by land-leveling operations. Unfortunately, we know very little about the site, but Harris was able to salvage several burials (letter to T. N. Campbell, August 8, 1956). Associated with these burials (see Fig. 1) were conch shell disc-shaped beads, perforated canine teeth, and one or two shell gorgets. The landowner excavated one burial and found a triangular projectile point associated with it. A stemmed obsidian dart point was collected from the surface of the site. Harris estimated that 20 to 40 burials were present at the site. From these indications, the site seems quite similar to Floyd Morris and Ayala.

While we have this data on burial practices in the Rio Grande delta area, there is little evidence with any of the burials to firmly link

them to any defined cultural unit; some, like the burials reported by Mason (1935: 38), a couple mentioned by Anderson and the Rio Hondo cemetery, may be attributable to the Brownsville complex, but this has not been convincingly demonstrated. MacNeish (1947, 1958) has described and defined the Brownsville complex, which is characterized by the extensive use of marine shell in the production of tools and ornaments. Though MacNeish believes the complex to be primarily Neo-American (and extending into the historic era) in age, his assumptions are based exclusively on surface collections. In his 1958 paper, MacNeish has summarized his impressions of the Brownsville complex (and the neighboring Barril complex) burial customs: "Burials of these complexes are usually flexed and in shallow pits near or in campsites. For the most part they are without grave goods. However, several have with them a few beads or pendants, and a number have whole Huastec pots . . ." (p. 192).

This very generalized summary by MacNeish, as well as the sketchy data compiled by Anderson and others, does not help us very much in trying to fit the Floyd Morris and Ayala cemeteries into the local archeological picture. Similarly, the data on the burial customs of the historic Coahuiltecan groups in the area is also very unsatisfactory. Ruecking (1955: 139) cites Leon, who stated that the dead were buried away from the village, and that cremation was sometimes practiced.

Prior to the reporting of the Floyd Morris and Ayala Sites, this previous research in the Rio Grande delta provided the following burial characteristics which were later to be recognized at Floyd Morris and Ayala: (1) flexed burials; (2) multiple burials; (3) primary and secondary burials; (4) associated shell artifacts; (5) location of burials on high elevations and along resaca banks; (6) placement of some burials away from campsite areas; and (7) presence of other cemeteries.

That the Floyd Morris and Ayala Sites do not conform neatly to the previously reported burial patterns in the area should not be surprising. There has never been any extensive excavation program carried out at sites in the delta region; most of what is known about the area is based on the large surface collections of A. E. Anderson. He (unpublished notes) has said that the only times he found burials was when they were eroding out (or were completely exposed), or when ditch-digging operations had uncovered them. Since he apparently rarely excavated the area around the eroded burials, he may have missed many additional burials.

Although we can suggest that the Floyd Morris and Ayala Sites

are attributable to the Brownsville complex because of the associated burial goods, this conjecture has to be tentative because of the apparent complexity of burial patterns within this complex and in the whole south Texas region.

HYPOTHESES

It is known that the historic groups in the Rio Grande delta area and in all of southern Texas were affiliated with the Coahuiltecan linguistic stock (Newcomb, 1961; T. N. Campbell, personal communication); and, from the available data, all of the many groups appear to have shared a simple, nomadic, hunting and gathering Archaic lifeway. It has also been assumed that the ancestors of the Coahuiltecans probably inhabited the same area in prehistoric times, practicing a very similar form of subsistence (Suhm, Krieger and Jelks, 1954: 138). It has already been noted in this paper that cemetery sites are concentrated on or near the coast, while in the interior, single burials are found. If the coastal and interior groups were ancestral to the Coahuiltecans (as our historic evidence indicates) then what accounts for the difference in burial customs in the two regions? Three hypotheses are suggested:

1. The readily available and more dependable resources of the Gulf of Mexico made it possible for groups living along or near the coast to range over a much smaller area to obtain their subsistence. Their inland relatives had to be continually on the move in search of food in semi-arid southern Texas and northeastern Mexico. Perhaps the coastal groups, traveling only within a small area, repeatedly buried their dead at one or more conveniently located cemeteries. The interior groups, always ranging over large areas, disposed of their dead at random, without elaborate burial goods.

2. Southern Texas groups near the coast lived in one place during certain parts of the year (perhaps foraging inland during the rest of the year), taking advantage of marine and/or riverine resources. These cemeteries then might represent the burials of people who died during these seasonal encampments.

3. It is possible that the varying burial patterns reflect differing religious, social or governmental modes among individual groups, though their subsistence patterns were quite similar. Our historic data on the Coahuiltecans is meager, though Ruecking (1955) has cited one example of differing governmental traditions among them. He notes that Escandon found "incipient tribal or confederational organization" present among the Coahuiltecan bands in the Rio Grande delta around 1750 (p. 42), while most other Coahuiltecan groups in other areas purportedly were very loose-knit governmentally. Per-

TABLE 1
A Comparison of Burial Traits at the Floyd Morris and Ayala Sites.
x: indicates presence of trait.

BURIAL PITS	*Floyd Morris*	*Ayala*
circular-oval	x	x
BURIAL TYPES		
single interments	x	x
multiple interments	x	x
secondary interments	x	probably
BURIAL POSITIONS		
flexed	x	x
flexed on right side	x	?
flexed on left side	x	?
flexed on back	x	?
head to north	x	?
head to south	x	?
head to east	x	?
head to southwest	x	?
head to west	x	x
BURIAL GOODS		
tubular bone beads	x	x
perforated canine teeth	x	x
disc shaped conch shell beads	x	x
disc shaped stone beads	x	
Oliva sayana tinklers	x	x
Oliva sayana beads		x
Marginella apicina shell beads	x	
Noetia ponderosa shell beads	x	
incised rectangular bone pendants		x
undecorated rectangular bone pendants		x
red ochre		x
bones coated with pigments	x	
deer antler beams		x
large conch whorl pendant		x
human bone artifacts	x	

haps the incipient confederational organization would be reflected in more uniform burial customs among the groups, but this is impossible to ascertain with our present data.

However, these hypotheses are constructed on the assumption that cemeteries are the modal form of burial along the coast and in the Rio Grande delta, but the data of Anderson and others has shown that other types are present. A systematic study of burial practices is needed on the coast, and the careful excavation and recording of future burials is essential. Continued land-leveling and other forms

of progress will undoubtedly uncover other cemeteries in the future; persons engaged in salvage efforts at these sites should obtain a maximum amount of documentation, and where feasible, attempt to locate adjacent occupation areas. Furthermore, the cemeteries present on the central and upper coast should be carefully analyzed; perhaps the key to our understanding of the Rio Grande delta cemeteries can be found there.

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The McCann Site

NOLAN E. PRESTON
Technological Analysis by JOEL L. SHINER

ABSTRACT

Artifacts recovered from a deeply stratified midden in Central Texas are analyzed both typologically and technologically. Certain traditional mythology regarding typology is questioned.

ACKNOWLEDGEMENTS

The excavation of the site could not have been possible without the kind cooperation of the land owner, Mr. Gordon McCann. His interest in the excavation was an inspiration and Mrs. McCann's hot coffee during the winter months was an added incentive.

Many hours of hard labor, digging and shoveling, were shared by the author's companion, Mr. Richard Pruitt.

Valuable information on the classification of artifacts was furnished by Robert Forrester of Fort Worth. Mr. R. K. "King" Harris also helped in the identification of several projectile points, as did Mr. Jay Blaine on the "Paleo" points.

Mr. Roy Padgett of Fort Worth kindly furnished information on several tool types and on organizing this report.

Dura Maye Brisco was most helpful in converting the field notes of two years excavation into publishable form.

Mr. Hubert Achor of Dallas is responsible for the photography of the artifacts. His method is especially designed to emphasize techniques of manufacture and to play down ephemeral accents of natural coloration.

GEOGRAPHY AND GEOLOGY

In Lampasas County, twenty miles from the Colorado River and twelve miles from the Lampasas River, runs a broken line of hills and mesas. On the eastern side of these hills a valley gently edges up to the largest mesa and probes a finger up the eastern side in the form of a deep and wide gorge. The gorge rises to 1500 feet above sea level and terminates at a point 20 feet below the top of the mesa. Here a rapidly flowing spring emerges and flows down the ravine. Materials that form the basis of this report were found in midden trash and adjacent to the spring.

The topography of the area is typical of the hill country in central Texas. The valleys have a rich tan loam, which, when cultivated, grows bluestem, buffalo and witch grass. Along the rivers, hardwoods

such as pecan and walnut grow. The hills are limestone and where soil permits, mesquite, live oak, juniper, and elm thrive. Shin oak grows in profusion on the thin soil. Opuntias, known more commonly as "prickly pear", grow well and are plentiful in the area. The average annual rainfall is 30.24 inches. The average January temperature is 47 degrees and that of July is 87 degrees (Texas Almanac, 1955:577).

The site areas are located on top of a mesa that has a measured elevation of 1580 feet above sea level. Below the crest, between 1540 and 1560 feet, are several acres of fairly level land that surround the gorge on both sides. There are 5 different sites, each with a large fire pit, scattered about the area. The mesa is limestone with a very thin layer of soil ranging from 2 to 4 inchs. Outcroppings of limestone ridges make walking an easy means of getting about, but by automobile, following a crude trail 4 miles up the side of the mesa, a hazard.

None of the mesa top sites are worthy of excavation due to the thinness of the soil. Other than an occasional surface find tools are scarce. Camp rubble such as broken manos, cores, chips and flakes by the thousands cover the area. The sites were not well known due to the inaccessibility of the mesa. The owner, however, has surface hunted the area for years.

The native flint at the sites is characteristic of that of the Belton and Stillhouse Hollow Reservoirs (Bell County) and that of a site on the Colorado River in Mills County. Basically slate gray, it is flecked with white and varies in shades from light gray to black. Intrusive flints are very plentiful here. One of the most common is the light tan and beige flint found along the Brazos River farther north. Also very common is the chocolate brown flint common along the Llano River. Very fine grained white, red, and black flints are the majority of the intrusive flints. Chert, quartz, and worked obsidian are also found.

Of the five sites checked, all have burned rock middens. The heaviest concentration of camp rubble was found around these burned rock areas (Fig. 1).

Site A has the largest pile of burned rock. Some 400 feet to the southwest is site D which also has a large area of burned rock. Both sites are 20 to 30 feet in diameter and 3 to 5 feet high. Test pits in both areas discovered almost no artifacts. No burials were encountered during any of the excavations or tests in the area.

The McCann site is approximately 125 feet long (east to west) and 40 feet wide. Its shape is determined by the constrictions of the stream bed and the bluff. These natural boundaries created a situa-

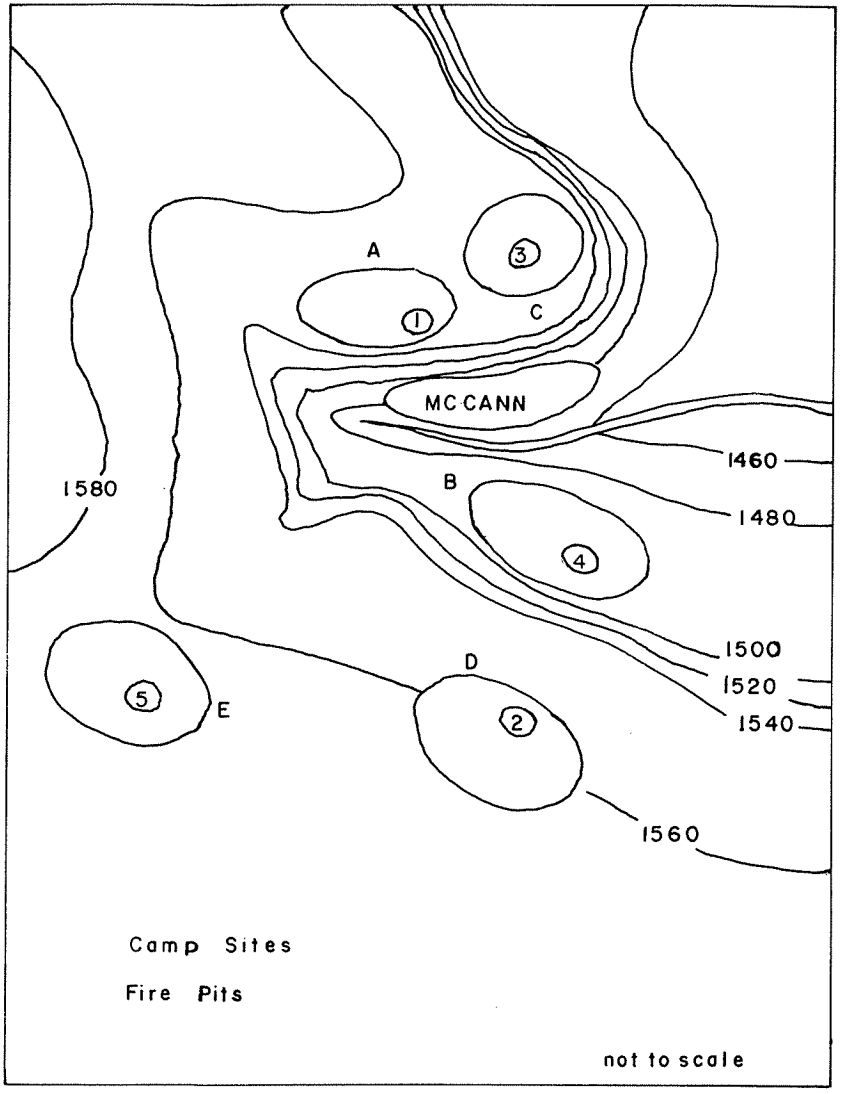

FIGURE 1. Site topography.

tion like that of a rockshelter where later residents were forced to camp on top of earlier debris.

Today the vicinity supports a varied flora which would provide a considerable portion of the subsistence. Among the wild plants that might have been available in the past are the pecan, walnut, bull nettle, oak (acorns), hickory, grape, dewberry, plum, persimmon,

clover, prickly pear, dandelion, nut grass, peppergrass, sunflower, onion and yucca.

An exhaustive assessment of the fauna present in the area today has not been made, but Blair (1950:93-117) is more than adequate for study purposes.

Preliminary analysis of the bone from the midden indicates deer and bison from all levels, but more abundant in Zones I and II.

EXCAVATIONS

It has already been mentioned that the burned rock middens on the mesa top were not worth excavating because of the erosion and because of the lack of artifacts. Much of the topsoil and possibly some of the artifacts came over the cliff and were deposited on the McCann site. Initially, it was believed that the erosion and redeposition would create a situation which would include some reverse stratigraphy. The artifact analysis, however, does not appear to bear this out.

The excavation was planned to cope with both vertical and horizontal differentation. Horizontal controls were maintained by a grid system of five foot squares. Initially, vertical controls were imposed as arbitrary six inch levels. Almost immediately however, natural stratigraphy was encountered, and the arbitrary levels were altered so as to subdivide the natural zones (Fig. 2).

Zone I had a mean thickness of 18 inches and was excavated in three levels, beginning at the surface of the site. The matrix was black topsoil with considerable ash. It was tightly packed and contained almost no burned rock.

Zone II had a mean thickness of 30 inches and was subdivided into six arbitrary levels. The matrix consisted of large amounts of gray to white ash and a great accumulation of burned fragments of limestone. The rocks showed no consistent structure and no clear patterns were evident.

Zone III was approximately 18 inches thick and its horizontal dimensions were much smaller. It was 70 feet long and 25 feet maximum in width. The soil was dark brown in contrast to the yellow clay subsoil, and it showed little evidence of the ash and burned rock encountered in Zone II.

CLASSIFICATION OF ARTIFACTS

Projectile point classification was guided by the "Handbook of Texas Archeology" (Suhm, Kreiger and Jelks, 1954), and by "Excavations at Stillhouse Hollow" (Sorrow, Shafer and Ross, 1967). Some difficulties were encountered in the matter of the range of the various dimen-

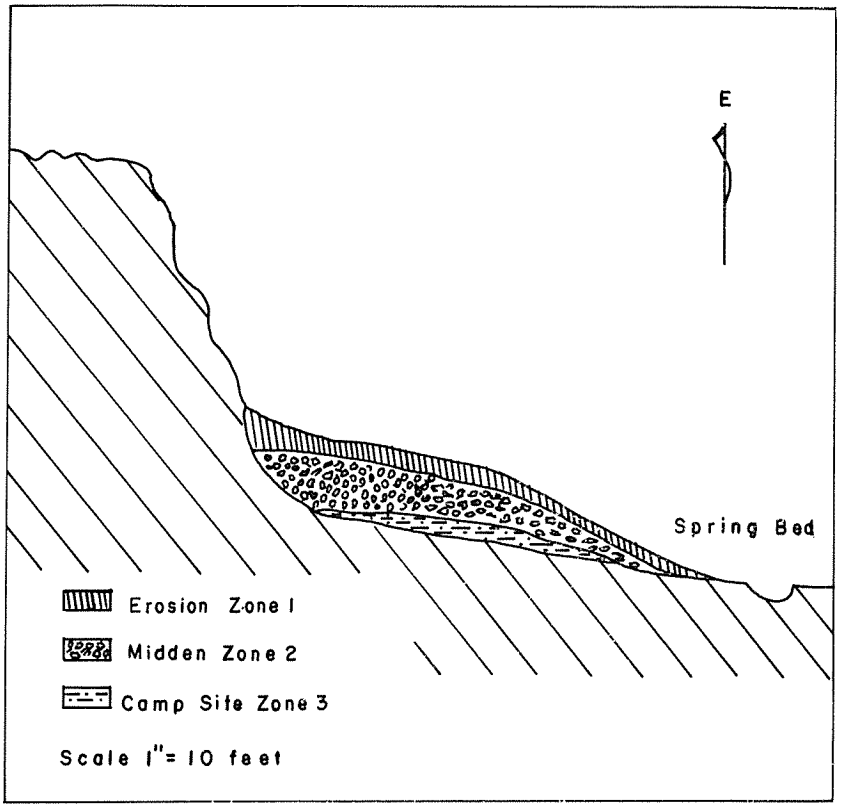

FIGURE 2. Stratigraphic profile of midden.

sions of the points, and the author (Preston) accepts all responsibility for the classification.

Other tools are classified (Shiner), as nearly as possible, into categories that reflect morphology and technique of manufacture. This "system" recognizes that function can rarely be ascertained at this stage in American Archaeology, but shape and process can be described. This avoids the obvious trap of reading use into type names.

Scrapers are classified according to a modified European system which identifies the position of the working edge relative to the bulb of percussion.

THE ARTIFACTS

Several lists are necessary in order to indicate the changing frequencies of projectile points and other tools through the various levels and zones. Table I indicates the numbers of projectile point

TABLE I

	ZONE I			ZONE II					ZONE III			
DEPTH	*0-6*	*6-12*	*12-18*	*18-24*	*24-30*	*30-36*	*36-42*	*42-48*	*48-54*	*54-60*	*60-66*	*Total*
Darl	15	4	4	----	----	----	----	----	----	----	----	23
Ensor	18	24	8	----	----	----	----	----	----	----	----	50
Yarbrough	6	5	11	----	----	----	----	----	----	----	----	22
Montell	26	25	14	8	8	6	----	----	----	----	----	87
Marcos	6	7	5	3	2	1	----	----	----	----	----	24
Frio	13	15	9	12	2	4	1	----	----	----	----	56
Castroville	18	17	19	14	6	6	4	----	----	----	----	84
Wells	8	2	3	5	5	1	2	----	----	----	----	26
Marshall	9	19	9	4	8	7	13	----	----	----	----	69
Lange	1	5	4	2	4	4	5	2	----	----	----	27
Bulverde	5	12	6	9	15	32	46	110	28	----	----	263
Travis	2	3	2	6	8	5	17	18	47	----	----	108
Nolan	1	1	2	4	5	6	9	15	80	----	----	123
Pedernales	87	108	93	84	56	59	46	48	16	12	10	619
Martindale	----	1	----	----	1	1	1	1	2	1	1	9
Tortugas	----	----	2	2	----	2	2	5	----	----	----	13
Kinney	----	----	----	----	----	3	2	2	----	----	----	8
Abasolo	----	----	----	----	----	1	3	1	2	2	----	8
Gower-like	----	----	----	----	----	----	----	----	2	1	----	3
Plainview-like	----	----	----	----	----	----	----	----	1	3	1	5
Angostura-like	----	----	----	----	----	----	----	----	----	2	----	2
Unclassified	----	----	----	----	----	----	----	----	----	----	1	1
Total	215	248	191	153	120	138	151	202	178	21	13	1630

types recovered with each level. Frequencies have been omitted from the table because there is considerable doubt as to the validity of many of the types and more doubt as to the ability of any two individuals to agree on the classification of a significant number of the points.

Not shown in the list of projectile points are 30 specimens usually referred to as arrow points because of their small size. All were found on the surface of the site. They include 15 Scallorn, 3 Young, 1 Alba, 1 Fresno, 1 Perdis, 2 unclassified and 7 fragmentary specimens. There is no further information on this material, and no grounds for speculation on its relationship to the buried artifacts.

Projectile points recovered from Zone I are exceptionally numerous and are of many types. Of considerable interest is the presence together of significant numbers of points thought to be relatively early and others thought to be characteristic of late Archaic. Ensor, Darl and Yarbrough points were recovered along side Bulverde and Pedernales; not just at the same depth, but within each substratum of the natural zone.

There is some variety to be found in the raw material used, in the quality of workmanship, in the range of proportions and in gross size. The Ensor type had many specimens that were of quite superior workmanship (Fig. 3 d, e). The Ellis type was smaller than would have been expected. Bulverde and Pedernales types included a number of outsized specimens, many of which are exceptionally well made (Fig. 3 m, n).

A most unusual phenomenon at the McCann Site is the frequency of complete projectile points particularly in Zone I. Large numbers of points are absolutely undamaged down to the smallest details of tips and barbs. This group includes quite a few types that are long, thin and slender. At the other extreme, 17 out of the 19 Frio specimens had been broken. No explanations can be given for the breakage or the preservation, for there were no burials and no caches.

Zone II consists of a natural level some 30 inches in depth. It is not only thicker than Zone I, but it shows more apparent change in the projectile point styles within the Zone. The types Montell, Marcos, Frio, Castroville, Wells and Marshall are not present at the lowest arbitrary division of the level, but become more frequent in the upper strata (Fig. 3). Bulverde and Pedernales types are particularly frequent all through Zone II. Travis and Nolan points are most numerous in the lower levels of Zone II as well as in the highest arbitrary level of Zone III.

This is a most impressive array of projectile points. The 651 speci-

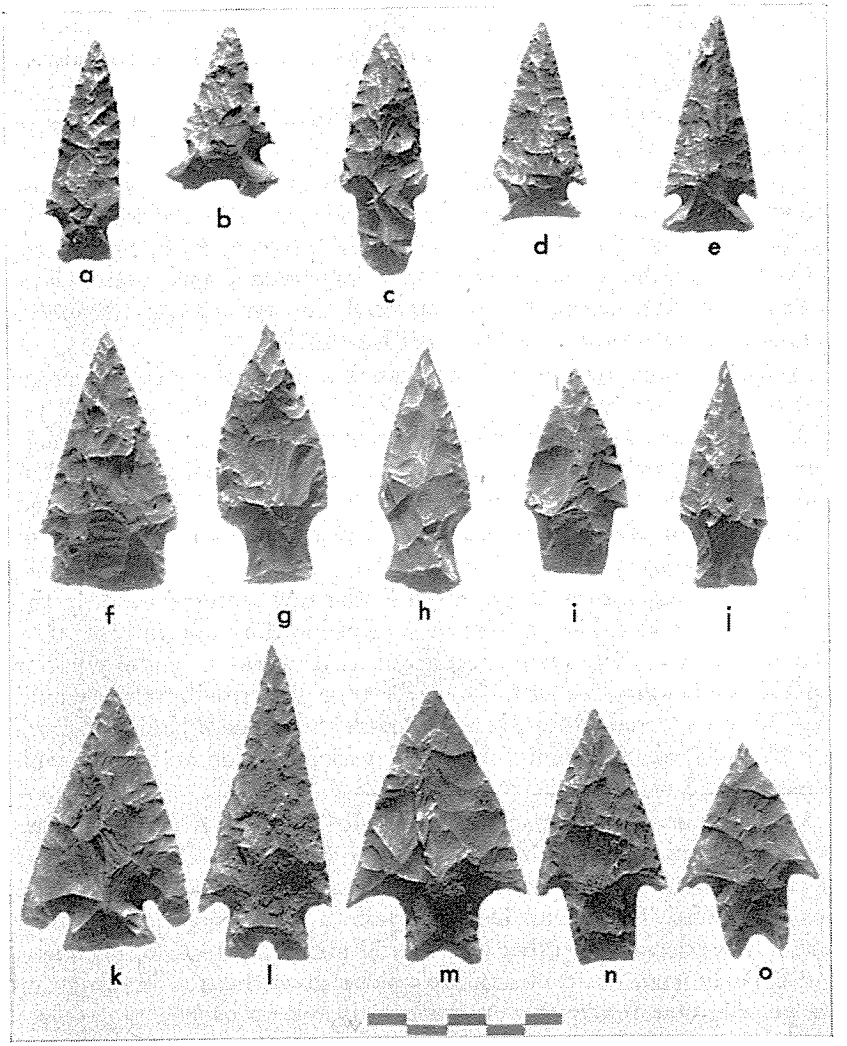

FIGURE 3. Points: a, Darl; b, Frio; c, Wells; d, e, Ensor; f, Castroville; g, Travis; h, j, Nolan; i, n, Bulverde; k, Marshall; l, Montell; m, o, Pedernales.

mens from Zone I and the 737 specimens from Zone II are listed for the purpose of illustrating typological change and the Table does not include a large number of fragments. Neither does it include a number of point types which are represented by extremely small samples (Palmillas, Kent, Uvalde, Fairland, Edgewood, Williams). Most of these types have only one to three examples at any one level, merely overcomplicating a complicated typological morass.

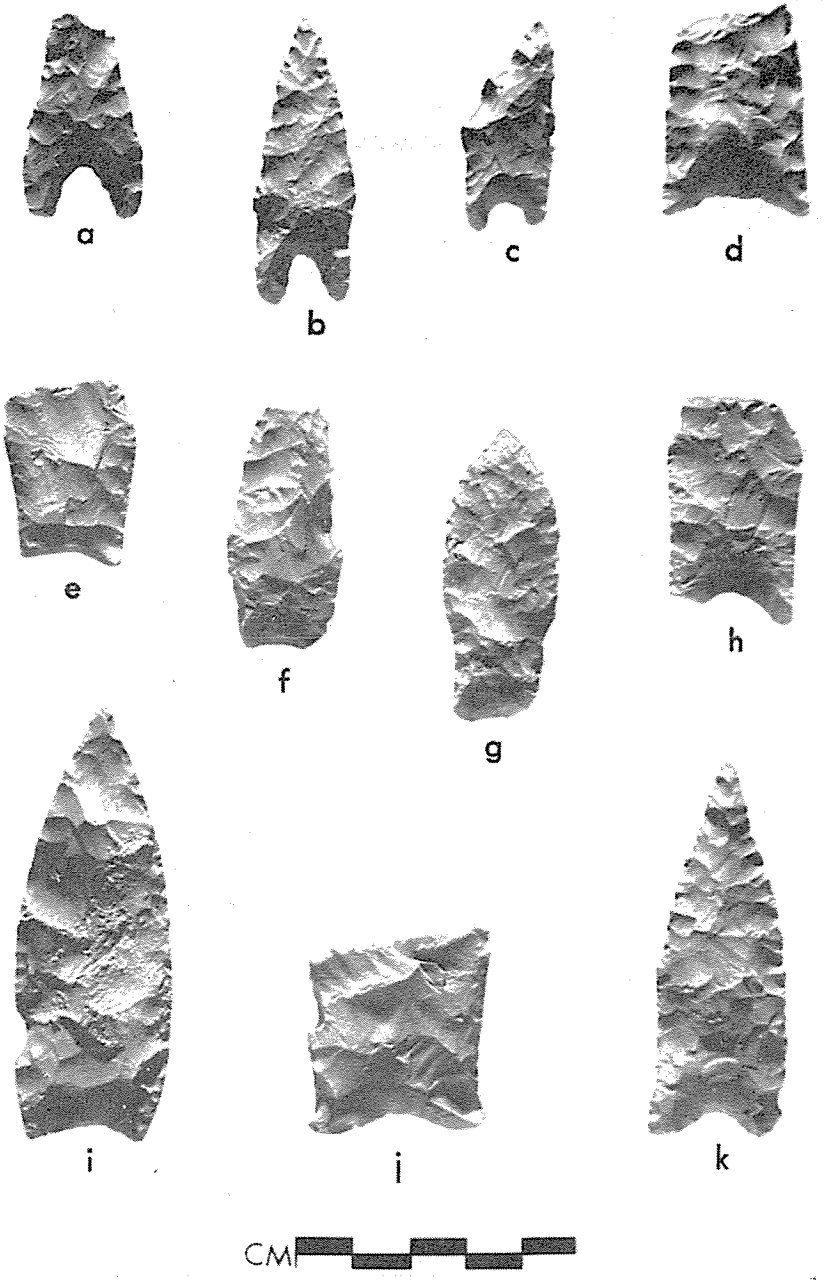

FIGURE 4. Paleo-points. a-c, Gower; d, Plainview; e, j, unclassified; f, g, Angostura-like; h, k, Plainview *golondrina*; i, Plainview-like.

Zone III, subdivided into three arbitrary levels, covered a smaller area and contained fewer projectile points (218 specimens). As a unit, it appears to represent a more or less continuous deposition of midden materials since there are no obvious subdivisions. There are no apparent natural lines of stratigraphy, no lenses and no sterile layers within the larger natural zone.

The projectile points usually regarded as "Paleo" (Fig. 4) were recovered at the same level and frequently directly above points considered to be "Archaic". Such terms as Plainview-like and Angostura-like were used for some of the points even though half of the specimens in each group appeared to fall within the morphological limits of the "types" (Fig. 4 d, g). Two of the Plainview-like points might well be called *golondrina* variety (Fig. 4 h, k). The meaning of the type names and certainly the connotations thereof must differ because of the context of the Archaic situation. Zone III, then, is characterized by Bulverde, Travis and Nolan in its upper portion. Lower in the Zone, and presumably earlier in time, the persistence of the Pedernales type is noteworthy. The "Paleo" types show lateral edge grinding, but so do all the Gower and some of the Pedernales points at this level.

It would appear that certain types are fairly diagnostic for time-markers as far as the McCann Site is concerned (Table II). Thus, Darl, and Ensor seem to be late, Montell and Frio somewhat earlier, and so forth, to Angostura and Plainview as the oldest.

Some significance might be attached to the fact that scrapers in general increase through time, but end-scrapers show the largest increment. More significance, however, may be seen in the virtual absence of all flaked stone in Zone III other than incomplete bifaces and projectile points. Single specimens of burins, biface foliates and retouched flakes contrast peculiarly with the 211 projectile points. Whatever was going on at the site at various periods, it is clear that the activities of Zone III times differed greatly from later times.

Zone II and Zone I are represented by essentially the same tool inventory. Clearly the contrast between the two can be seen in progressive change in tool frequencies.

The scrapers do not show the same characteristic pride of workmanship that is evident in the projectile points. Even so, the forms are extremely well defined (Fig. 5, scrapers from Zone I; and Fig. 6, scrapers from Zone II). Of the few specimens that did not "fit", almost all show some unusual trait such as inverse retouch or placement of the bit at the proximal end. Two additional scrapers, not listed, had been converted into burins by treating the scraping

TABLE II

	ZONE I			ZONE II					ZONE III		
DEPTH	*0-6*	*6-12*	*12-18*	*18-24*	*24-30*	*30-36*	*36-42*	*42-48*	*48-54*	*54-60*	*60-66*
Darl	15	4	4	----	----	----	----	----	----	----	----
Ensor	18	24	8	----	----	----	----	----	----	----	----
Montell	26	25	12	8	8	6	----	----	----	----	----
Frio	13	15	9	12	2	4	1	----	----	----	----
Travis	2	3	2	6	8	5	17	18	47	----	----
Nolan	1	1	2	4	5	6	9	15	80	----	----
Abasolo	----	----	----	----	----	1	2	1	2	2	----
Gower	----	----	----	----	----	----	----	----	2	1	----
Angostura-like	----	----	----	----	----	----	----	----	----	2	----
Plainview-like	----	----	----	----	----	----	----	----	1	3	1

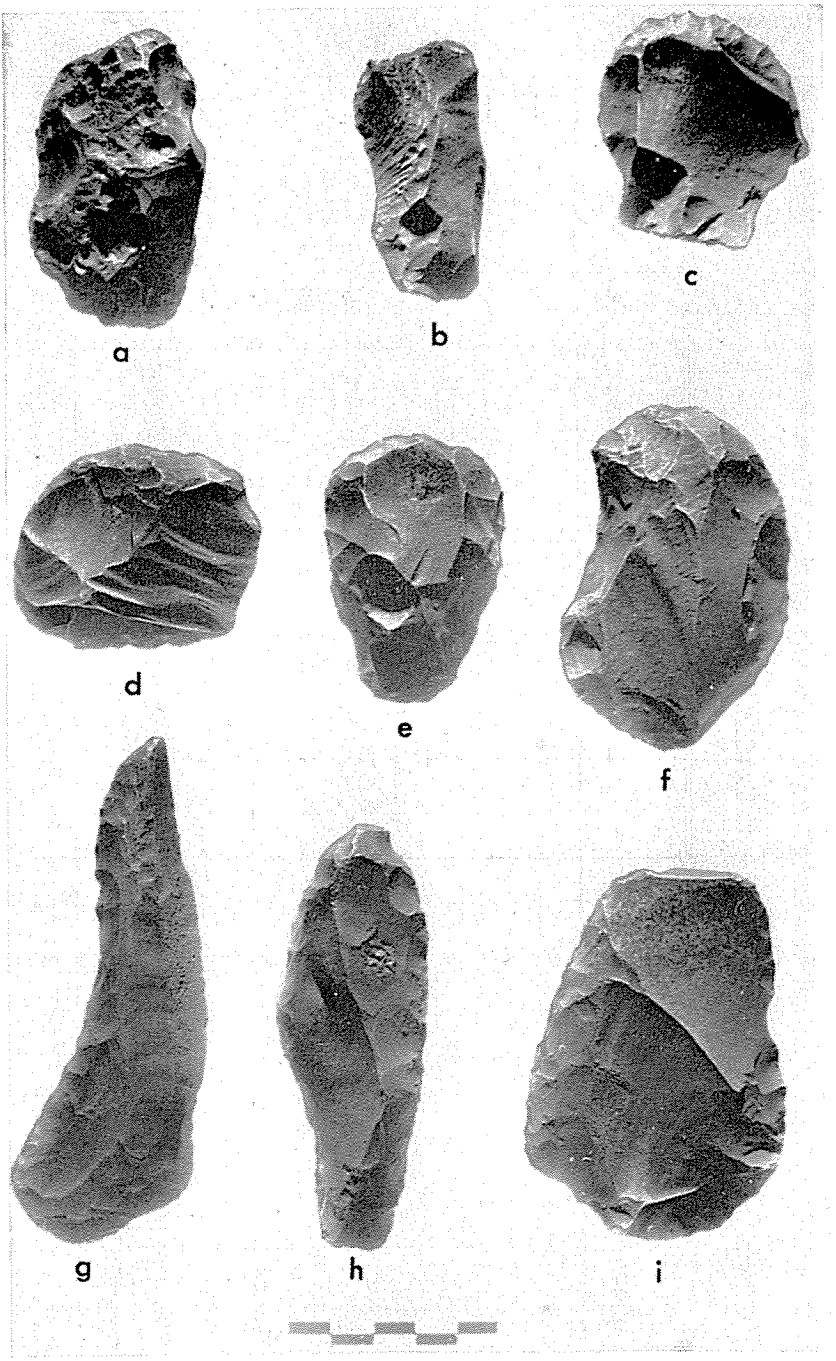

FIGURE 5. Scrapers, Zone I. a-d, end-scraper; d, transverse side scraper; e, f, h, multiple-edge scraper; g, concave scraper; i, side scraper.

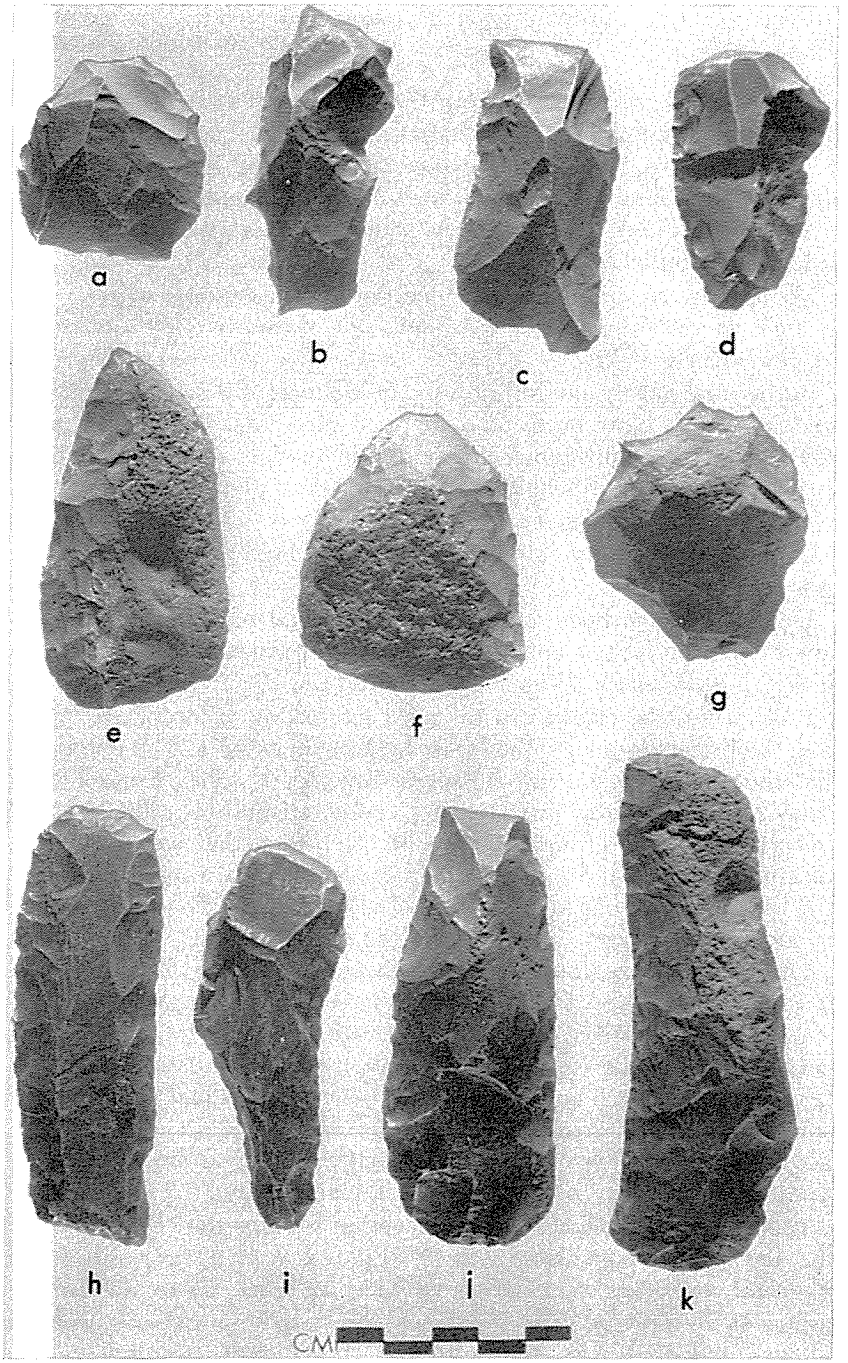

FIGURE 6. Scrapers and other tools from Zone II. a, f, denticulate; b, multiple graver; c, notch on scraper; d, end-scraper; e, j, side scraper; f, i, multiple edge scraper; h, side scraper with graver; k, concave scraper.

edge as a truncation, and striking the burin spall from that surface. One had been an oblique side scraper and the other a transverse side scraper (Fig. 7 a, h). Several scrapers are made on local flint rubble, others utilized flint river cobbles with cortex frequent. No clear preference is indicated. Approximately half of the scrapers had thinned or truncated bulbs of percussion.

Notches are so infrequent that one doubts the wisdom of referring to them as spokeshaves. Six specimens out of nearly 2400 total tools are few indeed.

Burins are mostly on fortuitously or deliberately snapped pieces. One is a single blow burin on a snapped piece and 3 are on truncations. Two of the truncations closely resemble edges of scrapers. Three specimens show additional retouch along the platform in addition to the burin blow (Fig. 7).

Gravers are carefully chipped from a single face, and many of them show multiple bits.

Drills may have been hafted since almost all of the examples are either made on former notched or shouldered projectile points, or are of the "T-head" shape (Fig. 8 a-d; Fig. 10 f).

Bifaces must be considered the most interesting group of all. Other than the projectile points, the bifaces create an enigma. The one thing that they probably are not is knives. Anyone who has worked with stone is aware of the poor cutting characteristics of a biface. The exceptionally large group from the McCann Site, that were available for study, showed three sets of characteristics. One sub-group of 124 had been roughed out by percussion, but because of flaws, poor workmanship, or whatever, had not received further treatment (Fig. 9 e, h, i). A second sub-group of 244 had been roughed out by percussion and then thinned by billet flaking (Fig. 9 d, f, g, j). Many of this stage broke because of (vibration?) shock, or were not finished because of hinged flake "knots" (Fig. 11 a-d), or were ruined by overshot flakes (Fig. 11 e-i). The third group of 66 specimens had been percussion shaped, billet thinned and pressure retouched to complete the job (Fig. 9 a-c). Thus these three groups of bifaces are not several types but are stages in the process of manufacture.

There are other bifaces in the collection such as the "corner tangs" and the "spear" point from Zone I (Fig. 12 a, c, d) as well as the plano-convex pieces of unknown use (Fig. 12 b, e). There are also the large stemmed pieces (Fig. 6 e, f, g) which show roughing out of the notches and shoulders before the specimens were finished. These three all appear to have broken during the thinning stage of the process. Some complete bifaces from Zone II are shown in Fig. 9 d,

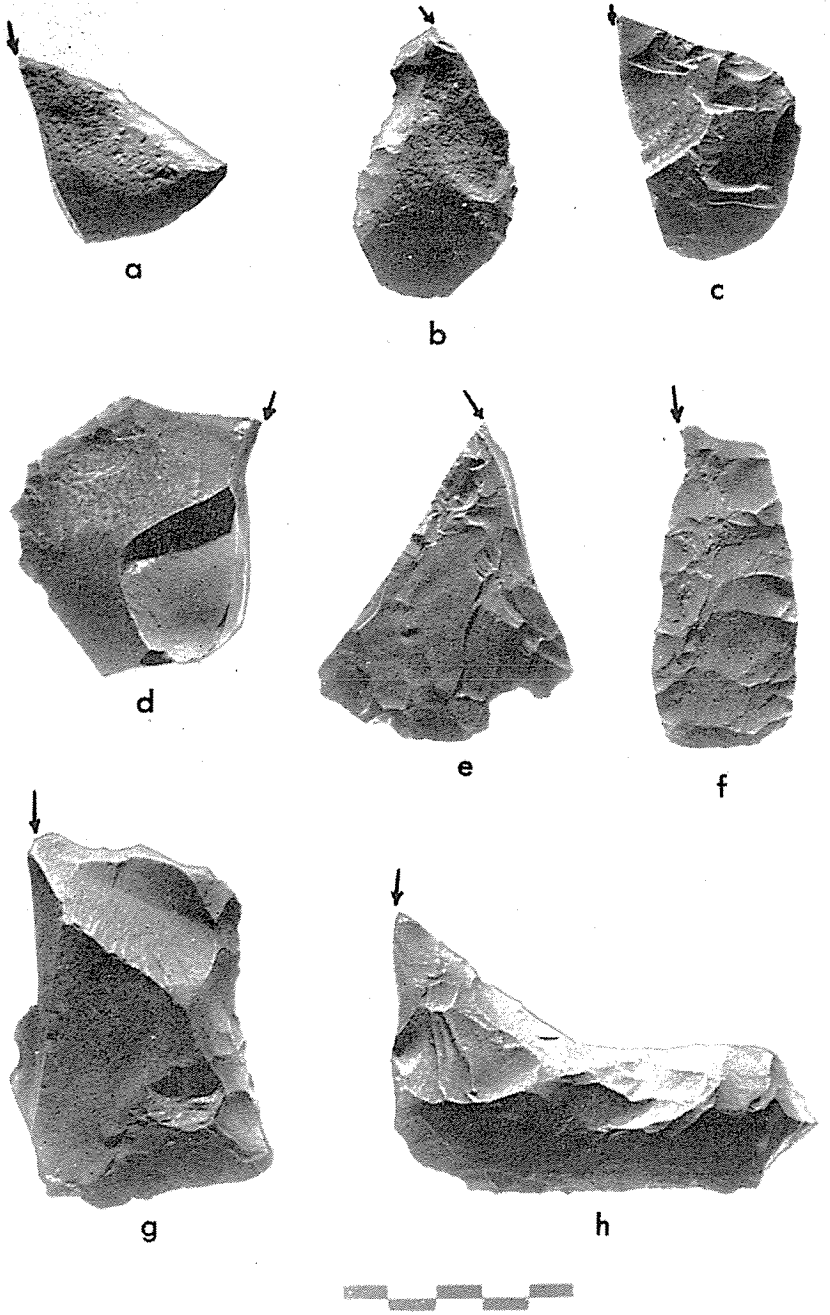

FIGURE 7. Burins. a, b, h, on truncations; c-f on shaped flakes; g, single blow.

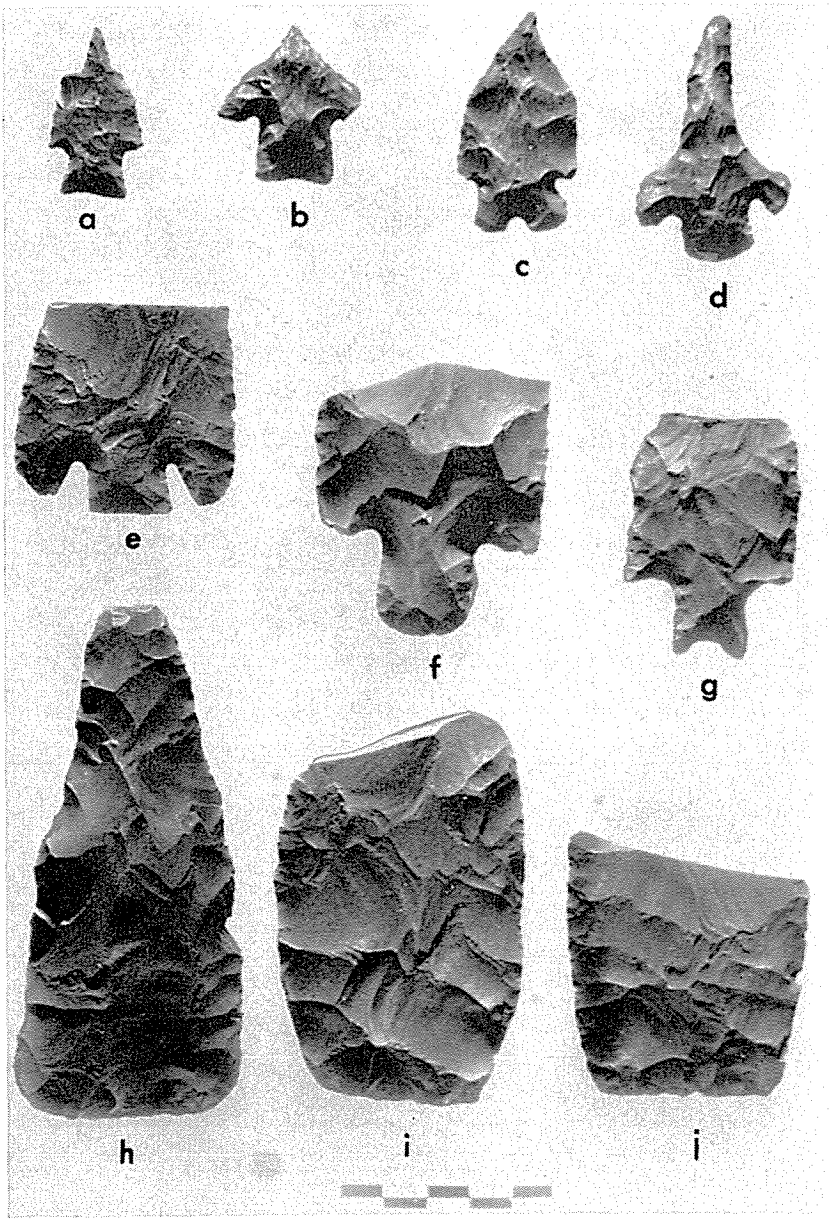

FIGURE 8. Various bifaces from Zone I. a-d drills on projectile points; e-g unfinished points; h-j thinned, but unfinished bifaces.

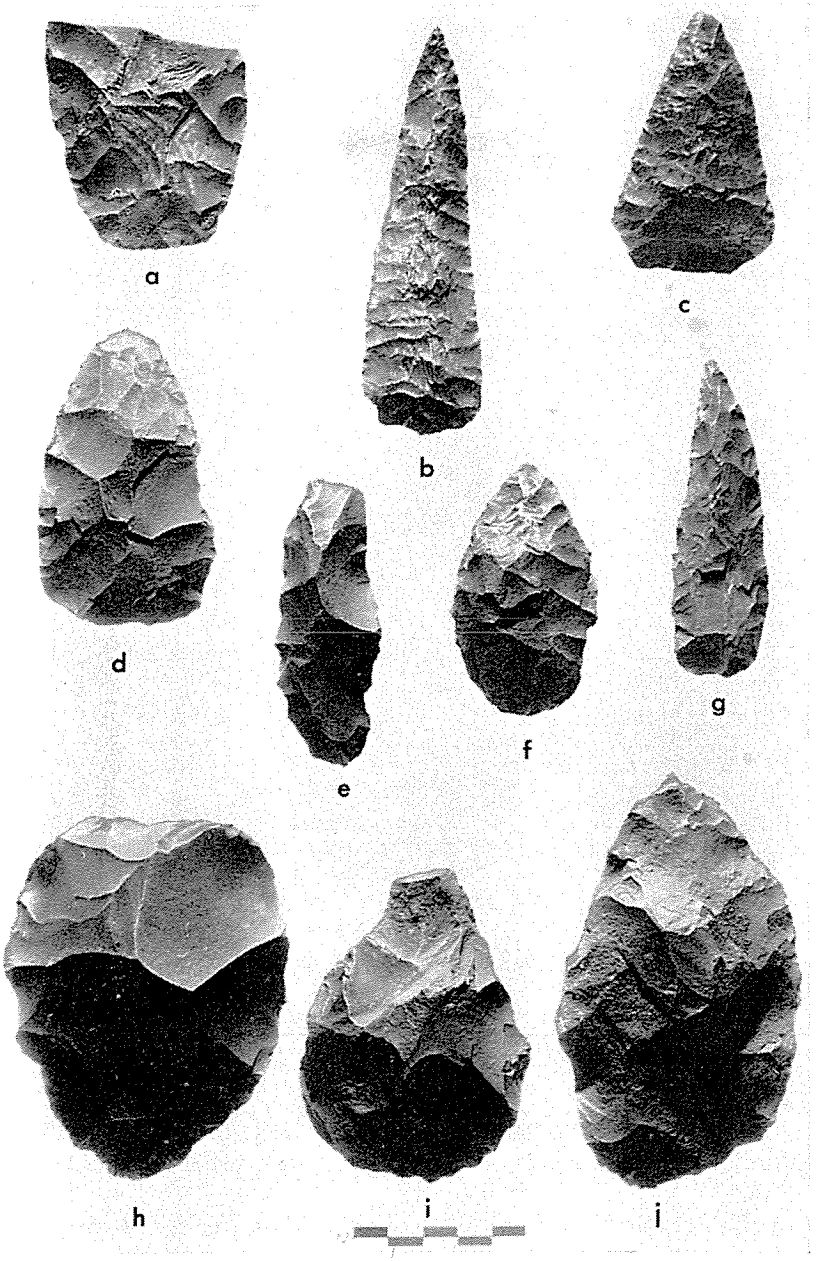

FIGURE 9. Bifaces, Zone I. a-c finished but broken; d, f, g, j, thinned but incomplete; e, h, i, percussion flaked only.

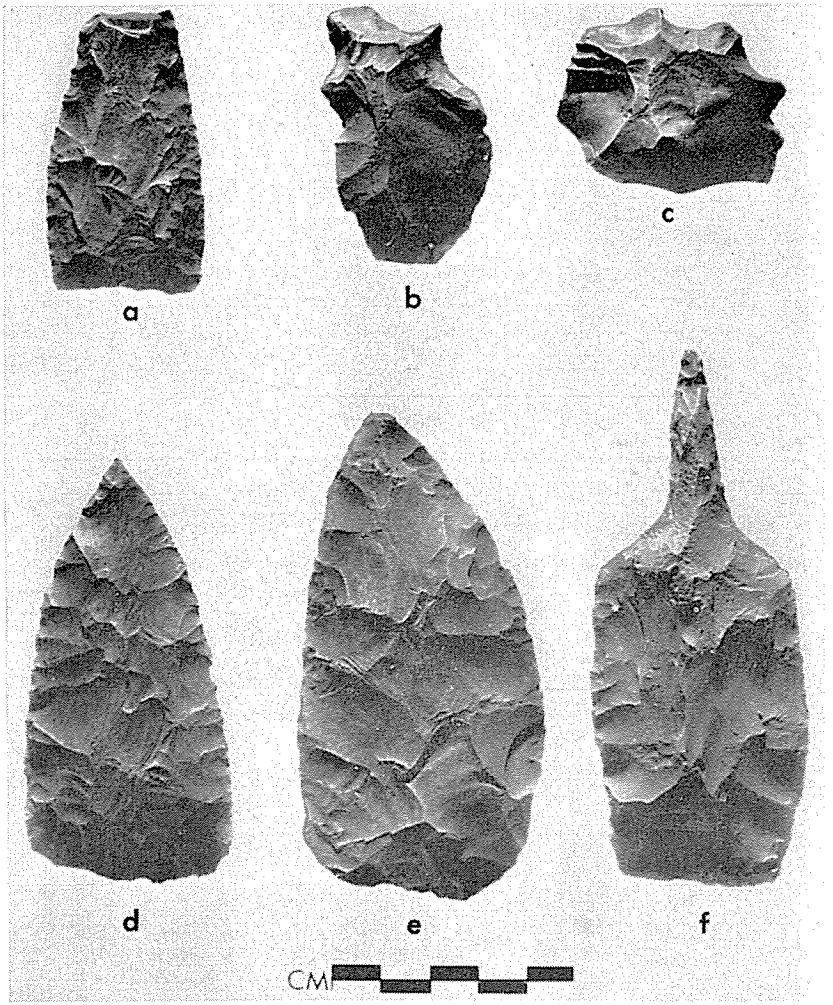

FIGURE 10. Various tools. a, biface broken by impact; b, multiple graver; c, denticulate; d, e, finished bifaces; f, drill, awl or reamer made on a biface.

e. One biface that normally would have been classified as a knife shows an impact fracture, suggesting use as a projectile point (Fig. 10 a).

Artifacts other than those made of chipped and flaked stone include a number of mano and metate fragments found at all levels of Zone I and II. One mano fragment was recovered in the upper portion of Zone III.

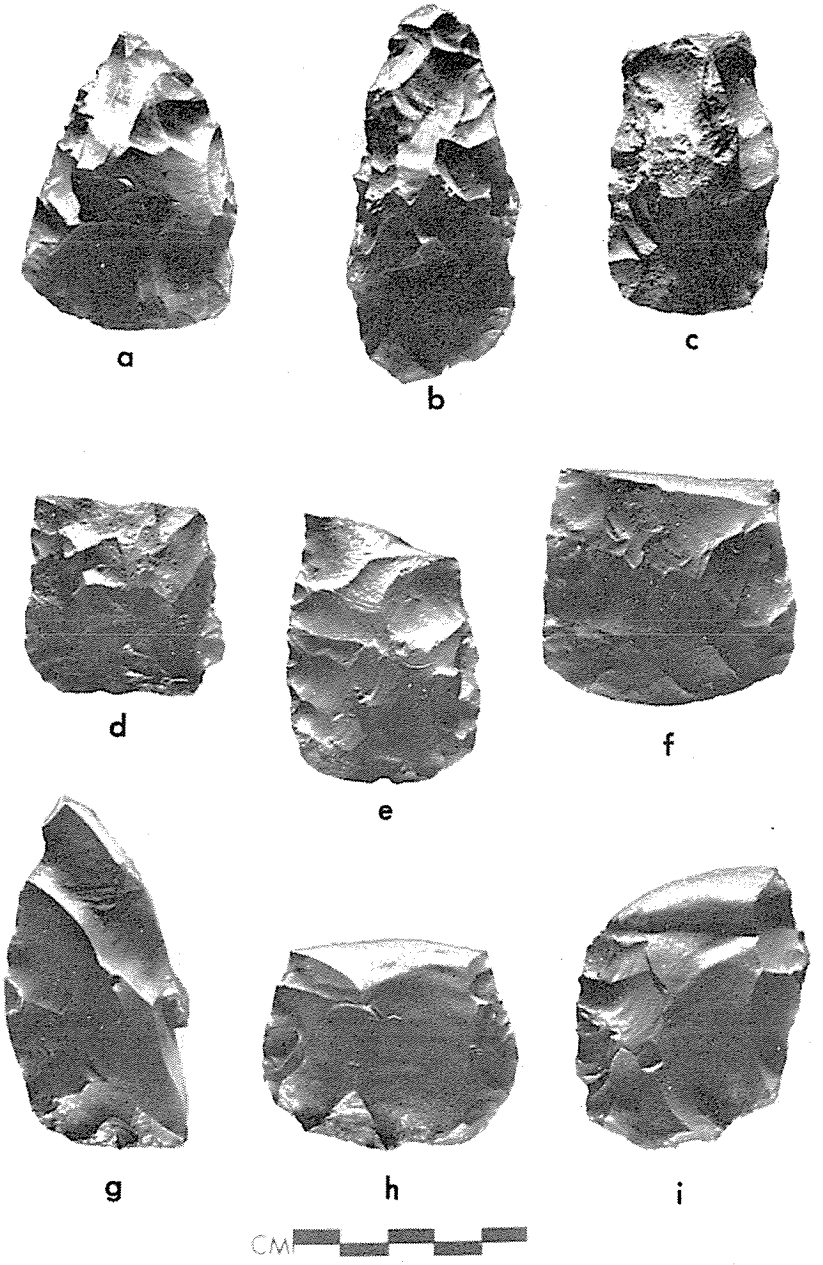

FIGURE 11. Unfinished bifaces, a-d with multiple hinge fractures; f-i, ruined by overshot thinning flakes.

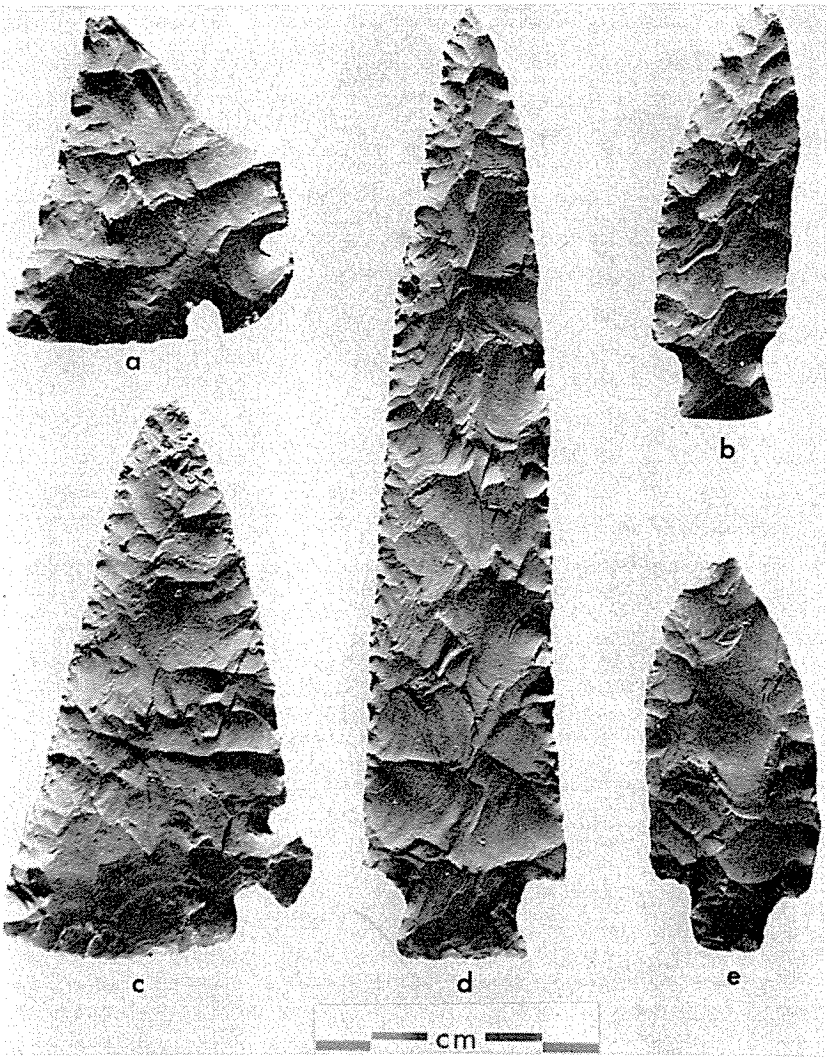

FIGURE 12. Biface, Zone I. a, c, "corner-tangs"; d, "spear" point; b, e, plano-convex.

Two ground-stone objects appear to be atlatl weights (Fig. 13). One is grooved and the other (broken) is notched at the end.

Bone tools were restricted to the later portions of the midden, that is, to the upper 24 inches (Fig. 14). As near as can be determined, the marks on the bones are decorative, not utilitarian.

A stone gorget with at least two drilled holes was recovered in

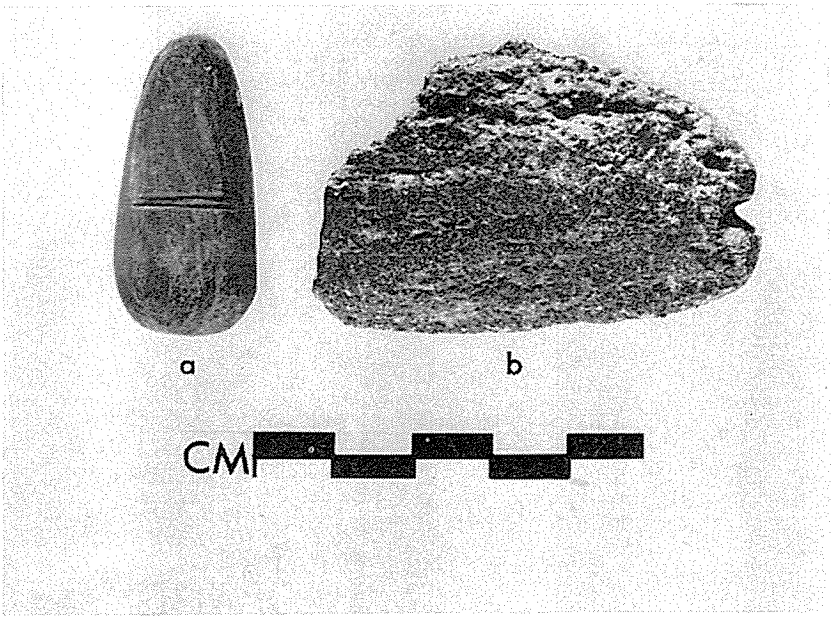

FIGURE 13. Atlatl weights?

Zone I (Fig. 15). It and a bone bead are the only certain ornaments found at the site.

According to what we can see in the stratigraphy of tools (Table III), other than projectile points, not many dramatic changes take place. Since there are too few tools in Zone III to discuss, we can only speak of that unit in terms of projectile points.

Zone II is characterized by a high frequency of retouched flakes, foliates and side scrapers. Zone I is characterized by higher frequencies of end-scrapers, drills and notches. Burins, truncations, corner tang "knives", gouges, and gravers are too few in number to be highly significant, but all of these tools appear to be more characteristic of the upper portions of the site (Zone I and the higher arbitrary levels of Zone II).

Such trends that can be observed, typologically, seem to be from side scrapers toward end-scrapers, and toward more kinds of tools.

One important trend is in the reduction of tool size. There is a considerable and regular reduction in mean tool size from the lower levels to the higher levels. This observation does not include projectile points. They were left out of the calculations because so many were broken. Table IV illustrates the change, expressed as the mean length of all tools in each level, measured along the axis of the original strike.

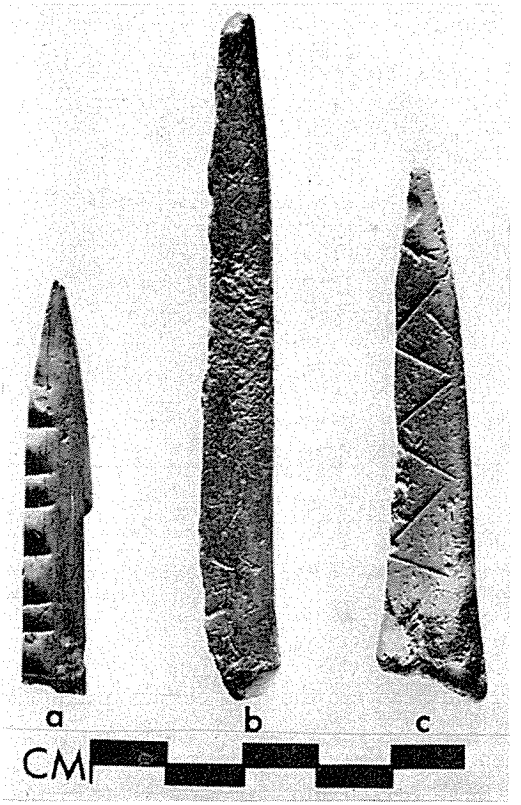

FIGURE 14. Bone awls?

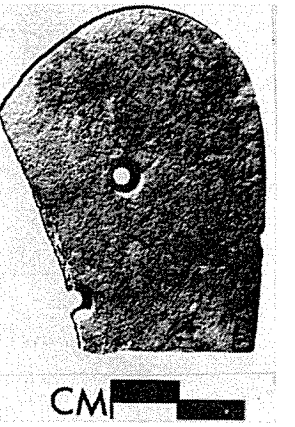

FIGURE 15. Stone gorget?

CONCLUSIONS

A very large sample of tools and other remains were recovered from a stratified site. Because the trash deposit (and/or living area) was squeezed between the cliff and the water, the situation resembles somewhat that of a cave. Stratified materials were inevitable as long as people insisted on living there.

Fortunately, three natural levels existed in the midden. They contrasted in texture and in soil color as well as in artifact content. Excavation of the site in terms of recovering a sequence of projectile points presented no problem other than that of long, hard labor and the resolution to maintain rigid horizontal and vertical controls.

Unfortunately, less attention was paid to the recovery of debris and debitage. A study of this unglamorous material might have shed further light on the activities of the inhabitants. Especially, it might have identified many tools as having been locally made. Also, at the

DEPTH	ZONE I			ZONE II					ZONE III			Total
	0-6	6-12	12-18	18-24	24-30	30-36	36-42	42-48	48-54	54-60	60-36	
Nosed Scraper	1	----	----	----	----	1	----	----	----	----	----	2
End-Scraper	17	14	12	7	3	4	1	----	----	----	----	58
Side Scraper	3	3	6	7	3	2	3	1	----	----	----	28
Side Scraper (2 sides)	3	5	5	2	2	----	2	1	----	----	----	20
Side Scraper Oblique	1	1	2	1	2	----	----	----	----	----	----	7
Side Scraper Transverse	1	----	----	1	----	1	1	----	----	----	----	4
Side Scraper Dejete	----	----	2	----	----	----	----	----	----	----	----	2
Side Scraper Concave	2	3	2	1	----	3	----	----	----	----	----	11
End-Side Scraper	3	8	2	6	2	1	----	----	----	----	----	22
Scrapers Diverse	3	11	5	2	----	1	----	----	----	----	----	22
Denticulate	3	5	1	5	1	1	1	----	----	----	----	17
Notch	2	2	1	----	1	----	----	----	----	----	----	6
Burin	3	3	4	2	1	1	1	----	----	1	----	16
Graver	3	2	2	2	1	1	----	----	----	----	----	11
Unfinished Projectile Points	2	5	1	----	----	----	----	----	----	----	----	8
Preforms	23	27	16	12	10	15	18	3	----	----	----	124
Thinned Bifaces	21	49	48	29	29	25	29	10	3	1	----	244
Foliates	5	6	16	8	11	9	4	6	----	1	----	66
Drills	10	5	10	4	----	----	----	----	----	----	----	29
Plano Convex Bifaces	----	----	1	1	----	----	1	----	----	----	----	3
Clear Fork Gouge	1	1	1	----	----	----	----	1	----	----	----	4
Corner Tang Knives	----	1	2	1	----	----	----	----	----	----	----	4
Truncation	3	----	----	----	----	----	----	----	----	----	----	3
Retouched Flake	7	4	6	14	8	4	1	2	----	1	----	47
Varia	----	3	4	----	----	----	----	----	----	----	----	7
Ax	----	----	1	----	----	----	----	----	----	----	----	1
Total	117	158	150	105	74	69	62	24	3	4	0	766

time of excavation, no rational system was available for the classification of scrapers and some of the other tools. Consequently, quite a few of these tools could not be figured into the story. They had been classified, or rather placed into funny categories, and then discarded following the examples of available literature on central Texas.

TABLE IV

Mean length of complete tools other than projectile points

DEPTH	*0-6*	*6-12*	*12-18*	*18-24*	*24-30*	*30-36*	*36-42*
Number of specimens	39	53	47	29	17	17	8
Mean length in millimeters	54.2	64.8	62.5	62.3	71.8	73.3	80.6

The majority of the usable and significant data comes from the sequence of projectile points (Table I). There is no escaping the fact that the relative positions of the points are quite secure. Rodent holes and all other excuses cannot be used here except to a minimal extent. If numbers of points were moved up or down subsequent to their deposition, the clearly demarked zones would not have remained intact.

Some of the data are as follows: the Stillhouse Hollow point sequence (Sorrow et al., 1967) is confirmed at least in part; Bulverde and especially Pedernales are established as "resident" types (Fig. 16); Gower or Gower-like points are confirmed as early in the sequence; "Paleo" points did occur along side of types that are considered to be "Archaic."

There is no further evidence on the meaning of projectile point types. We cannot guess why so many types appeared, apparently together, in the midden. We are unable to comment on the significance or even the existence of trade in projectile points. Had all of the debris been available for study, perhaps we would know a bit more about trade.

Less is known about the "other" tools of flaked stone, and a larger sample would have been desirable. Nevertheless, a considerable continuity of activity is indicated, whether or not the inhabitants were in the same ethnic "lineage" (lineage in the loose sense of the word). No meaningful discussion is possible on the relationship of Zone III to Zone II. On the other hand, from Zone II to Zone I there are almost overwhelming similarities. These are in spite of very apparent changes in point types.

The three stages of bifaces, the more frequent of the scraper types

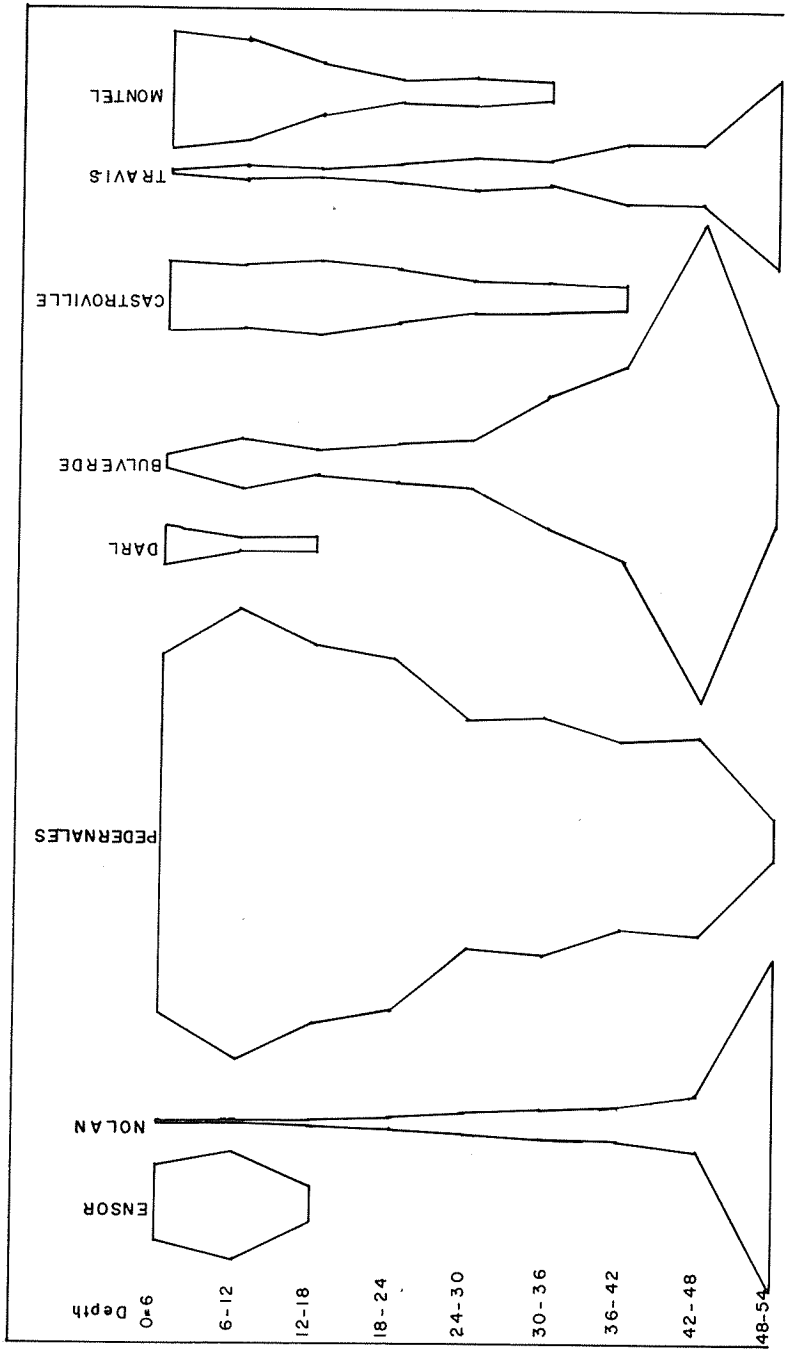

FIGURE 16. Relative percentages of major point types according to level.

are relatively consistent. Yet there is change. It can be seen in a shift from side to end-scrapers, in artifact size and in the diversity of tool types.

It may be speculated that the McCann Site was a base camp for different kinds of activities. Whatever the use of the large bifaces may have been, one must suspect that the residents might have made what amounts to a surplus of them; the reasoning being that if 368 of them were not finished, how many might they have completed? How many could have been sold or traded? Was the making of bifaces an economic activity at the site?

The presence of bones of large mammals suggests hunting, and the presence of manos and metates suggests gathering of various plant products. The discarding of large numbers of apparently serviceable projectile points may indicate some supernatural belief. An often repeated "folktale" in Central Texas has it that the Indians would discard points that had killed something. Sometimes these tales are based on authentic aboriginal beliefs.

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Paleo-Indian Blades From Western Oklahoma

HALLETT H. HAMMATT

ABSTRACT

Two known Paleo-Indian sites in western Oklahoma have been yielding prismatic blades from unstratified deposits. It is suggested, on the basis of stratified parallels, that these blades and others of the same description belong to the Paleo-Indian period. These artifacts would have been admirably suited for use as butchering tools and would have formed as important a part of the Paleo-Indian economy as the characteristic projectile points. It is shown that there are causal relationships between certain characteristics of the blades, and that a substantial degree of skill and knowledge would be required for their manufacture.

In the past few years the archaeological evidence has been disclosing, in addition to projectile points, a variety of new tool types which must have formed an everyday part of the economy of the Paleo-Indian period.

Common to all stone using hunters throughout the world is the need for tools and weapons to kill the prey, butcher the meat and prepare the skin for clothing. Their tool and weapon types have been designed to meet these three basic needs. Can one assume that the types which the Paleo-Indian hunter developed to fulfill these three needs were any less specialized in shape and function than those of other stone using hunting cultures? The various kinds of Paleo-Indian proectile points compare quite favorably in specialization of manufacturing technique and form to the finest of the European Upper Paleolithic. Such points, of course, could only have been used to slay the hunted animal. But what of the tools developed by the Paleo-Indian hunter to butcher the meat and cut and prepare the skin? Surely, we can assume the force of ingenuity in the development of scrapers and butchering knives to be equal to that which produced the projectile points.

The possibility of a solution to the problem of how and with what the Paleo-Indian hunter butchered his prey was most dramatically presented by the discovery of a cache of twenty-six prismatic blades with a number of massive core chopping tools and disc shape choppers in Caddo County, Oklahoma (Hammatt, *American Antiquity*: in press). In an attempt to assign this cache of artifacts to one particular period of American prehistory, one was struck by the obvious parallels presented by the discovery of a similar group of blades at the Clovis Site in New Mexico. These blades were assigned to the Llano culture both on the evidence of the stratigraphic position of the find in the

Grey Sand (Bed 2) of the gravel pit, as well as on the evidence of other stratified parallels (Green 1963:157).

In addition, western Oklahoma has yielded new evidence that these uniformly manufactured blades belong to the Paleo-Indian period. Two canyons in the same area, which have been known for many years to contain Paleo-Indian deposits, have yielded prismatic blades of exactly the same description as those mentioned above. One, Cedar Creek, on the eastern edge of Washita County, north of the town of Carnegie, has been yielding Paleo-Indian projectile points of varied styles for many years and is known to contain late Pleistocene deposits. Seven of the blades illustrated (Fig. 1 a-g) were discovered by Dan Base of Apache, Oklahoma over a period of many years of collecting in the stream bed and associated gravels. The other, Domebo Creek, in Caddo County was the scene of a full scale excavation in 1962, of Oklahoma's first mammoth kill site (Leonhardy 1966). Since that time, the creek bed has been continuously yielding evidence of Paleo-Indian occupation in the form of Mammoth bones and projectile points. One blade (Fig. 1, h) was found in the Domebo stream channel downstream from the excavation site.

It is clear that the manufacture of prismatic blades of such description would be backed by a long tradition of well developed stone working techniques, every bit as standardized as that required for the production of the various styles of projectile points.

The preparation of the core is the first and most essential step. The striking platform would have been made from the top of the core most probably by the removal of a small horizontal flake perpendicular to the long axis of the blade to be struck. In order to produce a blade with parallel sides and uniform thickness, at least one ridge must be made on the side of the core which will run the full length of the subsequent blade. The ridge or ridges form the "backbone" of the blade and determine the length, width, thickness and shape of the finished product. In the illustrated examples, there is a definite correlation between the curve of the central ridge or ridges and the curve of one of the sides of the blades. The lines of the sides follow the meanderings of the central ridges. This is especially noticeable in Figure 1 b and Figure 1 f.

Without the "backbone" ridge, the force applied to the top of the core would spread and result in a flake with non-parallel sides, whose width would be greater than the length. Therefore, the presence of such a ridge is the most important single characteristic in determining the difference between a blade and a flake (Crabtree 1968:464).

Obviously, the successful extraction of each successive blade from

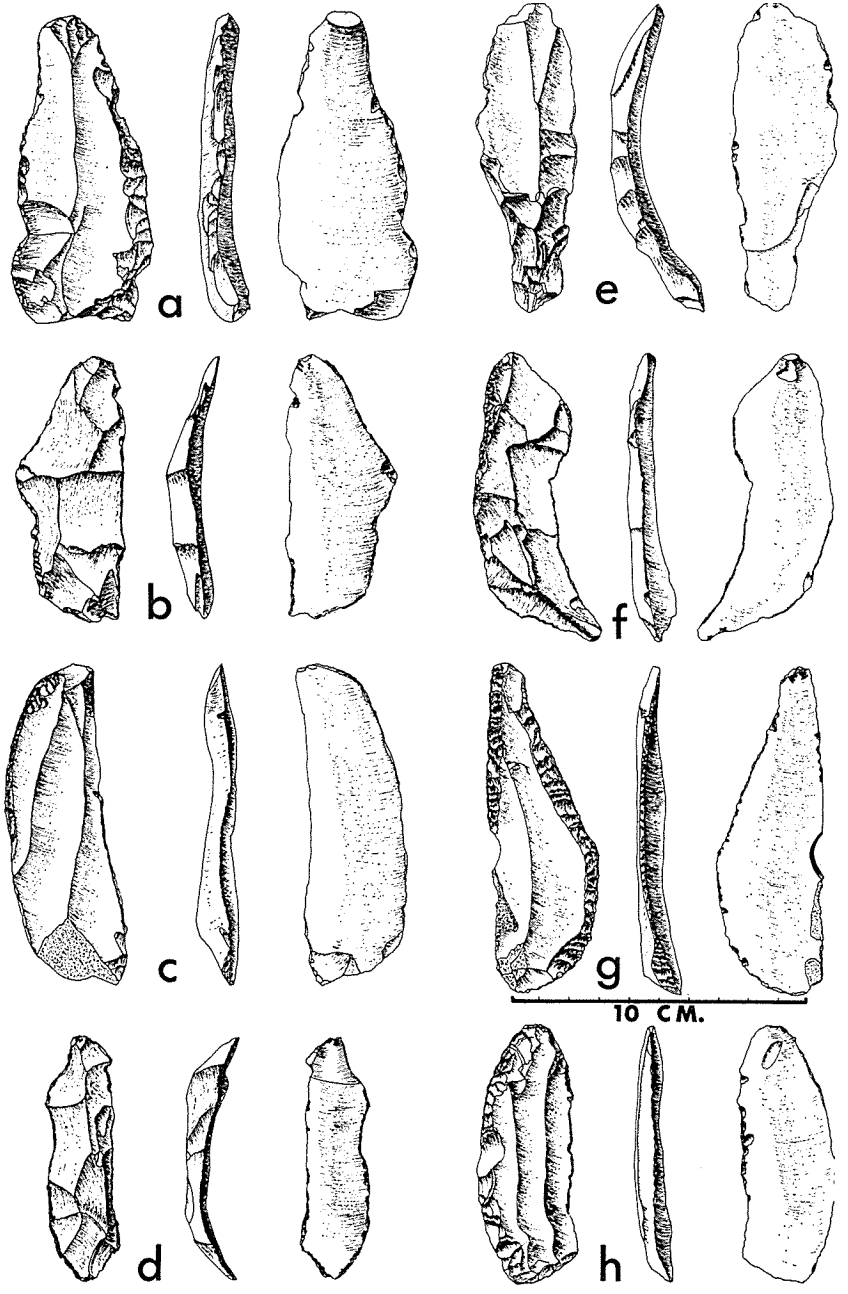

FIG. 1. Paleo-Indian Blades from western Oklahoma, Washita and Caddo Counties (all blades are illustrated with the striking platform or proximal end at the top).

the core would leave straight ridges on the side of the core which would serve as "backbones" for the removal of more blades. However, before the first blades were removed from each core, or, if through some miscalculation, a later attempt at blade extraction went amiss and left eccentric side ridges on the cores, then, new ridges would have to be carefully shaped by lateral flaking. The resulting ridge would have a jagged, uneven appearance, very different from the normal ridges. In spite of the unevenness, if the flaking was done carefully the resulting blade would still have relatively parallel sides. Figure 1 b and Figure 1 d are blades with ridges which have been shaped with lateral flaking on the cores. The bottom segment of the ridge of another of the blades (Fig. 1 e) has also been shaped by lateral flaking. It is, of course, important to keep the steepness of the ridges at a fixed angle along the whole length of the side of the core, because the width of the blade varies in accordance with the angle that the two longitudinal planes adjacent to the ridges make with one another. The larger the angle of these planes, the wider will be the resulting blade.

The main characteristics of the blades under discussion have been recorded in table form (Table I). All of the examples have wear on the edges of varying intensity. It is interesting to note that in the examples with blunted sides (Fig. 1 a, b, c, f, g), the most noticeable wear appears on the edge directly opposite the blunting. This would indicate that the tool was not hafted, but rather was used in the hand with one finger pressed against the blunted portion of one side. Secondary retouch appears on all but one of the artifacts and varies from light to heavy. The retouch was probably for the purpose of resharpening a dull edge for further use.

Proximal thinning, which is evidenced on all but one of the blades seems to be a general characteristic of Paleo-Indian blades. After the extraction of each blade from the core, a slight overhang on the striking platform would be left by the natural swelling of the bulb of percussion at the proximal end on the inside of the blade. Such undercutting of the platform on the core must be removed by flaking before the next blade is struck. This proximal thinning produces a series of facets on the top inward face of the subsequent blade.

The bulbar scar is the slight indentation left in the inside of the proximal end. The proximal lip is the small thin ridge running along the inside of the segment of the striking platform left on the blade. These two characteristics may bear some relation to the method of manufacture, but their general significance is not known. There are,

of course, too few examples in this case to establish a causal relationship among any of the artifact characteristics listed in Table I.

TABLE I
Characteristics of Blades

Blade figure 1—	a	b	c	d	e	f	g	h
Provenance	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Domebo
Length in cm.	10.2	9	10.6	8.2	10.3	9.2	11	8.6
Width in cm.	4.7	3.6	3.5	2.2	3.3	2.9	3.6	3.2
Thickness in cm.	1.3	1.2	1.4	1.3	1.1	1.4	1.1	1
Presence of wear on edges Y=yes —=no	Y	Y	Y	Y	Y	Y	Y	Y
Blunting Y=yes —=no	Y	Y	Y	—	—	Y	Y	—
Secondary retouch l=light m=medium h=heavy	h	l	m	l	—	m	h	h
Proximal thinning Y=yes —=no	Y	Y	Y	Y	Y	—	Y	Y
Bulbar scar Y=yes —=no	—	—	—	—	—	Y	—	Y
Proximal lip Y=yes —=no	—	—	—	—	Y	Y	—	Y
Striking platform in degrees	128	110	—	—	115	125	105	105

In general then, the manufacture of prismatic blades such as these is not purely the result of trial and error, but rather of an understanding of the cause and effect relationships existing between the core, the side ridges and the finished product. With the comprehension of these relationships, the shape of the resulting blade can be anticipated with a reasonable degree of accuracy, producing a form which, in its way, is every bit as specialized as the various kinds of Paleo-Indian projectile points.

ACKNOWLEDGEMENTS

I wish to thank Mr. Dan Base of Apache, Oklahoma for his cooperation and kindness in lending parts of his artifact collection to the Museum of the Great Plains. I also wish to thank Mr. Marvin E. Tong, Jr. for his guidance and criticism.

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Archaeological Survey of Parts of the Denton Creek Watershed

Jon L. Gibson and Blake L. Benham

ABSTRACT

Archaeological reconnaissance of two small reservoirs within the Denton Creek watershed of north central Texas recorded three archaeological sites. The nature of these sites as seen through the limited amount of cultural material presents little information concerning the activities represented or their position within a temporal framework. The environmental data has been used to pose inferential arguments about prehistoric adaptation and to evaluate the data beyond mere description. In this sense, various questions have been asked and tentatively answered in the light of hypothetical situations.

SITES AND ENVIRONMENT: A STUDY OF THE ARCHAEOLOGY OF A PORTION OF THE DENTON CREEK WATERSHED, WISE COUNTY, TEXAS

Jon L. Gibson

INTRODUCTION

During a two week period from January 1 to 15, 1968, a portion of the Denton Creek Watershed was systematically surveyed. The survey area corresponds to the lower 1½ miles of the Sweetwater Creek alluvial plain near its confluence with Denton Creek (Fig. 1). This tract of approximately 1000 acres is in eastern Wise County, about 8 miles east of the small town of Decatur, Texas. It is unequally divided by State Highway 24 with the greatest portion lying south of the highway.

The area figures prominently in the Denton Creek Watershed Flood Prevention Project, as it is slated to become one of two multipurpose structures in the Denton Creek drainage. Upon completion, this structure, Site 28 (Soil Conservation Service 1965:20), will provide municipal water for Decatur as well as affording recreational facilities such as boat docks and ramps, bathing beaches, picnic areas, and nature trails.

DESCRIPTION OF ENVIRONMENT

The survey area lies within the Grand Prairie Physiographic Province (Fenneman 1931 and 1938). This narrow strip of prairieland is between the Eastern Cross-Timbers and the Western Cross-Timbers. Relief becomes more pronounced near its southern and southwestern

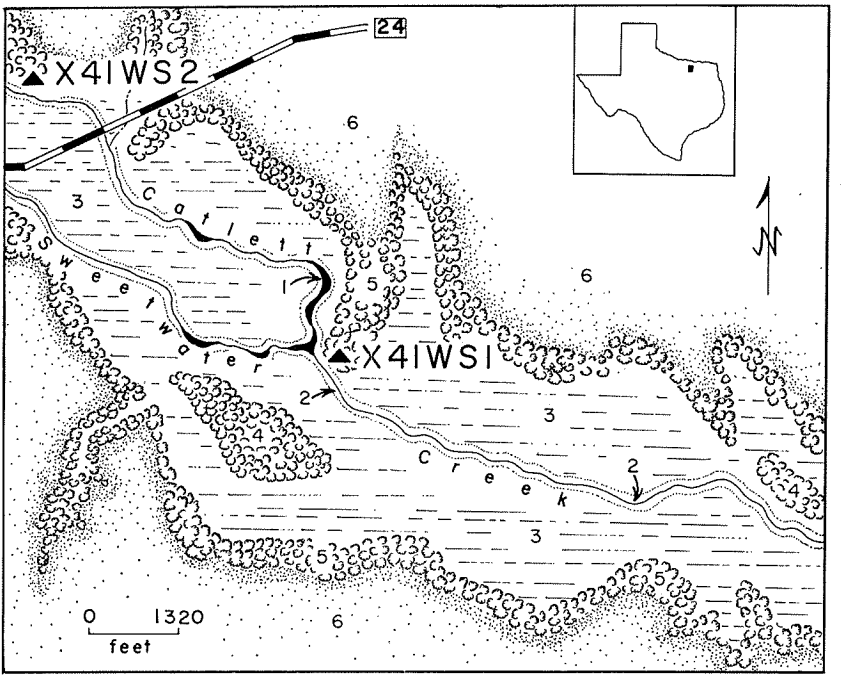

FIGURE 1. Distribution of sites and microenvironments in the survey area. Key to microenvironments; 1. batture sand bar, 2. natural levee, 3. floodplain, 4-5. remnant terrace and higher terrace, 6. upland escarpment-rolling prairie. Inset shows location of survey area in Texas.

borders as the rugged limestone country of the Edwards and Comanche plateaus is approached. To the north, the Grand Prairie merges imperceptibly with the grasslands of the High Plains. Generally the Grand Prairie Province is characterized by wide, flat to rolling plains dissected occasionally by small steepsided stream valleys. It is with one of the small valleys that this report is concerned.

A number of microenvironments (microhabitats) are contained within the survey area. Detailed consideration of each of these small ecologically significant zones has provided the basis of several of the hypotheses which follow. In essence, this cultural paleoecological approach intends to offer plausible interpretations of the aboriginal utilization of the natural environment. From this, inferences have been made regarding the underlying socio-cultural requisites necessary to have produced these archaeological data.

The assumption basic to interpretation is that the physical environ-

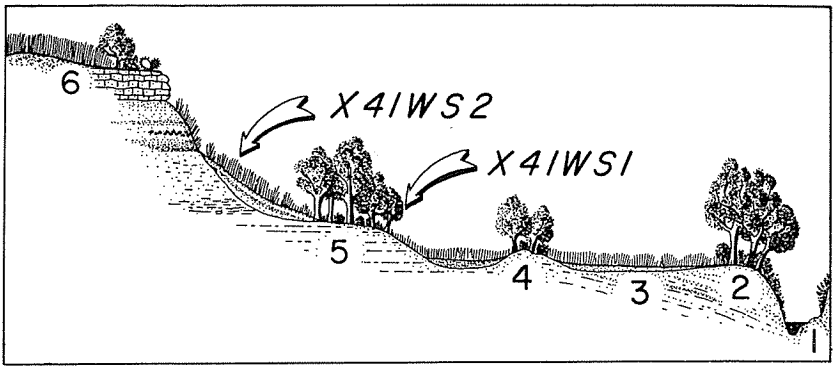

FIGURE 2. Schematic profile of microenvironments. Identifying numbers keyed to corresponding descriptions in text. Not to scale.

ment has remained more or less constant since the time of Indian occupancy to the present; that is to say, that since the prolonged aridity and widespread erosion of the Altithermal (Antevs 1962) of *ca.* 7000 B.C., the climate and resultant biotic aggregates have been relatively consistent. Of course, minor occilations and even marked regional droughts such as the Fairbanks, about 500 B.C., and the Great or Pueblo Drought, *ca.* 1300 A.D. (Antevs 1962), have occurred and were accompanied by eolian erosion, channel-filling, and other dry period landscape shaping phenomena. Nonetheless, these recurrent climatic episodes are not known to have produced drastic shifts in floral and faunal assemblages. However, an unmeasurable factor in assessing changes or shifts in the habitat is man, i.e., modern farmers and ranchers whose activities have greatly modified not only the biotic relationships, but the topography itself. This fact presents one of the major difficulties in projecting present-day environmental conditions into the past with any reasonable degree of assurance of comparability. However, it is believed that changes due to human agency are predominantly quantitative rather than qualitative.

Figure 2 illustrates a generalized composite cross section of the microhabitats or biotopes which exist today in the Sweetwater-Catlett Creeks valley. Concise descriptions of each of these zones are provided below.

1. BATTURE SAND BAR. Batture sand bars are presented in Catlett and Sweetwater Creeks but lack the characteristic development of corresponding phenomena in river systems to the east of the Trinity drainage. Although similar depositional forces are operative on a miniature scale in Catlett and Sweetwater Creeks, the general stage seems to still be one of downcutting. Correspondingly, the batture

walls are steep, and maximum alluvial accretion occurs only on those slopes of the most steeply convoluting meanders. At these points, clean white sands of true bar development are noted.

No cultural debitage, which would testify to aboriginal utilization of these areas, was recovered from any of the accumulations. This is not unexpected for these features are highly unstable and theoretically tend to migrate downstream.[1] In such a case, cultural refuse would either be washed away or covered very quickly.

2. NATURAL LEVEE. Natural levees bordering Catlett and Sweetwater Creeks are very narrow and poorly developed. Characteristically, they are almost imperceptible rises of only a few inches to a foot directly adjacent to the stream banks. The primary reason for distinguishing this biotope is that the loosely consolidated, better drained sandy soils near the edges of the stream channel support a distinctive growth of vari-storied vegetation (cf. microzones 4-5 and 6). Pecan, blackwalnut, rattan, red oak, burr oak, elm, hackberry, locust, and briars are the prevalent woody species. Fauna occupying this niche are squirrel, raccoon, opossum, and various transient predators including bobcat and wolf.

3. FLOODPLAIN. The area between the natural levee and the dissected upland escarpment is the alluvial floodplain. Within the survey boundaries, the average width varies from no more than a few hundred yards to almost three-quarters of a mile. Generally it is a flat fertile plain dissected in a few spots by intermittent rivulets, which are the products of upland runoff. Grassland cover is predominant today and was probably the floral condition in the past. However, it should be noted that ranchers and farmers are very active in this zone and the extent of modification cannot be accurately measured. The zone today furnishes the habitat for several mammalian and avian species, such as field rat, rabbit, skunk, coyote, fox, grouse, and quail. In years past, it may have also supported some bison, as a buffalo skull was exhumed by local residents from the bank of Sweetwater Creek some years previous to this reconnaissance (Cody Caraway, verbal communication, 1968).

A possible deterrent factor for aboriginal settlement in this biotope was frequent inundation. If figures compiled for the last 30 years for the Denton Creek Watershed can be projected with any degree of validity into the past, the area seems to have been subjected to rather persistent flooding. Although the mean annual precipitation is only 31.56 inches and is usually distributed throughout the year, individ-

[1] The general hypothesis of downstream migration of meanders and therefore of bars (Davis 1913:7) has not received much support from its application to the Mississippi River (Chawner 1936:23-24).

ual excessive rains may produce widespread flooding (Soil Conservation Service 1965:6). Since 1935 there have been 36 major floods which covered more than one half of the floodplain (Soil Conservation Service 1965:9).

4-5. Remnant Terrace And Higher Terrace. These microhabitats are discussed as one unit for the faunal and floral features are basically similar. Remnant terraces are physically part of the higher terraces that have been completely isolated by erosion. Soils of these zones are graveliferous sandy loams and red and yellow tenacious clays. Often those members fringing the upland escarpment are littered by limestone talus and in some areas colluvial fans are prevalent. Although recent clearing has denuded sections of this zone, scattered groves of oak, walnut, bois d' arc, elm, hackberry, and various shrubs are present, primarily near runoff gullies. Grasses grow in areas not in woods. Native fauna include squirrel, opossum, rabbit, an occasional Virginia deer, and rarely predators such as fox, bobcat, and wolf.

This microhabitat is abundant in food and material resources, is well-drained, is almost never inundated, is sheltered from the persistent north wind, and is in proximity of every other biotope. It was therefore not unexpected that the only site of any size in the survey area was located in this biotope.

6. Upland Escarpment-Rolling Prairie. This zone, which actually consists of several microenvironments, corresponds to the grassland portion of the Grand Prairie Physiographic Provenience (Fenneman 1938:105). It is true prairie with an aggregation of grasses including bluestem, Indiangrass, switchgrass, dropseed, and buffalo. Prickly pear is rarely found, and its presence may be due to recent human transportation. Woody vegetation, such as live oak, post oak, blackjack oak, and black locust is limited to the peripheries of the escarpment or to well-watered spots. Skunk, rabbit, coyote, quail, grouse, and probably bison (in previous years) utilize the forage and cover provided by this zone. Prominent elevations in the upland escarpment provide excellent panoramic views of the surrounding country.

SITES AND THE ENVIRONMENT

SITE X41WS1

Site X41WS1 is located in microenvironment 4-5, about 20 yards east of the Sweetwater Creek-Catlett Creek confluence. The occupation area, which is approximately 80 feet in diameter, lies atop a remnant terrace outlier.

Although there was a paucity of cultural refuse, 3 discrete concen-

trations of material pointed to task-specific areas. Conforming generally to the crest of the terrace was an area approximately 40 feet in diameter littered with burned limestone rocks. Immediately outside this fired zone in 2 spots were accumulations of flakes. Scattered throughout the site, including the burned area, were dart point fragments, pebble hammerstones, grinding-stones, ground axe and/or celt fragments, and a possible plummet.

Artifacts Of Chipped Stone

PROJECTILE POINTS: Two distal fragments of dart points and 1 contracting long stemmed dart point (probably Gary or possibly Wells) were recovered. The nearly complete point was approximately 55 mm. long and 20 mm. wide. Several other points are noted as having been picked up from the surface (R. C. Pitts, verbal communication, 1968). One of the fragments and the point were made of quartzite, and the other fragment was of waxy Central Texas flint.

DEBITAGE: Debitage consisted of 20 small flakes; the majority about equally derived from the two flake accumulations mentioned above. These irregular and unmodified pieces were simply thinning or trimming flakes resulting from tool or projectile point repair. No cores were present.

Artifacts Of Ground Stone

PEBBLE HAMMERSTONES: Eight pebbles of quartz, chert, and sandstone have marks of attrition or battering around the peripheries which suggests their probable function as hammerstones. The amount of wear is variable, ranging from slight to moderate.

AXES AND/OR CELTS: This rather inclusive heading describes 2 bit fragments and 1 poll fragment from X41WS1. Only the poll fragment is complete enough to identify it as a full-grooved rectangular axe. The other 2 pieces are too small to determine if they were axes or celts. The objects were made of ochreous siltstone, fossiliferous limestone, and exotic diorite.

MANO: A sub-rectangular piece of sandstone is judged to have functioned as a mano. The edges have been battered and only 1 face is well-smoothed.

ABRADED SLAB: A small slab of well-consolidated laminar siltstone had abraded surfaces. Several lightly etched grooves are present on 2 faces. The object may have served as a whetstone.

PLUMMET: An ovoid hematite concretion with a groove worn several centimeters below the apex may have functioned as a plummet or bolastone. Except for the groove, the specimen has not been modified in any fashion.

OTHER: Fire-cracked or reddened stone, fragments of fresh-water mussels, and 1 small piece of calcined bone (deer?), complete the entire inventory of the products or refuse of human activity at X41WS1.

The smallness of the site, the paucity of artifacts, the limited number of task-specific areas, and the presence of tools normally considered to be masculine articles point to the probability of the site having functioned as a short duration camp for a small number of men. It is further suggested that a group of men minus spouses carrying on so few vital activities, certainly insufficient for total culture maintenance, intimates by analogy with ethnographic data at least two alternatives. The first is that the site represents an in-route stop of a raiding party, and the second and favored alternative is that it is simply a hunting camp.

It is deduced from the few artifacts and inferred activities at X41WS1 that the occupants were active in exploiting several of the contiguous microenvironments. Limestone talus from the higher slopes of microenvironment 4-5 was imported for hearth stone. The residue from limited tool repair suggests that the raw material came largely from the few channel gravels of microenvironment 1 or from a gravel quarry in microenvironment 5, some 2 miles west of the survey boundaries. A few pieces of exotic stone, i.e., Central Texas flint and diorite, allude to extraneous connections or sources. Fragments of fresh-water mussels as well as the recognized biological necessity for drinking water testify to further utilization of microenvironment 1. A single scrap of calcined bone tentatively identified as deer indicates that at least some of the hunting endeavors were channeled into microenvironment 4-5.

The data are too inconclusive to positively assert the period of occupancy, although they implicate an Archaic type of hunting-gathering economy if not an Archaic period temporal position.

SITE X41WS2

A single other location, dubiously accorded site status, was present within the survey area. The geographic coordinates are Longitude 97°27′51″ and Latitude 33°15′22″ which places it north of highway 24 and approximately 150 yards north of Sweetwater Creek. The "site" consists of an area about 10 feet in diameter which shows signs of human activity.

ARTIFACTS

DEBITAGE: This category contains 5 flakes, of which 2 are rather

prismatic. At least 3 different pebbles of quartz and local chert seem to have been worked.

HAMMERSTONE: One ovoid quartz pebble has slight abrasions on one edge which may indicate its function as a hammerstone.

The confined spatial dimensions, the absence of any kind of finished tool, and indeed the dearth of any artifactual remains point to the utilization of this spot by a single occupant for a very short period of time.

The site occupies a portion of an upper slope of microenvironment 4-5. Pebbles of chert are present on the crest (microenvironment 6) of the ridge above. The site overlooks one of the wooded fingers of microenvironment 4-5 which extends along a drainage ravine, and game could have been observed most easily. Perhaps most importantly, the area is sheltered from the prevailing north wind.

CONCLUSIONS AND SUMMARY

Although the reservoir area was searched systematically and thoroughly, the two aforementioned sites were the only ones discovered. Several other ideal spots were carefully examined but yielded no indication of ever having been utilized. Congruently, the two sites which are found appear to represent the very limited activities of a few individuals for a short period of time. This brings us to an interesting point; one from which departure to predictive hypotheses of culture operation may be launched.

A number of sites are known from areas adjoining structure 28, primarily along Denton Creek and the upper reaches of Catlett and Sweetwater Creeks. Although only one of these sites was examined personally, artifact assemblages from several other sites were observed in private collections. From the holdings of assured provenience, it is possible to induce considerably more functions for the sites from which they were taken than for those sites within the survey boundaries by the simple fact that a considerably larger number and variety of tool types were represented. Wider variety within the tool kit alludes to more patterned activities of the cultural group. Hence it is logical to assume that the sites in structure 28, from which only cooking, stone tool maintenance, and hunting and gathering activities may be inferred, do not appear to typify complete, self-sustaining cultural entities. Therefore, it is posited that these small sites are actually functionally-specific activity units, i.e., hunting camps, of a larger socio-cultural system which perhaps centered along Denton Creek. Of course, it goes without saying that this hypothesis is operational within the present conceptual framework, but the burden of

validation or rejection ultimately rests with future survey and excavation.

Assuming for a moment that the environment is responsible for the differences in settlement and activity patterns in the two areas, then it is feasible to look for some factor or factors physical or cultural, which would preclude permanent occupation in the reservoir area. It is suggested that the impermanency of occupation in the area is basically due to the ephemeral availability of water. Supporting data for this proposal include: 1. a greater number of sites on Denton Creek and the spring-freshened headwaters of Catlett and Sweetwater Creeks where a more voluminous and more dependable water supply was assured, and 2. the fact that the portions of Catlett and Sweetwater Creeks within the survey boundaries are known to have gone dry during periods of drought.

Thus, although settlement stability was hindered, the area was still occasionally frequented by hunting and/or foraging parties, who were apparently attracted by the natural bounty of the landscape. Indeed, the necessity for permanent occupancy may never have arisen as the area was readily accessible from the villages or base camps on Denton Creek. Carrying the proposal further, it is conceivable that the presence of the small camp sites may be correlated with a daily or seasonal exploitation of the abundant mast crops or game. However, this is beyond corroboration by the available evidence and is certainly speculative at this point.

A case for the relationship between habitat and culture has been proposed by Quimby (1960:382) who writes:

> Under certain conditions a hunting culture will develop to the limits of its habitat and in so doing will acquire forms determined by the habitat.

Quimby has perhaps overstated his point, for it alludes to a deterministic quality of the natural environment. Nonetheless, the general idea, possibly more aptly expressed by Meggers (1954:801-824), as the limiting effects of the environment, has provided the core of this discussion. It is beyond question that rapport between culture and nature must be established if the former is to survive.

If culture is viewed as man's extrasomatic adaptation (White 1959:8), then understanding of the paleoecological relationships will assist the archaeologist in making socio-cultural interpretations. This is precisely the goal advocated two decades ago by Taylor (1948), but which received concerted attention only recently (Longacre 1964; Coe and Flannery 1967; MacNeish 1964; Binford 1962).

This report has brought out some of the intricacies of the culture-environment relationship in a small area of North-Central Texas.

Additional data from excavation and from comprehensive reconnaissance in adjoining areas are required in order to test the interpretations offered herein. It is then toward these ends that this preliminary paper is directed.

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X41MU15, A SITE ON THE HEADWATERS OF DENTON CREEK, MONTAGUE COUNTY, TEXAS

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INTRODUCTION

The present paper deals with a site located within the Denton Creek Watershed. The site was located during a survey of multi-purpose structure No. 1 C, a Soil Conservation Service dam providing rural domestic and livestock water with incidental recreational benefits. The specific area of study is at the headwaters of Denton Creek, where the channels of two branches meet, one flowing from the north, the other from the west. The dam spans the northern branch about a quarter of a mile upstream from the point of confluence. The reservoir lies eight miles east of Bowie and seven miles south of Montague in the north central portion of Montague County, Texas.

SITE SETTING

Being the upper portion of the Trinity Watershed, the sixty mile drainage of Denton Creek flows southeasterly through three major land resource areas: the West Cross Timbers, the Grand Prairie, and the East Cross Timbers (SCS Work Plan 1965:3-5). The site, X41MU15 is located within the West Cross Timbers, a region characterized by rolling topography of early Cretaceous formations which are severely incised by Denton Creek and its tributaries (Sellards, Adkins, and Plummer 1932:278). Although the soil series for each of the land resource areas differ in terms of their resistance to erosion, the primary changes in channel forms between the upper and lower reaches of this watershed are the result of stream dynamics. In the upper reaches, headward erosion is evidenced by the abandonment

of catch basins in combination with the cutting of V-shaped channels. The catch basin remnants bear a striking resemblance to floodplains, but are structurally dissimilar, and occupy extended areas far beyond the channel peripheries and remain as isolate canyons that occur at varying intervals for a distance of three miles downstream.

In sum, a transition from a youthful to a more mature channel development is readily observable in the drainage basin. On the lower reaches there are small, but definable natural levees and terraces within an active floodplain. More youthful and still in the process of headward erosion, the upper channel has become entrenched to the extent that 30 meter high escarpments rise steeply from the stream banks confining the water course and restricting floodplain development to a minimum. The site lies atop such an escarpment to the east of the confluence of the north and west branches of Denton Creek. This is the location of the last abandoned catch basin from which the creek has since migrated.

Approximately six miles to the northwest, three variations of the West Cross Timbers environment become apparent. These variations are distinguished by a change in type and density of vegetation which corresponds to changes in soil type and topography. The site is located on the western fringe of a densely wooded area, composed largely of post and blackjack oak which is restricted primarily to the east of the 1000′ MSL contour. West of this contour and extending north to the Red River (an area known locally as the Badlands), are the Windthorst-Nimrod Prairie types, (Carter 1931:79-81) which support only sparse vegetation of small mesquite trees, buffalo grass and grama grasses. This vegetation grades almost imperceptibly into the Rolling Plains by the Nimrod Prairie Soils, on the northeast by the 1000′ MSL contour and reaching northward to the Red River is a moderately open savannah that can best be described as a "transitional" area containing representative traits of the bordering vegetations.

The watershed divide which separates the Red River and Trinity River drainages is less than three miles to the north of the site. In addition to the vantage points afforded by the crest, within half a mile north and east of the site, there are strategic promontories providing views over an extensive area.

Other than the deviations introduced by the presence of abandoned catch basins and the youthful character of the upper segment of the drainage system, the microenvironmental resources described for Catlett Creek in the preceding paper give a full account of the environs of the site proper.

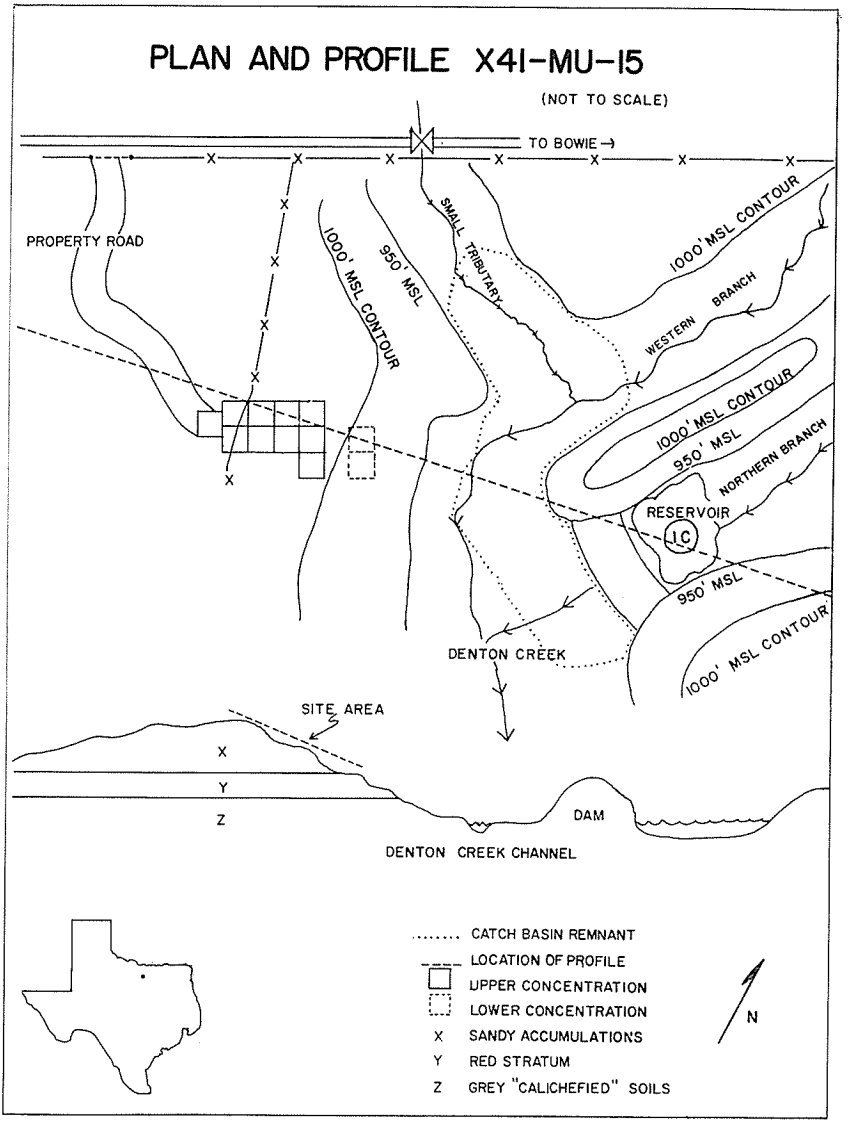

FIGURE 1. Plan and profile of site X41MU15.

SITE DESCRIPTION

The site consists of two distinct concentrations of chipped stone material, one along the summit, and the other on the slope of the escarpment (Fig. 1). Both concentrations cover a maximum area of seventy-five by thirty meters. The upper concentration contains

numerous small secondary retouch flakes in an area approximately fifteen by three meters, with the long axis oriented east-west paralleling the edge of the escarpment. No material was collected from the upper area. It was decided that a collection would destroy any patterned distribution that might be present. (See Hayden 1965:272).

The lower concentration is composed of primary (cortex) and initial flakes (Honea 1965:29). A number of these larger flakes were collected as they were representative of resource material which occurred in the upper concentrations. Furthermore, although the distribution of the material may be skewed by contour plowing of the escarpment slope, the area on the summit appeared to be undisturbed by this practice.

The resource materials included fine-grained quartzite found in the immediate environs and on the Red River, locally derived cherts, and opaque grey to black Central Texas flint from more distant locales. Gravels and relatively large chunks of limestone and sandstone occur in proximity to the site, but give no indication of being utilized by the occupants. No finished tools were recovered.

SUMMARY AND CONCLUSIONS

Since the cultural material of X41MU15 suggests a very limited range of activities, the problem of interpreting the site is primarily one of relating the evidence to a larger whole or pattern of adaptation. The available data cannot be taken to represent the remains of a total cultural pattern; but rather, the site evidences certain activities which are part of a round of life that encompasses a sizeable geographic area.

Although the evidence is not conclusive, it is proposed that the site indicates the pursuance of hunting and may reflect a hunting and gathering economy. Pending further investigation, this is a tentative perspective. The situation of the site might be brought forward in support of this interpretation. From the site area an accurate account can be made of the movements of game along the canyon slopes and within the catch basin remnant below; this argument stresses the strategic location of the site for hunting. Decidedly, success in hunting depends upon the vulnerability of game within certain settings, whereas the heavily wooded uplands offer a greater amount of cover and would put the hunter at a disadvantage.

More specifically, the site may be envisioned as a preparatory step in the pursuance of hunting activities. A substantial number of secondary retouch and initial (Honea 1965) flakes are most closely aligned to "sharpening" and shaping of tool forms. If tools were

used on the spot, some it seems would have been found as utilized discards. It is suggested then, that the site served only an instrumental function in the killing of game and not the goal-satisfying or end consequences, i.e. kill site.

Further, there is the question whether one or several persons prepared tools on the site at successive occasions or whether the chipping areas resulted from one hunt carried out by a number of persons. An analysis of the distribution of flakes over the site area should be conducted concerning the organization of hunting practices. One thing seems certain: the high density of secondary retouch flakes in relation to the other flake classes is highly suggestive that preforms and debitage blanks received final treatment on the site and that preliminary treatment of the materials was achieved elsewhere.

This means that we are dealing with a point in time in which a stone-working process was in operation. The material, therefore, refers to a specific spatial dimension in which an economy operated.

In this sense, the site is a study complete within itself, for the process of resource alteration and the economic pursuit with which the material is so closely linked (whether hunting or gathering) has become a matter of exploiting and accommodating to space.

Ethnologically derived models of hunting and gathering economies provide insights into the general mechanics of their operation, but the spatial dimensions of completed economic cycles are a perplexing problem from the outset. The variations in environments and climates, in how particular resource users assemble a subjective picture of the environment (Blaut 1959:92), and in the technological orientation of the users, are some of the classes of multivariate phenomena within the spatial scheme. It is in how these "stage settings" are employed by cultural-economic processes that dimensions of space become prescribed. Archaeological reconnaissance must subscribe to an unknown spatial dimension, especially when dealing with hunting-gathering economies, and through the location of sites provide information necessary to synthesize and tentatively define a spatial adaptive pattern or patterns.

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Component Analysis for Archaic Sites

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ABSTRACT

Before one talks about foci, or other time-space units, he should understand the components from which they are built. This study attempts to define components in terms of more comprehensive typological and technological traits.

INTRODUCTION

One of several new trends in American archaeology is the attempt to do prehistoric studies within the framework of anthropology. Although archaeologists have discussed this on the theoretical level since the end of World War II, it has only been since 1965 that the techniques have developed that will really permit it. These techniques include the study of stone technology, a modern typology for tools, and new ways of comparing and ordering data. More than anything else the techniques are used not just to study material objects, but to study the people that made them.

There is little to gain from pointing out the futility of continuing with the older form of taxonomy. Foci based on two or three material culture traits are not steps toward understanding past cultures. Despite protests to the contrary, there is no possibility nor intent for this kind of archaeology to progress beyond the art history of projectile points.

Foci that are intended to reflect the behavior of people and not just groupings of material objects must be based on sound components. Sound components rarely emerge from excavations and surveys that stress only stratigraphic analysis and collection of a few typological tools. Instead the component must be based on the specific material culture of one group of people. It is precisely the same concept that is embodied in the word assemblage which was defined as *"the surviving material culture of a single resident group over a short period of time at a specific locality"* (Marks, Wendorf and Shiner, 1967).

In theory, the focus ought to be the surviving material culture of a society over a period of time so short that cultural evolution would be no major factor. Seasonal specialization, however, would be considered.

Many of the southwestern and southern plains sites are on the surface and cover vast areas. More often than not, it is difficult or impossible to determine where one camp ends and another begins.

FIGURE 1. Site 25, fire hearth just beginning to erode.

Any collections from one of these sites runs the risk of including artifacts of distinct periods or of more than one society. No end of confused data could emerge, especially in mistakened associations.

Small, isolated, single component sites that were quite rich in tools and other artifacts would be ideal for discovering the material culture array of a local group. Unfortunately, sites of that quality are rare, and we must work with the larger units.

It is the purpose of this paper to indicate how it may be possible to isolate components from these large sites. The approach is simple enough. One should collect and analyze as small an area as possible, but one large enough to provide an adequate statistical sample of behavioral traits. The area collected should be one which still shows a considerable degree of intact structure. In other words, where use areas and fire hearths are still discernible (Fig. 1). The list of traits

should be considerably enlarged by recognizing that there are many stone tools usually ignored by American archaeologists, and huge amounts of material that clearly define the processes of stone tool manufacture. There is no reason to believe that these behavioral traits are of less importance than projectile points.

SITE DESCRIPTIONS

For several reasons study collections were made within the Tamaulipas area (Kroeber, 1939). Sites were available, they were "rich", and they were relatively undisturbed by cultivation or by collectors. This area is the brush country of south Texas and northern Mexico, south of the Frio River, northeast of the hills around Monterrey, and west of the Gulf Coast. In previous literature, the area was included in a hastily conceived Balcones Phase (Kelley, 1960), or divided into ill-defined Falcon and Mier Foci. These divisions rested on little geographical and less archaeological information. The present study does not pretend to rectify the situation or to substitute new "culture area" concepts. It is only the beginning of a series of studies within an area of reasonably uniform environment.

The Tamaulipas Area is dominated by two things: the relatively flat to slightly hilly brush expanse, and the dendritic drainage pattern centered on the Rio Grande. Overall, there is a gradual shift from drier and more open country in the west to more vegetation in the east. There are several repeated microenvironments. One of these, the Rio Grande Floodplain, seems to be of minor importance as regards settlements. Only a few small sites show on the terrace surfaces or in the buried silts. The banks may have been used, however, for hunting and gathering. Three other microenvironments are worth mentioning at this time: the low floodplains of the major creeks, the extensive brush "flats" and the hilltops. Each of these offered certain ecological advantages (Newton, 1968). The floodplain and hills served as areas for foraging and as a source of raw materials for stone tools. The "flats" were normally used as camp sites as well as for hunting and gathering.

Site 25 lies immediately beside Santa Isabel Creek about 25 miles northwest of Laredo, and within the highest area of the floodplain. All indications were that floodwaters had frequently covered the site, but not before the undisturbed features themselves had been covered with soil and grass. The hearths and associated artifacts were eroding for the first time when the collection was made. Two contiguous hearth areas were collected here in order to obtain an adequate sample of artifacts for a hypothecated component.

FIGURE 2. Cut-bank of small creek. All deep cuts show A, B and C soil horizons. When present, cultural materials are found only in the A horizon.

Site 26 is in the identical position, geologically, but on the opposite side of the creek, some 200 meters southwest of site 25. The hearths and artifacts are eroding from an in situ position in the terrace where they had been buried with minimum disturbance. Two contiguous hearths provided a collection of artifacts numerically adequate for comparison with those from Site 25. It is not the intent of this article to argue for a specific number of artifacts as being an "adequate" sample, but rather good results have been obtained in Europe and Africa with collections of over 100 tools plus the accompanying debris and debitage.

Site 27 lies on the surface of the flat valley some 600 meters east of the Santa Isabel Creek. The site is larger than 50 meters in diameter, but parts of it are still buried beneath the alluvium and the

limits are not determinable. Although this area of occupation is at a considerable distance from the actual creek bed, its elevation is little more than two meters above the high flood plain of the creek. Much of the area between the site and the creek is low flood plain and unsuitable for permanent occupation.

Incidentally, the settlement patterns along Santa Isabel strongly suggest that the elevation of the flood plain, the entrenchment of the creek, and the amount of summer thunder-shower runoff may have changed but little since Archaic times. Not more than one occupation level may be seen in any given cut-bank (Fig. 2).

The surface of the site is thickly strewn with debris and debitage. In almost the center of the site are the remains of a small Latin-American farm house, and the local public road runs right beside the site. Point hunters have worked this and other sites in the area for more than two generations, but each major rain uncovers new material. The collection was made immediately after a series of heavy rains in the strip of just exposed materials at the east (upslope) edge of the site.

Site 27 no longer shows the structure of an undisturbed site, but was apparently deflated at one time and re-covered by grass and soil (Fig. 3). Parts of it were eroding again when the collection was made. The artifacts collected are not necessarily from any given hearth, but were collected within an area large enough to provide a reasonable sample.

Since early and late sites appear together in the same microenvironments and are both absent from others, it may be assumed that there has been little change in the topography since Archaic times. This increases the possibility of overlapping camp sites. Indeed, where any erosion, whether aeolian or fluviatile, has taken place on the flats, camp debris is usually visible. Almost every ranch house in the entire area is located on or quite near a major prehistoric site.

A great many, possibly most, of the sites in the area are marked by fire hearths. Varner (1968) noted such concentrations of fire-broken rock over considerable areas of northern Nuevo Leon and eastern Coahuila. The hearths described in this paper are similar in size, three to five feet in diameter. Scattered about each hearth are quantities of tools, debris, debitage and use-retouch artifacts.

THE ARTIFACTS

The assumption is that the artifacts are associated with the hearth and are the products of a single group and of a relatively short span of time. If this is true, other hearths in the vicinity may have been

FIGURE 3. Site 27. Cultural materials have recently eroded from the coluvium but the site had obviously been deflated at an earlier time.

occupied by members of the same group. Such a hypothesis cannot be tested by comparing projectile points because statistically meaningful samples would not be obtainable (Table I). By adding scrapers and the so called "knives", the samples can be increased but rarely can it reach significant levels with only these tools being considered (Table II).

The enlarged trait list used in this experiment is believed to include sufficient artifacts with which to make comparisons among systematic collections. It includes tools which qualify as such because they are modified in certain systematic ways. As far as it is possible and practical to do so, type names based on suspected use have been abandoned. This eliminates such categories as "knife" and opens the possibility that some of these are stages in manufacture. Pieces that have been

TABLE I
Projectile Points

	Site 27	*Site 26*	*Site 25*
Abasolo-Catan	5	5	5
Tortugas-Matamoros	1	5	1
Pandora	0	1	3
Shumla	5	0	1
Marcos-Ensor	1	5	0
Langtry	0	1	0
Perdiz	0	0	1
Scallorn	0	1	0

TABLE II
All Tools

	Site 27	*Site 26*	*Site 25*
End-Scrapers	3.5%	1.8%	0.8%
Side-Scrapers	9.1	6.5	3.8
Multiple-Edge Scrapers	2.2	0.6	3.1
Denticulates	6.5	6.5	5.3
Projectile Points	7.4	10.7	12.2
Foliates	17.4	25.0	15.3
Biface Preforms	19.1	19.6	14.5
Gouges	1.7	4.2	3.8
Burins	0.9	1.8	2.3
Truncations	1.7	0.6	2.3
Notches	3.5	2.4	8.4
Choppers	0.9	1.2	0.8
Gravers	1.3	0.0	0.8
Retouched Flakes	24.8	13.7	24.4

called spokeshaves elsewhere are referred to herein as notches in order to protect against unwarranted speculation. In addition, the study includes among the tools such things as burins, denticulates, truncations and retouched (intentional) flakes. Most discussions of the Archaic ignore these. Scrapers are divided into categories based on morphology rather than on material (Table II).

There are three other categories besides the tools. They are debris (cores, chips, cortex flakes and biface thinning flakes), debitage (flakes suitable for chipping into tools) and use retouch flakes (flakes that show wear patterns on edges). This group of non-tools which may range from 80 to 90% of all artifacts, provides the main sample for comparison and contrast with other collections.

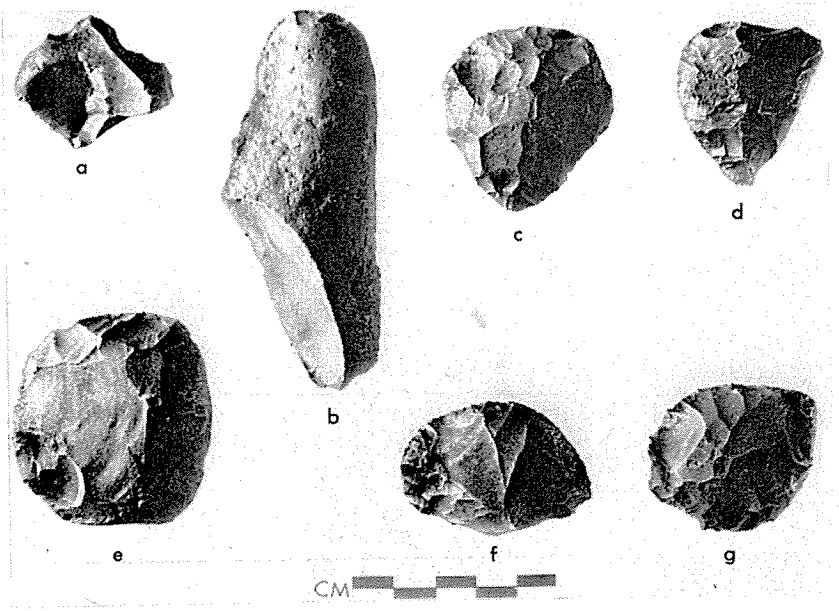

FIGURE 4. Scrapers: a, end-scraper (nosed); b, end-scraper; c, and e, multiple-edge scrapers; d, side-scraper; f, side-scraper (tranverse); g, multiple-edge scraper (*dejeté*).

Scrapers from all three sites are similar. A very few are made on cortex or simple secondary flakes. The majority are shaped by flaking over the convex or "upper" face and around the edges. One long edge, sometimes two edges, are beveled and finely retouched. Bulbs of percussion often are truncated away or have been reduced by flat retouch. Some of the side scrapers can be classified as simple, some as transverse and some having multiple edges (Fig. 4).

Foliates are larger than projectile points, but otherwise similar to the Abasolo-Catan and Tortugas-Matamoras types (Fig. 5). These are finished pieces that have been both thinned by billet and finished by pressure retouch.

The biface preforms may have been intended as projectile points or something else, but they were not completed.

Truncations are flakes or blades whose proximal or distal ends have been removed by deliberate chipping. One purpose of truncation is bulb reduction, but the reason for distal truncation is not known.

The so called "gouges" would seem to include several varieties. No information is available on what these tools represent (Fig. 6).

Choppers show bifacial work along one or more edges, plus evidence on both faces of the edge that they have been used for chopping.

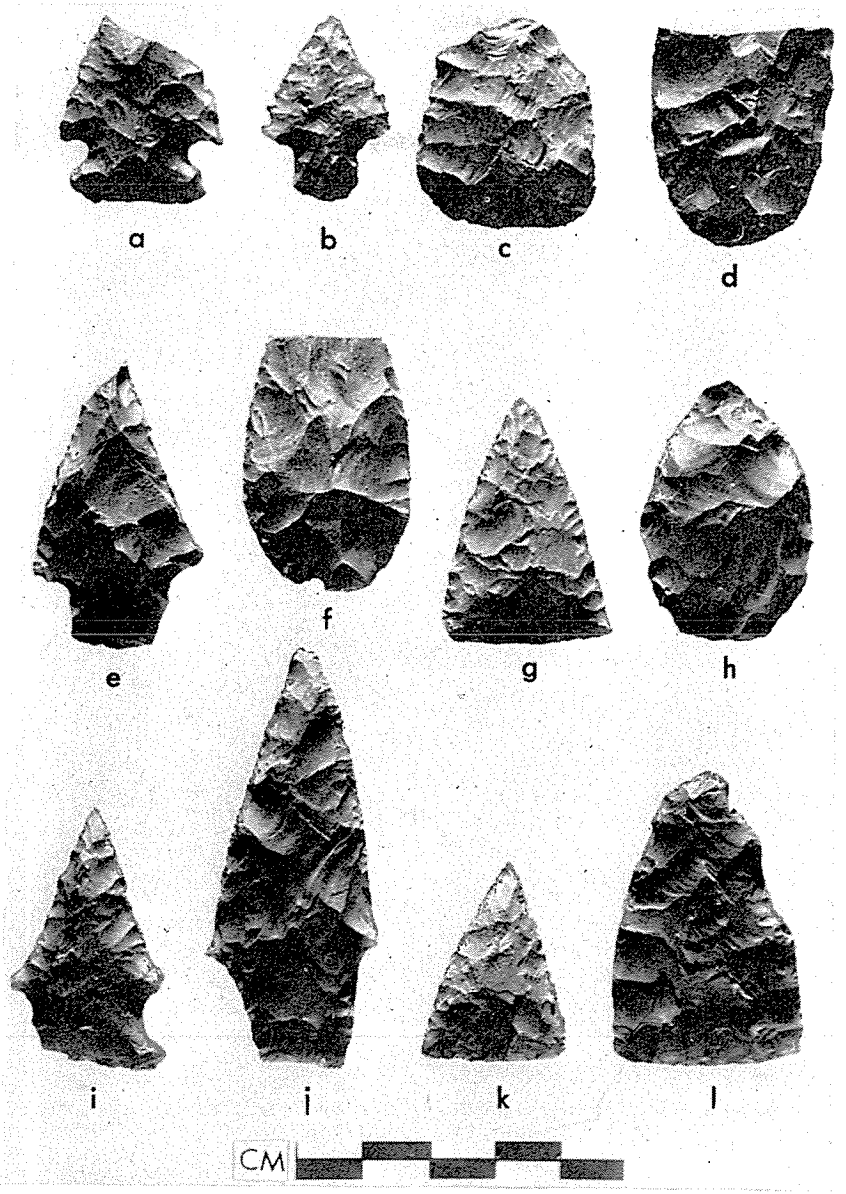

FIGURE 5. Projectile points: a, b, c, and d, Site 25; e, f, g, and h, Site 26; i, j, k, and l, Site 27.

Denticulates are large and well made, obviously by intent since they display many evenly spaced "teeth" (Fig. 7).

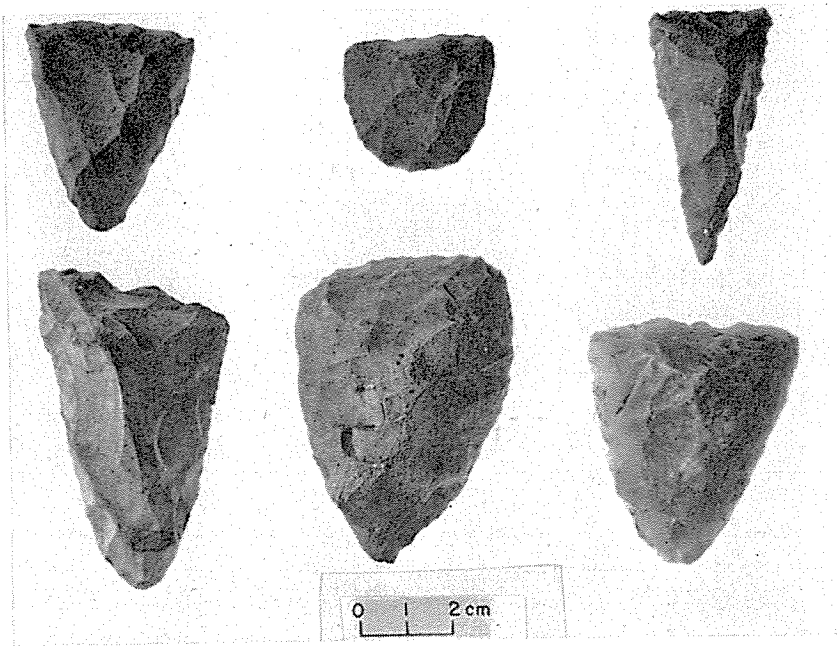

FIGURE 6. Various gouges.

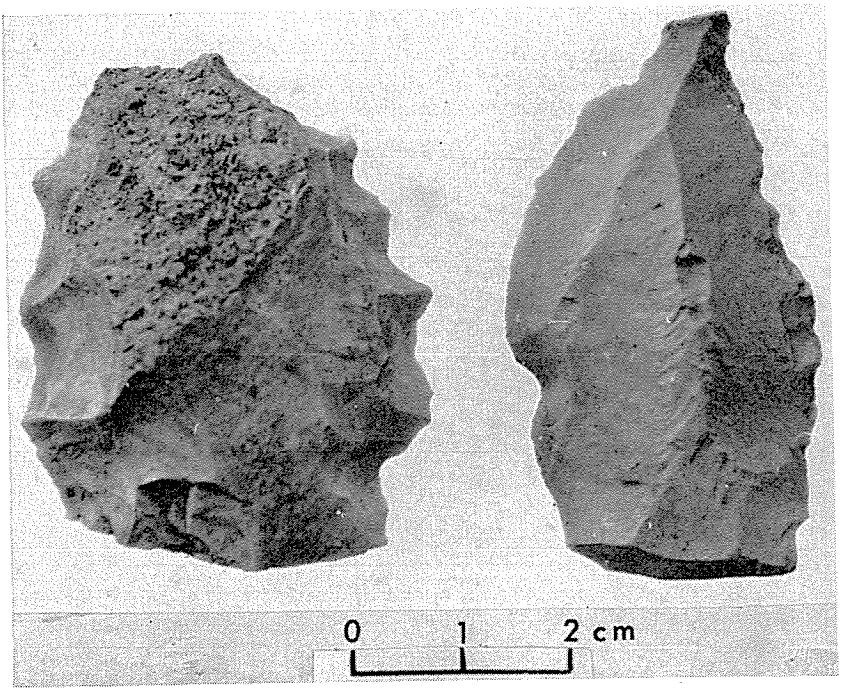

FIGURE 7. Denticulates.

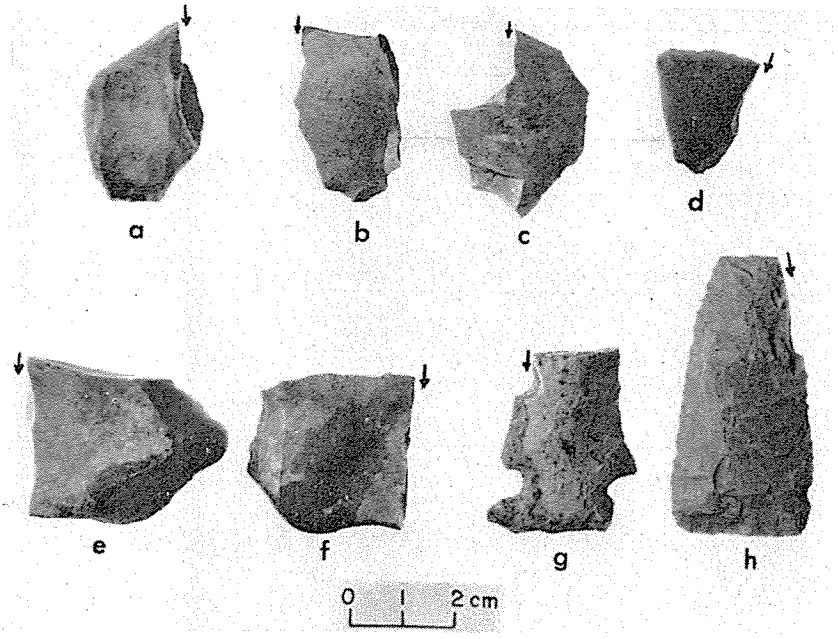

FIGURE 8. Burins: a, b, c and e on snapped flakes; d and f on truncations; g and h on snapped projectile points.

Burins are on snapped flakes (Fig. 8 a, b, c, e), on truncations (Fig. 8 d, f) and on snapped projectile points (Fig. 8 g, h).

Classification of retouched flakes is difficult, especially in distinguishing these deliberately made tools from the use-retouch pieces. The key to the problem is not to make any decisions until all of the artifacts have been examined. The deliberate retouch will stand out as patterned and regular, and the chipping will be of the same direction and force. Use retouch normally produces finer chips that are more irregular in spacing, direction and relative size.

Artifacts in Table III include debris, an inclusive term for the unwanted and unused "trash" left over from making tools and usable flakes or blades. Debitage could be called "blank flakes or blades" as these pieces have not been altered further by chipping or by use.

Table IV lists the breakdown of the debris. Biface thinning flakes (Fig. 9 a, b) show a faceted platform which is indeed a part of the opposite face of the biface. It is undoubtedly a product of a billet and is from the second stage of a biface production (Fig. 9 c, d). The first stage is demonstrable as percussion, the second as billet-thinning and the third as pressure retouch.

TABLE III
Other Artifacts

	Site 27	*Site 26*	*Site 25*
Debris	43.5%	48.2%	70.6%
Debitage	32.7	32.8	16.0
Use Retouch	6.7	6.7	5.9
Tools	17.1	13.3	7.5
Total Specimens	1342	1364	1738

TABLE IV
Debris

	Site 27	*Site 26*	*Site 25*
Biface Thinning Flakes	7.5%	6.4%	6.7%
Cortex Flakes	9.3	9.8	11.0
Cores	6.3	4.2	5.4
Chips	20.4	27.8	47.5

Although cortex flakes are occasionally made into tools (scrapers or denticulates) the practice is to classify unmodified specimens as debris.

Cores are self-explanatory, but chips sometimes cause problems in classification. Chips include material removed from cores or material removed from flakes or rubble in the process of making something else. These chips are too small or too irregular to be used as raw material for producing most of the tools in the collection. Admittedly, some arbitrary decisions must be made in regard to dimensions, but these can be reduced by studying the tools.

RESULTS

Now that the typological tools have been listed and the technological attributes calculated, we may proceed to the direct comparison of the three sites. It should be recalled that each site collection contains over 1340 artifacts and over 130 tools.

Compare the projectile points in Table I. The three sites have equal numbers of the Abasolo-Catan continuum, but that proves nothing. These so-called types have no temporal or spatial significance. The other forms of identifiable points show no pattern of similarity or significant difference. Obviously, a dozen or so identifiable points are of little use in comparing and contrasting sites. But, this may be the largest sample available in a real component (material remains of a local group).

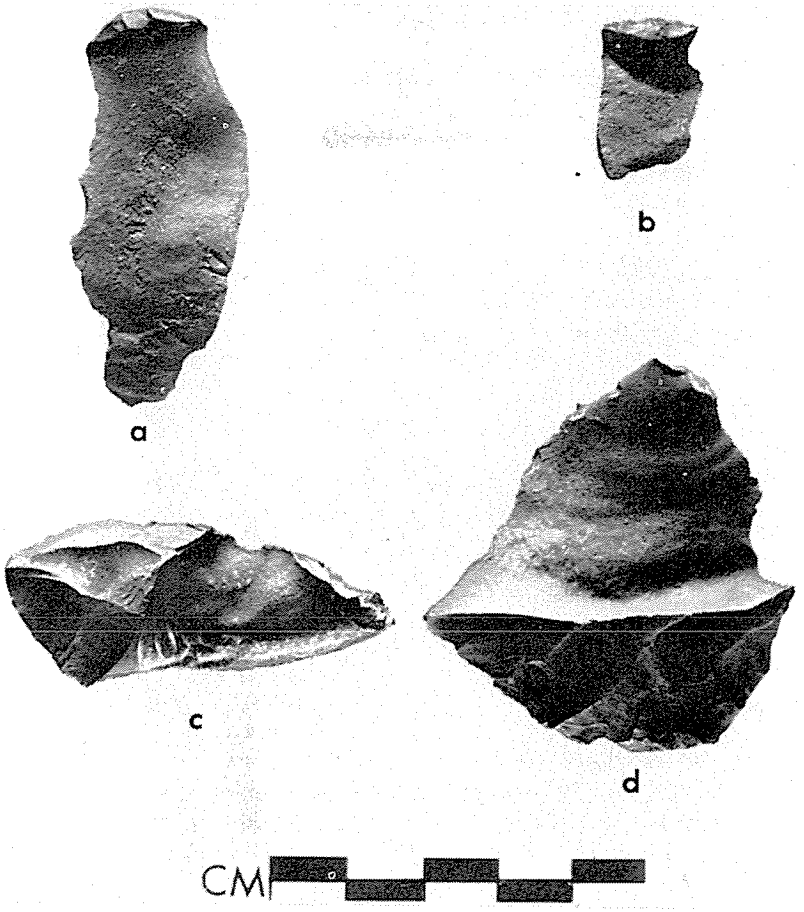

FIGURE 9. a and b, biface thinning flakes; c, biface ruined by overshot thinning flake; d, overshot thinning flake.

Compare the tools in Table II. This time there can be little doubt of the extraordinary resemblance among the three collections. Each tool, with only one exception, is represented at each site in reasonably similar frequencies.

The technological attributes reveal extremely close resemblances between sites 27 and 26, but an apparent difference between these two and site 25 Table III. The difference resolves itself into a considerably larger amount of chips in the latter site (Table IV).

The conclusion must be that the three collections are similar in so many ways that they can hardly be other than components of the

same abstraction: the material remains of a society over a relatively short period of time.

Unless the environment has changed considerably since these sites were occupied, I would conclude that the camps are primarily for foraging. Projectile points suggest hunting. The present abundance of reptiles, crayfish, freshwater mussels, various seeds, roots and fruit suggest that gathering might have been productive.

There is ethnographic evidence from other areas (Collier, Hudson, and Ford, 1942:38 and Shiner, 1961) that suggests that the hearths may be the remains of small earth ovens. If true, this may add to the probability that various roots as well as meat were cooked. From the condition of the fractured rock, it is quite probable that each earth oven was used only once, certainly not more than twice. Thus, a single hearth and associated debris may be the result of only a few days of residence.

Almost every site in the San Isabel drainage that has not been deflated conforms in gross structure to those described in this paper. The exceptions are flaking stations among the low gravel-covered hills and quite small concentrations without hearths. The latter are nearly always associated with quantities of small thin "arrow" points, and are considered to be later than the Archaic stage.

CONCLUSIONS

The social organization of a group of people camping together will depend upon a great many things. Season, activity, kinship system, basic economic patterns, environment, organization of the whole society, all will affect the size, nature and organization of the camp. The patterns of the debris vary also according to these influences.

Ideally, I suppose, a component should be the material remains of a central base camp where most of the important activities are originated, to which most of the economic products are brought, and where most of the artifacts are made. The science of archaeology has not yet demonstrated the existence of such sites for the Archaic period.

This paper has suggested that more thorough descriptions and analyses of smaller systematic collections can lead to a better understanding of what small groups were doing. In this study, logistic problems did not permit the recording of scatter patterns, a technique which would have added the dimensions of structure to the other dimensions of typology and technology.

The study does, however, show that the behavior patterns of certain small groups, as reflected by their artifacts, can in certain situations, be amazingly similar. The things made and the techniques of

making them are so nearly alike that a good case could be made for calling them all components of the same environmental adaptation. This implies that each of these individual collections are the material remains of members of the same society at about the same time, who were engaged in just about the same activities.

It is believed that the use of techniques such as those described in this paper will permit archaeologists interested in the Archaic or Paleo periods to resume the study of the people instead of being side tracked into pure taxonomy of tools. These techniques do not answer the main aims of archaeology which are history and process. They are steps in the direction of the prerequisite to these, namely description.

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The Basic Tool Kit Required To Make and Notch Arrow Shafts for Stone Points

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ABSTRACT

A project-approach is designed to find and define logical lithic tools. Arrow shaft notching saws, abrading knives, scrapers, and planing knives are described physically and comparatively on the basis of cutting edge type. Hard substances like wood or bone are found to be more readily and efficiently worked with tools having edges without retouch or other flaking.

INTRODUCTION

It seems to me that research of this nature needs a word or two of explanation. After the laboratory analysis and classification of the artifacts, there normally was a residue of specimens which were regarded as mere flakes. Some of these pieces are now believed to have been used as tools. They are being subjected to an analysis to determine their technique of manufacture, and to note and describe any effects of "use" that is discernible on them (Semenov, 1964).

There has as yet, been no particular emphasis or concern over what may have been a specific job for these "tools" other than major divisions such as scraping or cutting. Rather, the emphasis has been on how job use has affected or marked the tools. This approach only verifies that the "tool" was used in some mechanical way. It does not lead to identifying "tool" types for specific jobs.

Cultural change may be marked by the addition, or change, of products. This may require a modification of old tools, a shift in the relative frequency, or the creation of new types for new products. If these new forms are ever to be recognized, we need to greatly expand our knowledge of tools and pseudo tools. Special tool types should point to specific products. The presence of certain tools may indicate certain activities whether or not the product survived into an archeological inventory.

It is my belief that new tools may be recognized and eventually be added to our inventory of types. These new tools by their names will reflect major functions, or they will sub-divide classes. An example would be to sub-divide scrapers into: apparently best for bone, apparently best for wood, etc. (that is, apparently in the laboratory experiment).

I think that if any success is to be recognized along these lines, it will come from work projects designed to find the artifact tool that

will best do a specific job. Such a project is recorded in the following text.

GATHERING THE WOOD STOCK

Numerous excursions into the field proved to the author that stone axes were unsuitable for gathering shaftings of the proper diameter for arrows. Chopping resulted in long tapering ends, or in mashing, bruising, and splitting. The abrading knife (Sollberger, 1968b:97) in the proper size, does a fine easy job of gathering raw materials for arrow shafts. This tool will also quickly make the nock for a bow string in the proximal end of the arrow.

DRESSING AND SIZING THE SHAFT

The shaftings need to be uniform in length, weight, and spine for uniform performance. For this contouring, bifaces were found to be worthless. They will not do suitably neat work because of the irregularity of edge type.

Sufficient time was spent by the author making shaftings to acquire mechanical skill with lithic tools. One tool proved superior over all the others in reducing the diameters, and contouring wooden handles and shaftings. Uniface tools (scrapers) will do the work, but these were positively found to be second best. Flake or spall type tools with cutting edges formed by the intersecting line of two long flakes, make by far the best wood and bone working tools. Such spalls with thin, acute edge angles, can also be used as knives. These also may be snapped or truncated to make (like glass) excellent wood scrapers. However, the ultimate wood working tool is one that combines two special flake features. In the following paragraphs this tool will be referred to temporarily as a spall scraper. After a comparison of spall edged scrapers to flaked edge scrapers in wood working is made, this tool will be reclassified.

SPALL, OR NATURAL EDGED FLAKE SCRAPERS

The spall, or natural edge scrapers, that I have found to be the superior type for working wood or bone can be selected from the detritus of any lithic work shop, or, they can be made. From a mass, strike a platform large enough to produce flakes x and a to d (Fig. 1, A). Strike flake x and discard it. The following flakes, a through d are next struck to have in common this feature—that the plane surface below the positive bulb will be convex on both axes. This will produce four natural edge scraping implements that are knife-sharp and unblemished by other flake scar ridges.

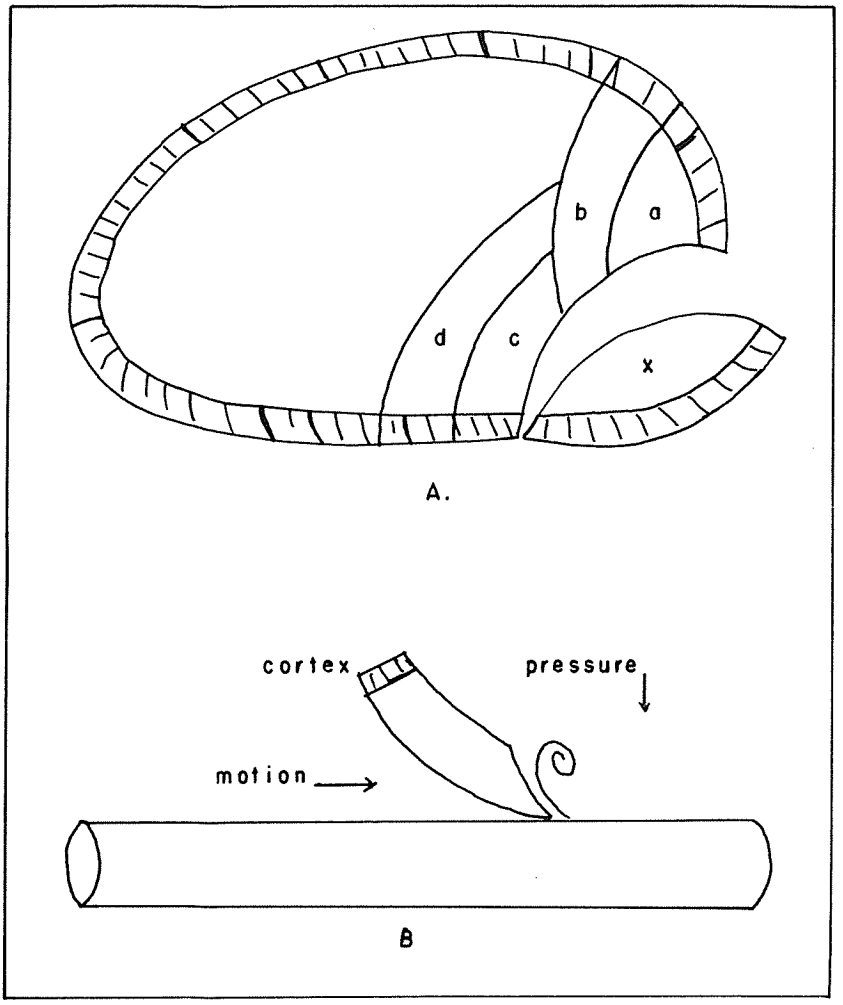

FIGURE 1. A, planer knife core, in section, showing knives a-d below the positive bulbs. B, planer knife shown in use. Note that scraper attributes are not present in use. The terms spall, or flake edge scraper, are inapplicable.

Now, with the aid of Fig. 1, B, the features will be listed that make this scraper type superior on hard substances like wood or bone. 1. The cutting edge is not marred by any ridge or irregularity. 2. The cutting edge has a lineal continuous concavity along its upper face that provides room for shavings to rise with a minimum of friction or distortion. 3. In use, this edge is self cleaning with the addition of

a slight lateral motion to the forward motion. 4. This edge is much longer lasting and capable of doing harder and tougher work because a "use-flaking angle" is not present in its use. 5. The convex surface below the cutting edge permits depth control over the shavings raised. This is accomplished by raising or lowering the cortex end as illustrated in Fig. 1, B. Gouging and rippling of the surface being worked is greatly reduced by this large planer surface directly beneath the cutting edge. In that this cutting edge is directly in line with the forward cutting motion, it will make thicker shavings with less effort, with less edge breakage, and with smoother finish than will the scrapers formed by chipping an edge.

FLAKED EDGE SCRAPERS

The scrapers that have been assigned informal type names such as: thumbnail, keelback, end, side, duckbill, spokeshave, etc. or classified by a modified European system (Shiner, in Blaine et al. 1968:76) all have one feature in common. That is, that the scraping edge is created and/or shaped by a series of flakes. An analysis of the edge reveals the following characteristics that are common to all scrapers. 1. Each flake removed to initially form or to resharpen an edge, will leave two ridges on the object face, and two ridge points at the edge being formed. 2. The edge between these points will be concave or scalloped. 3. The faces between the flake scar ridges will be concave, and there will be additional concavities—the negative bulb scars. Scrapers having these unalterable features proved to be considerably less efficient and harder to use than are natural edged (spall type) scrapers on hard substances like wood or bone.

When in use on wood or bone, (Fig. 2, B) the following events occur that do not occur when using scrapers that have no flakes on their cutting edges. 1. The ridge points striate the worked surface, and it never becomes completely smooth. 2. Full even surface contact is not made without excessive downward pressure because of the edge scallops and ridge points. 3. The ridge points must wear down and become dull before the scraper edge can make full even contact. 4. The scraper is therefore, on hard substances, never more than about fifty percent efficient. 5. There is no depth control over the cut other than downward pressure. This results in an excessive amount of ripple and gougings on arrow shaft surfaces that can only be removed by sanding or grinding. 6. Use-flaking of the edge occurs on hard surfaces whether this type of scraper is pulled or pushed into the work (Fig. 2, B). 7. The negative cavities create a thinness at the very edge that often breaks under hard usage. 8. Flaked edge

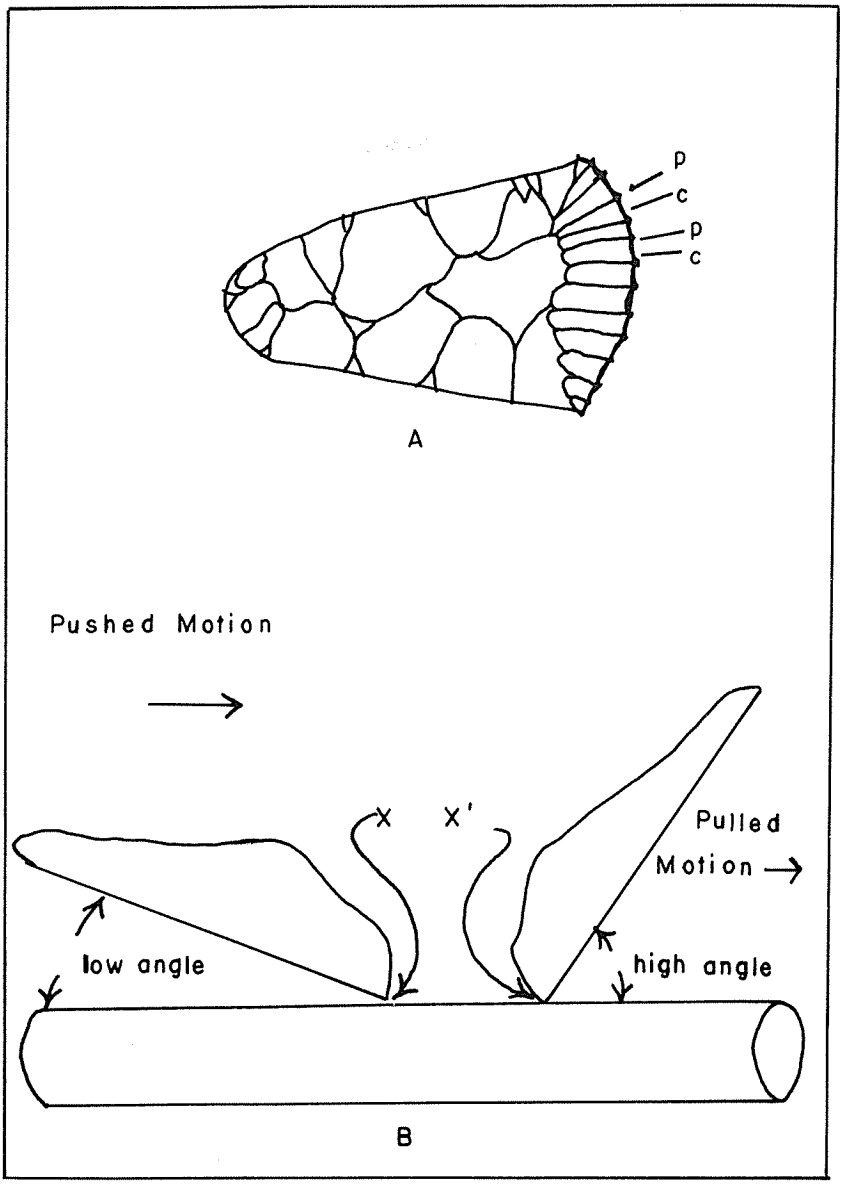

FIGURE 2. A, unalterable features of flaked edge scrapers; ridges and points —p, face and edge cavities—c.

scrapers must be presented into their work at a use-flaking angle (Fig. 2, B). On hard substances, this results in a too-short life be-

FIGURE 3. Planer knife shavings. Square ends were cut with an abrading knife.

cause of abrasion, breaks, and use-flaking. 9. The flaked edge scrapers are continually clogging up with wood fibers (items 2, 3 and 4). The edge contour (round to concave) of flaked edge scrapers seldom permits the self cleaning lateral motion to be added to the forward motion of the tool. The result here, is short broken shavings, and diagonal edge-gougings on the shaft being worked. Long continuous shavings as made by spall type scrapers (Fig. 3) are therefore very difficult to make with flaked edge scrapers.

THE PLANER KNIFE

Now that we have used both flaked edge scrapers and spall edged scrapers on the same and identical arrow shaftings, it is abundantly clear that the stone age man who was both a craftsman and artisan probably would not labor on similar shaftings by using a flaked-edge type scraper. It should also be clear that the spall type scraper that combines a "hollow-ground" upper face with a convex lower face is not a scraper, but, is properly a planing knife (Fig. 4).

Tool class in the functional sense is a determination of major mechanical activity that separates chopping, pounding, boring, grinding, scraping, cutting, etc. Type recognizes variations that are similar within class. Scrapers, as a class, have working edges that are designed to be pressed or raked across a surface. The sharp edges are not in

FIGURE 4. Planer knife.

line with the shavings raised or the cutting motion of the tool. Knives are cutting and slicing tools. Their edges are forced into the work in line and in plane with the cut desired. Lithic knives with very acute cutting edge angles are extremely fragile when used on substances as hard as wood or bone. Only very light side pressure is required to nick or break such an edge. Therefore, the edge angle is increased to prevent such damage as the hardness of the materials being worked increases. Wood or bone working knives of the planer type must have very strong or steep pitched working edges to prevent use flaking. This strength is provided by the convex surface below the edge. This convexity also serves as a depth gauge and planing bed, making it possible to produce long unbroken shavings of uniform thickness. The concave surface above the cutting edge serves the dual purpose of reducing the force required in cutting and friction distortion of the work done. The planer knife is forced directly into the work with the edge motion in line or paralleling the cut. It therefore is not a scraper, but a knife tool.

It is not known in what age stone workers discovered the superior qualities of edges combining a concave upper face with a convex lower face on a spall or flake, but this knowledge may have led to some of the blade industries recognized in various parts of the world. Perfection of this edge type extended into historic times in Mesoamerica. There, blades of obsidian were used as razors to shave with by the early Spaniards and others. These prismatic blades that formed polyhedral cores in their making (Crabtree, 1968:446) have edge types similar to planer knives. In fact, most blades, in cross-section, combine a convex lower face with a concave upper face in relation to the cutting edge. The edge angle is adjusted to suit the varying materials cut.

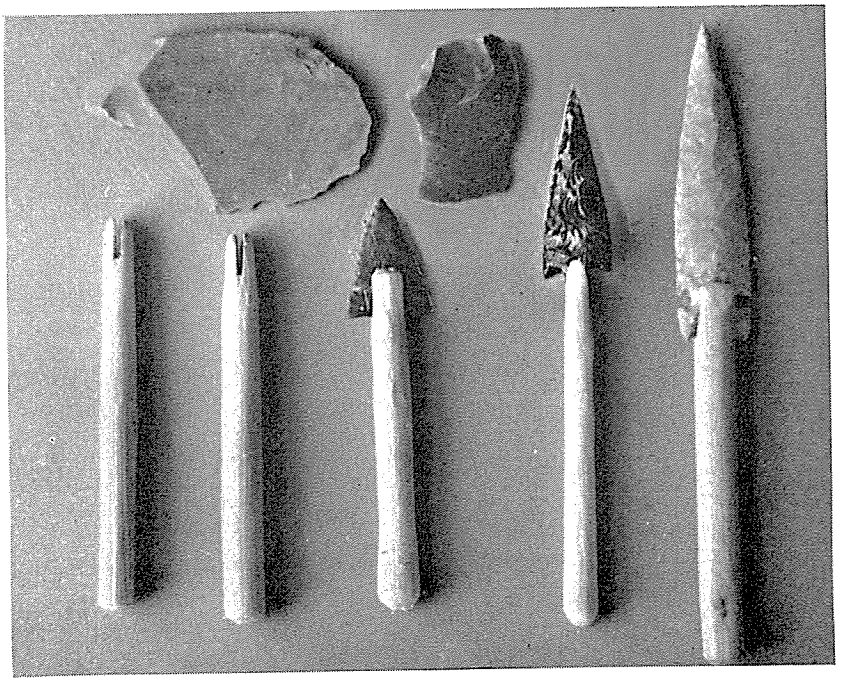

FIGURE 5. Notching saw, upper left. Note shallow teeth on lower edge. Knife flake, upper right. Gap thickness of notch on left is only 1.5 mm.

NOTCHING THE SHAFT

The preceding paragraphs have gathered the raw materials, shaped the arrow shaft, and described the certain tools required. Notching the distal end of arrow shafts, in which a stone point may be securely mounted, requires two more tools.

Statistics gathered from measuring a large number of stone points, tells us a number of facts that must apply in replicating an average sized distal end and notch, to receive the point. The diameter of this end will be reduced to about 6 mm. so that barbs or shoulders will not be obstructed. The notch must extend in from the tip of the shaft 10 mm. The notch gap, in order to hold tightly the thinnest points, must at times be no more than 3 mm. wide.

The tools to make the notch must have been available to all stone age men. The limitation of size, strength, and hardness, dictates that the tool material was the same as that from which the points were made. Fig. 5, upper left, illustrates the notching-saw flake that made the illustrated notches. The notching saw must have a few teeth (3 or 4) created by breaking small nicks from the lineal edge. Flaking

the edge will cause the tool to bind excessively and it then will not cut free the wood particles from within the cut. The saw is used until binding of its sides causes it to wedge in the cut. The knife-flake Fig. 5, upper right, is used to cut the sides of the deepening notch, parallel. The alternate use of the saw and the knife will make notches of any desired length. The notching saw must not have coarse teeth like artifacts usually described as denticulates. Each face of the saw should be a single plane. The faces should be essentially parallel and form a saw body often no thicker than 3 mm. for the thinner points.

The notching saw flakes and the knife flakes are normal by-products of a lithic work shop. Billet flakes are especially adaptable. Notchings for dart points and other larger haftings, permits the use of thicker and larger tools. One good notching saw will make several notches in soft green wood. Hard dry arrow shafts may require as many as two or three saws to complete one notch. Heavily used saws have wear on their edges that is easily felt or seen. The knives usually become nicked on the working edge before a light polish is apparent.

ARTIFACTS, VERSUS SHOP TOOLS

All of the various tools used in this project I made in order to have new, sharp, unworn cutting edges. Once it became determined that the abrading knife, the notching saw and the planer knife were, to me, the best possible tools for each phase of work, it became possible to test the hypothesis. The work performed had provided the physical features and method of using the tools in the laboratory. Knowing now what to look for, artifact assemblages were examined, and artifacts in exact replica of the shop tools were found.

I have collected planer knives from a quarry-shelter site at the Belton Reservoir, Texas. They average about four inches long, three inches wide, and one and one-half inches thick at the bulb. The bulb convexities are large and pronounced. Some examples have use-polish from the cutting edge extending back under the convex lower face. On others, where polish is not apparent, hand lenses show a smoothing that appears as a reduction of grain size of the stone surface. So far, with artifacts, shine has been restricted to the bulb area itself. Toward the distal end of the flake where cutting angles are more acute, extensive use retouch is present without polish.

At the Acton Site (Blaine *et al.* 1968:45) where all lithic artifacts and scrap were collected, no large flakes were present. However, I was permitted to sort out all pieces which had the technical morphology of the planer knife as I have discussed it. Examination of these edges with five to fifteen power hand lenses showed use-flakes of the proper character to indicate planer knife use. That is, use-retouch on the

lower convex face showed hinged flakes. Had the tool been used as a scraper, the use flakes on the under convex face would be feathered at the point of final separation, rather than hinged or broken off. This demonstrates the possibility that those tools were made and used as I made and used the planer knife in the shop.

CONCLUSIONS

It must be noted, regarding the wood working conclusions of this report, that green wood is much more easily worked. Seasoned wood and all bone will use-flake any lithic tool with a sharp edge. Notchings for hafting purposes must be delayed until the wood is nearly dry. Otherwise, the shaft or handle may split at the base of the notch during the seasoning interval.

The objectives of this project, initially stated in the introduction, have been realized to the extent that several conclusions seem justified. The replicating of bona fide stone age products (arrow shafts) should help in identifying new tools for archaeological inventories. One of these is the notching flake saw. This tool has no alternate when the notch is for light thin arrow points. The abrading knife has no alternate equal for gathering shafting and handling wood stock, and in making the proximal end nock for bow strings.

The planer knife is recognized here for the first time. It has no equal among lithic tools for making long uniform wood shavings, as far as laboratory experiments could determine.

A final conclusion is that wood scraping tools without retouch are superior to retouched edge scrapers. It is conceded that retouching of scraping edges for hard substances was probably done in the absence of available new tool stock; or to create a necessary shape not available in spall form.

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A Preliminary Report on the Development of a Ceramic Chronology for the Sabine Lake Area of Texas and Louisiana

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ABSTRACT

An extensive site survey was undertaken in the Sabine Lake area of Texas and Louisiana with the intention of obtaining sufficient ceramic collections to begin development of a ceramic chronology. Approximately 5,600 sherds were examined, although collections from only 14 sites (totalling approximately 5,000 sherds) were of sufficient size to use in the quantitative chronologic study.

The Sabine Lake sequence of ceramic paste categories is compared and correlated with the Lower Mississippi Valley Red River chronology by means of the Lower Mississippi Valley type ceramics that occurred in the Sabine Lake area collections. It is seen that although the two sequences can be aligned, the cultural dynamics of the coastal area are masked by the use of a stylistic classification in Louisiana on the one hand, and the use of a technological classification in coastal southeast Texas on the other. We urge that some accommodation be made.

The sequence is also compared and correlated with a rough sequence for the upper Galveston Bay area. It is seen that a substantial amount of cultural lag apparently existed between upper Galveston Bay and the Sabine Lake area, but the nature of the barrier to diffusion of cultural traits remains unclear at present.

INTRODUCTION

The principal obstacle to progress in investigation of the dispersion of cultural traits across the northern coast of the Gulf of Mexico is the lack of local culture chronologies between the upper Galveston Bay area in Texas, and the western margin of the Mississippi River floodplain in Louisiana. An extensive site survey in the Sabine Lake area of Texas and Louisiana (Fig. 1) was undertaken in an effort to partially remedy this circumstance.

One of the objectives of this survey was to obtain surface collections with which we hoped to begin development of a ceramic chronology by means of some seriation technique. This has been accomplished utilizing ceramic paste categories, and since our plans for additional kinds of analysis to refine the sequence will require substantial amounts of effort and time, and since no literature presently exists dealing with the Sabine Lake area, we feel it would be useful to present an account of our findings to date.

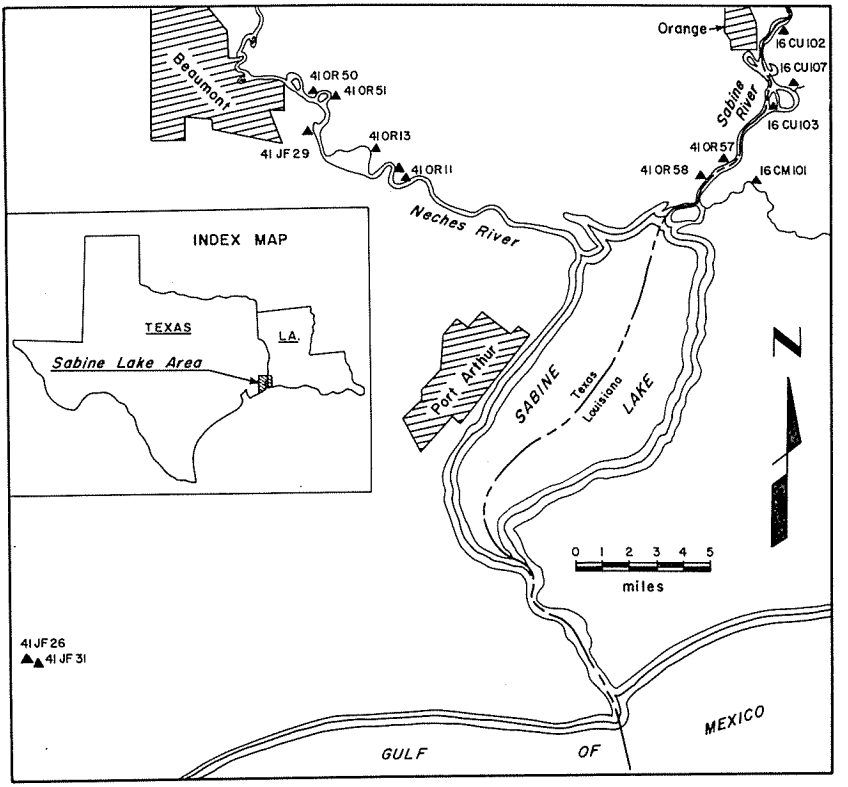

FIG. 1. Location of Sabine Lake area and seriated sites.

ARCHAEOLOGICAL BACKGROUND

The earliest known archaeological investigation in the Sabine Lake area was the 1940-41 site survey conducted by G. E. Arnold as part of a WPA-University of Texas project. This survey, confined to the Texas portion of the area, located numerous sites in Orange and Jefferson Counties. Some of these sites are now destroyed or are impossible to relocate, but others have been revisited and additional surface artifacts have been collected. Arnold's collections, now housed at the Texas Archeological Research Laboratory in Austin, have been examined qualitatively, but no detailed analysis has yet been undertaken.

That portion of the Sabine Lake area situated within Louisiana was surveyed for sites by McIntire (1958). This survey located twelve sites in western Cameron and Calcasieu Parishes, of which three were utilized in an extension of the Red River chronology to Southwestern Louisiana.

More recently, and in connection with this project, Bollich has surveyed and collected surface material from sites in Orange and Jefferson Counties, Texas and in Cameron and Calcasieu Parishes, Louisiana.

Excavations in the area have been limited to testing at the Gaulding Site (41 JF 27) by members of the Texas Archeological Society in 1965 (Bollich, MS in preparation). While the Gaulding Site data has some interesting aspects, it appears that it will not contribute significantly to the development of a ceramic chronology.

THE SITES

Sites in the area from which collections were utilized in this study are of two kinds: shell middens, and earth middens. The shell middens are composed almost exclusively of the clam *Rangia cuneata* and are situated on natural levees bordering present and former channels of the Sabine and Neches Rivers, on beaches bordering Sabine Lake, and on cheniers (stranded shell beaches) bordering the coastline. Generally these sites do not attain thicknesses greater than 3 feet, and average about 1.5 feet.

The earth middens which thus far are only known from Jefferson County, Texas, are apparently devoid of shell food remains. These sites are situated atop geomorphic features known as pimple mounds, which are associated in great number with meander belt ridges that traverse the surface of the late Pleistocene Beaumont Formation. These ridges, because of their slightly higher elevation, extend southeastward into the coastal marshes and offered drier habitation conditions for people apparently subsisting on a marsh fauna.

ARTIFACTS

During the Bollich survey, 5,659 artifacts were recovered. These include 5,625 potsherds (including 74 that could be identified with previously defined types), 9 dart points, 19 arrow points, 3 socketed bone projectile points, 1 elbow pipe fragment, and 2 historic artifacts. Since the chronology is based upon the ceramics, other types of artifacts are not described in this preliminary report.

Classification of the ceramics was begun by sorting them into the two descriptive paste categories and the previously defined types that are described below. The paste categories were then sorted into groups based on presence or absence of decoration, and on various vessel form traits. Since our investigations are not yet complete, detailed artifact descriptions will be presented later.

GROG-TEMPERED PASTE CATEGORY: we are using the term "grog" to

refer to fired clay fragments used as a tempering agent (Shepard, 1963: 25). Often these fired clay fragments are seen to be sherds, but usually they cannot be identified as such. Our original classification of grog-tempered sherds provided for two sub-categories: grog-tempered with sandy paste; and grog-tempered with fine paste. The reason for doing this was because we knew there were Lower Mississippi Valley decorated ceramics present in the area, and there was no reason to think that there would not be corresponding plain sherds as well. By subdividing our paste categories in this manner, we hoped to gain some insight into the importance of the Lower Mississippi Valley ceramic technology in the Sabine Lake area. Two difficulties have caused us to abandon this subdivision, at least for the present. The first is that we were not able to standardize our criteria sufficiently well. Although each of us could reproduce his own classification well enough, we were not able to reproduce the other's classification satisfactorily. This is one of the inherent limitations in visually estimating size and percentage of sand grains .

The second difficulty came to light after examining surface collections from coastal sites much closer to the Mississippi River. This revealed that some of the indigenous Lower Mississippi Valley grog-tempered sherds are actually quite sandy (at least from the coastal area) thus defeating our purpose. It is clear, however, that Lower Mississippi Valley ceramics are present in some quantity and during a significant period of time along the coast as far west as the Sabine Lake area. It is doubtful though, that the Lower Mississippi Valley ceramics can be confidently differentiated from presumably indigenous grog-tempered ceramics on the basis of paste characteristics alone.

It may be that the significance of the paste categories needs to be considered in a different perspective. Let us first review some of the salient facts of the situation.

1. The significance of sand in sandy paste ceramics is, at best estimation, uncertain. We incline to the viewpoint, previously stated by one of us (Aten, 1967: 10-11), that sandy paste ceramics were made from sands and clays used in their natural associations and that any selection for grain sizes was based on the natural associations available. We are presently unable to prove this viewpoint, but the fact that many sandy paste sherds are light-colored and contain iron concretions suggests that this is the case, since this is also a characteristic of the late Pleistocene sediments in the area. By the same token, we are unaware of any objective evidence suggesting that the sand is truly a tempering material (i.e., an intentionally added aplastic).

2. Sandy paste ceramic traditions have been recognized at a Tche-

functe time level in Louisiana, and throughout pottery using time in southeast Texas.

3. Both Aten (1967: 13) and Ambler (1967: 39) have noted the frequent occurrence of sand and silt in addition to grog particles in the paste of the proposed grog-tempered types San Jacinto Plain and San Jacinto Incised from the upper Galveston Bay area. In addition, Ambler (1967: 40) has noted (and we concur in this observation) that grog particles are quite rare in some of these sherds.

4. Most workers have for many years acknowledged the similarity between many of the design styles on Goose Creek Incised in the upper Galveston Bay area to Coles Creek Period and Plaquemine Period design styles in Louisiana (e.g., Suhm and Jelks, 1962: 55). However, many of the Goose Creek Incised design styles, while still clearly in the Coles Creek-Plaquemine design tradition, combine design elements into design styles unreported in the Coles Creek and Plaquemine Periods. The actual transition or drift between the two style traditions has never been documented.

Some of these Goose Creek type designs occur in the Sabine Lake area collections as well. We also have a very few sherds showing strange combinations of design styles. For instance, we have one sherd which would be a good example of Harrison Bayou Incised (a Plaquemine Period type) except for the presence of a set of horizontal, parallel lines incised below the cross-hatching. Another sherd has horizontal, parallel lines incised on the exterior, cross-hatched lines on a flat lip, and Harrison Bayou type cross-hatching on the interior. This might be the first evidence of stylistic innovations that ultimately become part of the inventory of Goose Creek Incised design styles. The important point, however, is that incised designs probably were not introduced into the upper Galveston Bay area directly from Lower Mississippi Valley ceramics.

The possibility is thus presented that the grog-tempered (with sandy paste) sherds actually represent the interaction of the two principal ceramic technologies present in the coastal area. That is, the makers of sandy paste ceramics (in our view, a technology based on using unmodified natural clays) were subsequently exposed to the idea of introducing fired clay fragments (probably crushed sherds) into the paste to make "better" pots. Judging from the relative toughness of contemporaneous sandy paste and grog-tempered sherds in coastal southeast Texas, we would guess that there was no observable improvement in the pottery as a result of adding grog fragments. At the same time, it appears that virtually no other Lower Mississippi

Valley ceramic traits directly accompanied the introduction of grog-tempering into the upper Galveston Bay area.

In the Sabine Lake area, grog-tempering was of great importance throughout most, if not all, of ceramic using time. But here grog-tempering is accompanied by Lower Mississippi Valley decorated ceramics. In the upper Galveston Bay area, however, such was not the case, with the possible exception of some Tchefuncte-like ceramics, but here we are dealing only with the sandy paste ceramic tradition. It may be that in the absence of a clear technological advantage, and without the reinforcement of other aspects of Lower Mississippi Valley ceramic technology, it was not possible for grog-tempering to gain much popularity.

We realize that many circumstances are left unexplained, but we feel that the issue of interaction between the makers of the two major ceramic technological traditions as expressed in grog-tempered (with sandy paste) ceramics is worth raising.

In any event, we have combined all grog-tempered sherds into a single group differentiated only by the presence of decoration (i.e., straight line incising occasionally combined with punctations, and red-filming).

SANDY PASTE CATEGORY: generally speaking, the morphological characteristics of this category are similar to those described by Aten (1967: 10), Ambler (1967: 31), and Shafer (1962: 22) for sandy paste ceramics in the Lower Trinity River area to the west. Attempts have been made to subdivide sandy paste ceramics on the basis of sand grain sizes at both Cedar Bayou (Ambler, 1967: fig. 19) and the Conroe Reservoir (Shafer, 1968: 40). At Conroe Reservoir, no stratigraphic significance for grain sizes could be found (Shafer, personal communication) and evidence for stratigraphically significant changes in the proportions of sand sizes at Cedar Bayou seem to us to be probably not significant. Recognizing the difficulties already mentioned in visually estimating size and percentage of sand grains in sherds, and recognizing the lack of results from nearby areas, we chose to use only one paste category for the sandy paste sherds. Late in our analysis, and while adding some new collections to our seriated sequence, we noticed an increasing number of sandy paste sherds containing granule-sized chert grains. Since sites containing such sherds generally fell early in our sequence, and since it should be reasonably easy to sort for such an extreme variation in grain size, our plans for the future call for such an analysis.

Decoration techniques (as opposed to design styles) on sandy paste ceramics are the same as those on grog-tempered ceramics,

i.e., straight line incising occasionally combined with punctations, and red-filming. We have not yet investigated changes in incised design styles through time and between paste categories. The sandy paste red-filmed sherds are all identical to the proposed type Goose Creek Red-Filmed (Aten, 1967: 11).

Reasonably good examples of the following pottery types were also found in the Sabine Lake area collections.

EUROPEAN TRADITION: Spanish Olive Jar, early or middle style (Goggin, 1960: 9-12).

ROCKPORT FOCUS: Rockport Black-on-Gray.

LOWER MISSISSIPPI VALLEY TRADITION: Hardy Incised, Harrison Bayou Incised, Coles Creek Incised, Ponchartrain Check-Stamped, Churupa (?) Punctated, Troyville Stamped, Marksville or Yokena Incised, Marksville Stamped, Orleans (?) Punctated, and Tchefuncte Plain.

Because of erosion of the surface of some sherds, it was not always possible to distinguish Marksville Stamped from Troyville Stamped. For this reason they are combined in Fig. 3.

THE ANALYSIS

If a logical scheme of investigation is to be followed in an area that is archeologically unknown, the location of sites through surveying should be followed by an attempt to develop an historical framework which, in our situation, means a ceramic chronology. As was previously mentioned, McIntire (1958) attempted to extend the Lower Mississippi Valley chronology to this area. It has been our experience, however, that diagnostic sherds from the Lower Mississippi Valley area do not occur in sufficient numbers to serve as chronological markers in very many sites, or zones within sites. More importantly, such a scheme does not deal directly with the indigenous ceramics. Indeed, it seems to us that any seriation scheme which utilizes less than 1.5 percent of the artifacts recovered is questionable at the very least. Rather, we have found these Lower Mississippi Valley ceramics (along with certain other artifacts) to be useful in verifying our sequence based upon paste categories and in correlating this sequence with Ford's Red River chronology (Ford, 1952: fig. 2).

Although we recorded the occurrence of designs and various kinds of rim and base forms, it seemed clear from the start of our investigation that a sherd sequence based upon differences in proportions of the paste categories would be most likely and most practical, since only a relatively small percentage of the indigenous ceramics collected exhibit decoration or some indication of vessel form. In this situation,

one is forced to rely primarily on variations in paste characteristics if statistically reliable sample sizes are desired.

The requirements necessary for a successful seriation have been discussed by Ford (1962: 41) and are itemized below as they apply to our Sabine Lake area collections.

1. It is essential that a consistent typology be utilized. It is for this reason that we abandoned the subdivisions of the grog-tempered paste category that were based upon sand content.

2. The assemblages to be ordered should represent short periods of occupation. The shallow depth of most of the sites from which collections were made (the average was about 1.5 feet) suggested that this might be the case. Further, the lack of variety within the different classes of ceramic attributes indicated that rates of change might be rather slow, thus minimizing the effect of surface collections representing somewhat longer periods of occupation.

3. All of the collections are from a fairly restricted area (Fig. 1) thus minimizing the effect of any spatial variation.

4. The sites from which most collections were made are located along Holocene geomorphic features of varying age, suggesting that the sites and ceramic assemblages would likewise be of varying ages. This is an obvious requirement for chronological ordering, for if the sites are all of more or less the same age, the constituents of the ceramic assemblages should be present in more or less the same proportions and an ordering would not be possible.

5. In order to obtain reliable percentages, an unselected sample of sufficient size must be obtained. In other areas, best results have been obtained with samples containing more than 100 sherds although smaller samples have been used. Since we had 14 site collections with more than 100 sherds in each (and totalling 5,071 sherds) we chose to confine the ordering to these sites for the present.

Since we were attempting an ordering based on only 2 paste groups, the graphic seriation technique advocated by Ford (1962) seemed quite adequate for the problem.

The procedure was simple: percentages of the two major paste categories were plotted graphically on strips of paper and these strips were then ordered into smooth patterns of increase in one category and decrease in the other. Based on information from the Addicks sites (Wheat, 1953: 184) and the Jamison Site (Aten, 1967: fig. 5a), we assumed that the sandy paste ceramics would have been dominant early in our sequence and the grog-tempered ceramics dominant later (Fig. 2).

The crucial step in the analysis was to test the validity of our

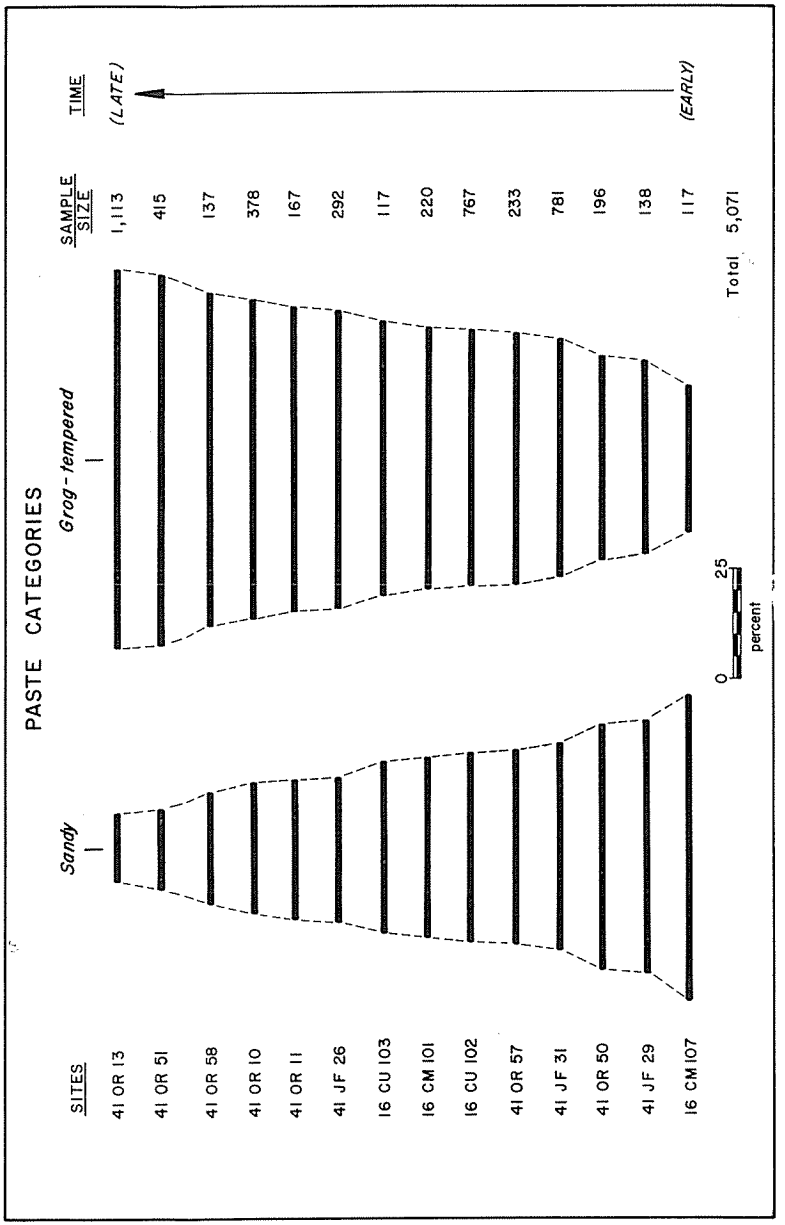

FIG. 2. Paste category seriation of Sabine Lake area sites.

sequence. One means would have been to dig a series of stratigraphic tests at several sites in the area. Almost all of our sites are shell middens, however, and artifact densities are generally low. It would thus have been necessary to excavate a large number of test squares which was entirely beyond our resources.

In our collections we had some 20 kinds of artifacts about which some estimation could be made of the relative time they would appear in a cultural assemblage. These generally consisted of projectile points, Lower Mississippi Valley ceramics, and European artifacts. Our procedure for testing the sequence of sites based on paste categories was to graph the occurrence of these 20 kinds of artifacts (subsequently called "diagnostic artifacts" for want of a better term) in the sites that had been seriated.

The seriated sites were listed on a sheet of rectangular coordinate paper along the ordinate axis, and the diagnostic artifacts were listed along the abcissa in the order we would expect them to appear. If the ordering of the sites was truly a chronological one, the occurrences of the diagnostic artifacts should fall above a line running more or less diagonally across the graph from lower left to upper right. Complete correspondence is not to be expected, particularly in these kinds of collections but the actual results (Fig. 3) show a remarkable correspondence to the expected results.

As was noted at the beginning of this section, sherds bearing information on vessel form and decoration were relatively few in number, and in the interest of larger sample sizes, we felt obliged to rely primarily on paste categories in setting up the Sabine Lake sequence. Having set up the sequence of paste categories and tested its validity, we then proceeded to examine the distribution of rim forms, base forms, lip modification styles, and decoration styles through the ordered sequence of sites. The relative proportion of each trait was plotted graphically by site on strips of paper. The strips were then placed in the same order as the paste category seriation. The results of this approach were practically nil. For one thing, most traits occurred in both paste groups and in most sites. For another, no popularity patterns could be recognized.

We do not feel that the paste category seriation is invalidated by these results. Rather, we feel that these form and decoration traits must be re-analyzed in a more sophisticated manner. Toward this end, we are reworking the material for data to be used in a trait association analysis along the lines of Deetz's Arikara study (Deetz, 1965). This, however, will not be finished for quite some time. In any event, it

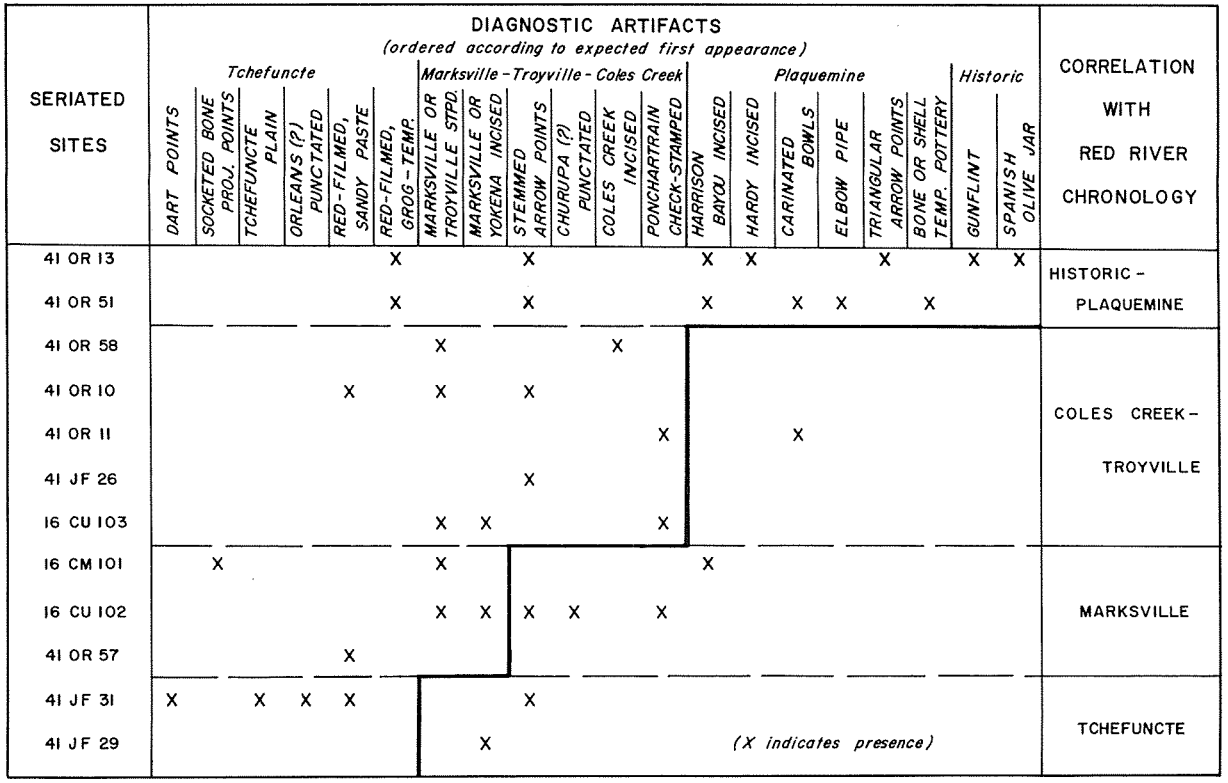

FIG. 3. Correlation of seriated Sabine Lake area site sequence with "diagnostic artifacts." Sites 41 OR 50 and 16 CM 107 are omitted because no "diagnostic artifacts" occurred.

would appear that a chronological sequence based upon the patterns of popularity of sherd paste categories is highly practical, and viable.

CORRELATIONS AND COMPARISONS

The correlation of the Sabine Lake chronology with that of the Lower Mississippi Valley Red River chronology is clear in its broad outline and is indicated on Fig. 3. It is necessary to remember, however, that this is a correlation of relative chronologies, and not absolute chronologies. We have no information at this time to tell us the absolute age of the Sabine Lake Tchefuncte correlative horizon versus the classic (i.e., Ponchartrain) Tchefuncte Period in the Red River chronology, and the same applies to the other correlative horizons. Thus we have no idea of the time lag, if any, involved in the diffusion of ceramics westward along the coastal plain. Indeed, it is not presently possible to fully evaluate the occasionally heard suggestion that at least some ceramic traits diffused eastward along the coastal plain, having been ultimately derived from areas of Meso-America (e.g., Phelps, 1964: 122).

At the present time, the Lower Mississippi Valley ceramic taxonomy does not include any sandy paste wares except for the Tchefuncte Period types Mandeville, O'Neal, and Alexander. Thus we have no means of quantitatively comparing the sequence of Sabine Lake ceramics with the sequence in use farther east in southern Louisiana (Gagliano, 1967: 8). Moreover, the ceramic typology in use in Louisiana is largely based on stylistic considerations, whereas typology in coastal southeast Texas is largely based on technological considerations. The conclusion is fairly clear that some accommodation needs to be made. We feel that future work in southern Louisiana should include a more detailed quantitative consideration of paste categories and plainwares if the necessary perspectives on cultural dynamics of the coastal area are to be achieved.

It is also instructive to compare the Sabine Lake chronology with a ceramic seriation we have compiled (Fig. 5) from surface and excavated material for an area approximately 50 miles to the west. This area centers around upper Galveston Bay. To facilitate comparison we have expanded the Sabine Lake paste category seriation to show the decorated ceramics (Fig. 4).

For the most part, the two chronologies are based on similar ceramics although type names have been applied in the upper Galveston Bay area. We have introduced three horizon markers to aid in comparing the two sequences. It is important to remember that use of these markers is not an attempt to establish ceramic periods, but is

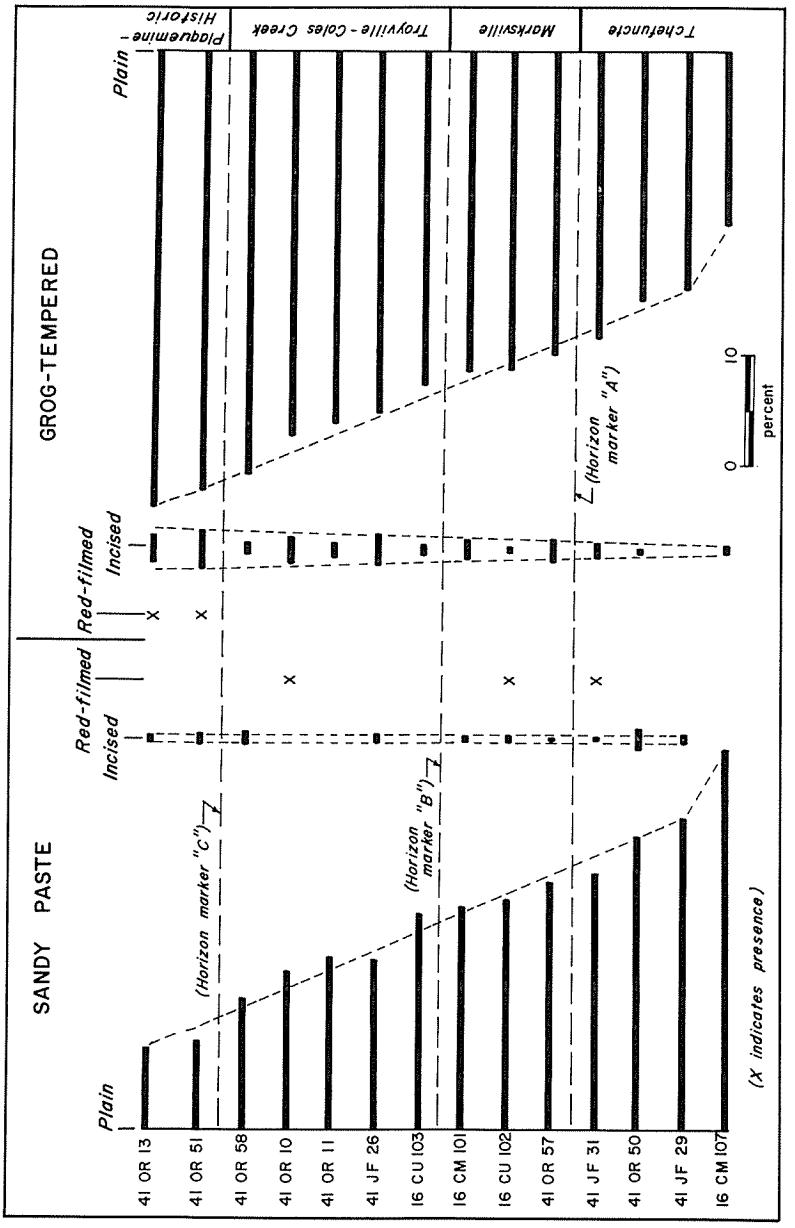

FIG. 4. Sabine Lake area paste category seriation of Fig. 2 expanded to show plain and decorated ceramics.

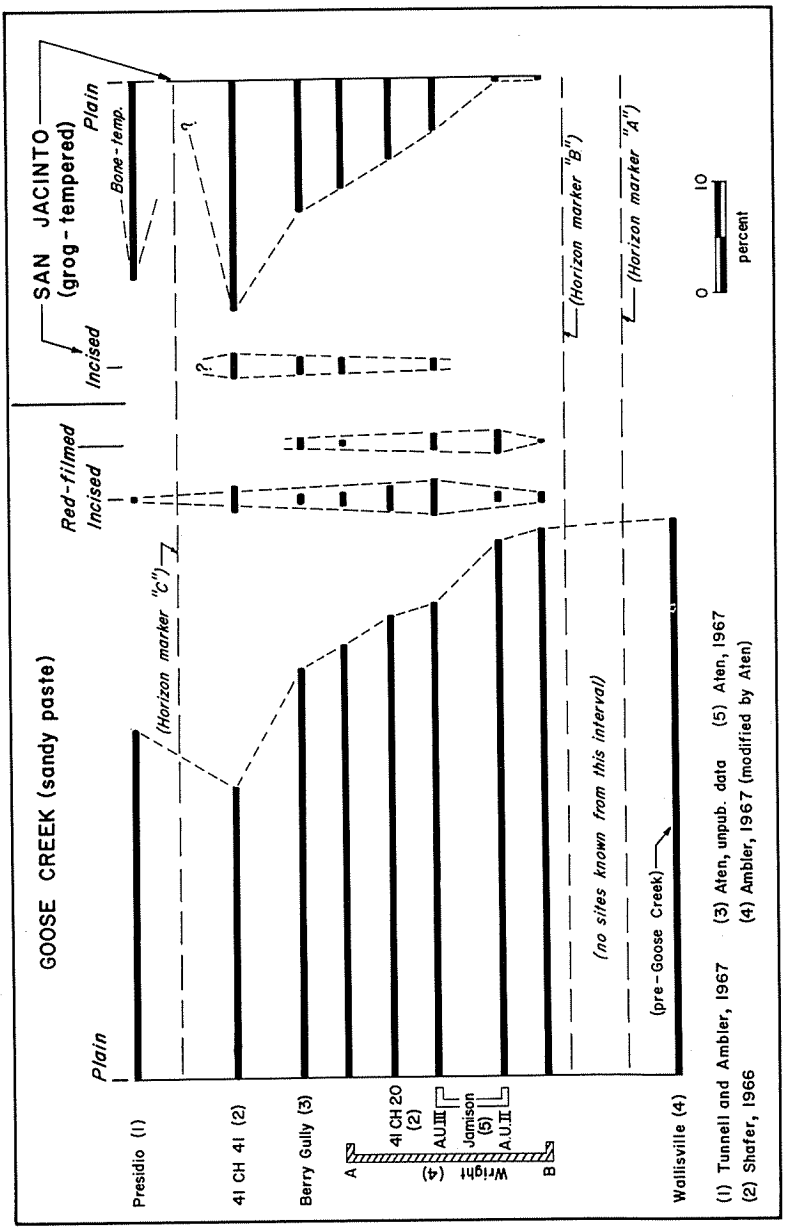

FIG. 5. Seriation of upper Galveston Bay area ceramic assemblages.

recognition of similar cultural events in both the Sabine Lake area and the upper Galveston Bay area. These events, or horizon markers, are then used to examine the relative differences in the ceramic assemblages from the two areas. Horizon marker "A" marks the last occurrence of assemblages associated with Tchefuncte cultural traits. Horizon marker "B" marks the appearance of arrow points in the upper Galveston Bay sequence and the beginning of the Troyville correlative horizon in the Sabine Lake sequence. In Louisiana, the introduction of arrow points is usually considered to mark the beginning of the Troyville Period. Horizon marker "C" marks the appearance of assemblages associated with historic materials.

The most striking difference is that the early part of the upper Galveston Bay sequence (prior to Horizon marker "B") consists solely of plain sandy paste ceramics. Plain grog-tempered ceramics (San Jacinto Plain) appear much later (just after Horizon marker "B") and with substantially diminished popularity when compared with the Sabine Lake sequence. The single bar for pre-Goose Creek ceramics at Wallisville (Fig. 4) actually represents three sites and is based on comments in Ambler (1967: 79). Ambler (personal communication) has subsequently developed a classification for this pottery but it remains unpublished at present.

Other important differences are also apparent. For one thing, incised ceramics of both paste categories appear in our earliest Sabine Lake site (prior to Horizon marker "A") and continue with remarkably stable proportions, up to the latest site (later than Horizon marker "C"). In the upper Galveston Bay sequence, Goose Creek Incised (sandy paste) appears much later (around Horizon marker "B"), reaches a popularity peak, and then steadily declines through Horizon marker "C." San Jacinto Incised (grog-tempered) appears after Horizon marker "B" and disappears by Horizon marker "C." It is important to remember, however, that this is only a comparison of the use of the incising technique on the various paste categories, and not a comparison of incised design styles.

In the Sabine Lake sequence, sandy paste red-filmed and grog-tempered red-filmed sherds apparently have a disjunct distribution but this is not clear because of the small number of sherds involved. In the upper Galveston Bay sequence, red-filming on a grog-tempered paste has not yet been discovered. The distribution of Goose Creek Red-Filmed (sandy paste) shows a distinct similarity to the distribution of the corresponding material in the Sabine Lake sequence.

Another important feature of the upper Galveston Bay sequence in contrast to the Sabine Lake sequence, is the absence of grog-

tempered pottery and the presence of bone-tempered pottery at the historic site of the Presidio San Agustin de Ahumada (Tunnell and Ambler, 1967: 90). It seems probable, however, that the assemblage at this site represents a Spanish occupation rather than an Indian occupation. For this reason, we cannot be sure if it is representative of the pottery utilized contemporaneously by the Indians.

After comparing these two sequences, the indication is that a substantial amount of cultural lag occurred over a very short distance (approximately 50 miles). Just what sort of barrier existed to the diffusion of the grog-temper ceramic technology and to various decoration techniques is not known at this time.

Finally, we should note that the possibility definitely exists that the Sabine Lake sequence can be extended somewhat farther back in time, possibly to show a pre-Tchefuncte correlative horizon.

CONCLUSIONS

As was stated in the introduction, this is preliminary report on a continuing investigation. Results thus far have been the establishment of a ceramic sequence for the Sabine Lake area of Texas and Louisiana based on sandy, and grog (probably sherd)-tempered paste categories. Comparison of this sequence with the occurrence in the seriated sites of "diagnostic artifacts" (artifacts whose relative time of first appearance can be estimated) indicates that the paste category seriation is viable and extends through time from a Tchefuncte correlative horizon to an historic horizon.

Distribution plats of rim forms, base forms, lip modification styles, and decoration styles do not reveal any simple popularity patterns. A more sophisticated analysis of trait associations is planned for this material.

Correlation of the Sabine Lake sequence with the Lower Mississippi Valley-Red River chronology can be made through identification of Lower Mississippi Valley ceramic types, but these occur too seldom to permit construction of a chronology around them alone.

A rough correlation can also be made with the emerging local chronology for the upper Galveston Bay area to the west. Although the indigenous ceramics in this area are more or less morphologically similar to those of the Sabine Lake area, dramatic differences can be seen in their respective popularity patterns. The most striking of these differences is seen in the grog-tempered ceramics. These are abundant throughout the Sabine Lake sequence but appear much later in the upper Galveston Bay sequence. Although we cannot presently evaluate the nature of the barrier resulting in substantial

cultural lag between the two areas, we are at least alerted to its presence.

It is quite true that we still have many investigative angles remaining to pursue in the collections we have in hand. Also, many of the sites along streams are being rapidly eroded and as a result we continue to enlarge our sample. These additional collections and analyses will be reported on in due time and will no doubt require modification, to a greater or lesser degree, of the conclusions reached in this report. For the present though, we have principally tried to present a practical tool for the chronological analysis of ceramic assemblages from the Sabine Lake area, and to attempt to foresee some of the problems that additional data may pose.

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New Perspectives for Physical Anthropology and Archaeology

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ABSTRACT

Physical anthropology and archaeology have diverged in their aims from a common base in anthropology. Today, these two sub-fields must come closer together in their investigation of man as a biological being and as a cultural being.

It is the purpose of this paper to present a new approach to the relationship of physical anthropology and archaeology. The basis of the approach centers about the idea that man is first a biological being, and only second is he a creature with culture. The concept is clearer if we look at the evolution of man. Most people will agree that there is a physical basis, a biological capacity, for culture which must have evolved prior to the evolution of culture. This relationship of biology and culture is present, however, and the import of the relationship has been hotly debated.

Granting the evolution of a biological capacity for culture, it is much easier to proceed to the second premise, that of biology as a cultural limitation. As biological beings, no matter how complex our culture may be, there are certain limits placed on this culture by the mere fact that we are, after all, human. We still suffer from diseases, we must still eat, our nutrition must be adequate, and so on.

Within this framework, the physical anthropologist may take skeletal remains and cultural materials and add another dimension to the framework. Historically, this dimension has been lacking. Physical anthropologists were struggling with a plethora of metrical data, and the first article of faith for physical anthropology was the acceptance of anthropometry as the basis of its science.

At present, a new trend has been taking root. Meaningless measurements are being either re-evaluated or cast aside for better techniques (Brothwell, 1968). Genetics, with its dynamic implications, is becoming the most useful tool with which to approach the analysis of our data, including that of skeletal remains. It emphasizes the analysis of populations and the changes of populations through time.

Much useful information has come from the application of a genetic framework to our skeletal populations. The use of epigenetic traits, those traits which are closely related to direct genetic content, has opened a new basis for analysis (Anderson, 1963, 1968a; Berry and Berry, 1967; Berry, 1968). For example, often cranii have accessory bones in the sutures. These accessory, or Wormian, bones may be

closely linked to the genetic content. Thus, two populations with high incidences of the accessory bones may be related. However, this data is not meaningful by the consideration of one trait alone. Usually many of these traits are used to compare two populations on the basis of a profile of these traits. If the profiles are very similar, then the two populations are said to be genetically similar populations. It is not safe to say that the two populations may be related on the basis of one trait, since, for example, brown hair has a high incidence in many and often unrelated populations.

A more complete listing of epigenetic traits is given in Berry and Berry (1967), and Anderson (1963).

Ideally, an anthropologist may trace a population through time as Anderson did at the Serpent Mound site. He compared the Mound and the Pit populations on the basis of 30 anomalies, which he called true hereditary traits. By use of statistical techniques he was able to show how the two populations differed from each other and how these populations changed through time (Anderson, 1968a). This may show the archaeologist the degree of intermarriage between the two groups or the isolation of the groups, at least in mating patterns, from other groups.

Another way to show degree of relationship is to examine diseases which are hereditary. Brothwell cites a situation in which five females of one period were found to have a congenitally abnormal femur head. This hip anomaly suggests genetic relationship, and further evidence suggests that this is certainly probable. All of these skeletons were in the same district, and three were in the same cemetery. Two of the latter occupied adjacent graves (Brothwell, 1965).

Numerous other diseases are hereditary; lists of these may be found in Dobzhansky (1962, pp. 107-111).

Other diseases, not necessarily hereditary, show the effects of occupation on the skeleton. For instance, a degeneration of the elbow joint, called atlatl-elbow, or javelin thrower's elbow, often occurs. This degeneration is caused by the peculiar movement accompanying a thrust of the object to be hurled. Cultural and skeletal evidence should both support this diagnosis (Miller, 1960).

Other skeletal adaptations are manifested elsewhere. The Balearic Islanders used slingshots and the result of this action pulled the deltoid muscle on the arm so that the bone was roughened in a distinctive manner at the attachment of this muscle (Wells, 1964:134).

Not only does the examination of disease and skeletal adaptation tell us something about culture, but equally importantly, it helps describe the physical world on which the culture rests (Armelagos,

1969). An analysis of artifacts does not tell us the degree of human suffering experienced by a people, and neither does a skeletal analysis tell us how people coped with their physical milieu in terms of their culture. Archaeology and physical anthropology in combination can tell us a great deal more about a culture and a people than we can simply discover relying on one to the exclusion of the other. This is the new approach which must be taken, and must include ethnology and linguistics, or else our data will become so fragmented as to become meaningless. Artifacts do not exist without the biological organisms, *i.e.*, humans, who manufacture them.

Skeptics may well cite past performances on the part of the physical anthropologists. While volumes of data were produced, they may say no meaning has emerged from this data in terms of the study of anthropology. Some physical anthropologists and others are, however, orienting themselves in this new direction. There are articles on the effect of inadequate nutrition in infancy on mental ability (Eichenwald and Fry, 1969). Armelagos (1969) and Roney (1966) discuss paleoepidemiology, the study of disease in ancient populations. Bone cells are being studied to discover disorders of metabolism, infectious diseases, developmental diseases, and so on (Frost, 1966).

New methods of skeletal analysis are presently available, through the use of which physical anthropologists could expand their contributions. These include X-ray diffraction, neutron activation analysis, laminography, fluorescent antibody techniques, and light microscopy. New knowledge is available in serology, genetics, chemistry, and physics.

For example, since many of the Southwest Indians kept turkeys, Salmonella, a bacteria which may cause an intestinal infection, could have been transferred from the turkeys and might be present in mummified remains. By new techniques, it is now possible to discover the presence of the infection (Jarcho, 1966).

Although this paper is mainly limited to a discussion of genetics, diseases, and skeletal adaptations, other areas of investigation yield much necessary information about human biology and culture. Some of these areas include the study of dentition, demography, skeletal deformations induced by cultural practices, non-hereditary diseases, biochemistry, X-ray studies, and so on. The use of genetics, diseases, and adaptation illustrate the central theme of this paper.

Physical anthropologists are presented a challenge to master and use these new techniques.

With data from all subfields in anthropology, not just archaeology and physical anthropology, the archaeologist may arrive at an inter-

disciplinary approach to his data. In essence, the net result of this interdisciplinary effort will be a unified approach to the study of anthropology. Some intradisciplinary effort already has been recognized as important with regard to zoologists, geologists, palynologists, and others.

Although this approach should be beneficial to the anthropologists, it makes greater demands on both the archaeologist and the physical anthropologist. It calls for more rigid controls in the excavation of human skeletal remains, and the close co-operation of the archaeologist and the physical anthropologist who will correlate their data. No physical anthropologist should pretend to be an archaeologist, but both should realize that anthropology is an endeavor to study all aspects of man.

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Catfish Spines from Archeological Sites in Texas

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ABSTRACT

Archeological reports containing photographs of pectoral spines of catfish, but identified as mandibles of gar, have led other investigators to perpetuate the error. Illustrations of pectoral spines and a gar's mandible are presented to aid in future identifications.

Spines from pectoral fins of catfish are among the less common items found in archeological sites in western and southwestern Texas. Such spines have been found, however, in Baker Cave (Douglas, in press), the San Lorenzo Site (Curtis D. Tunnell, personal communication), Eagle Cave (Ross, 1965), and Centipede and Damp Caves (Epstein, 1963). Pectoral spines have been considered to be awls, the evidence for such usage hinging upon the spines showing polishing of the surfaces.

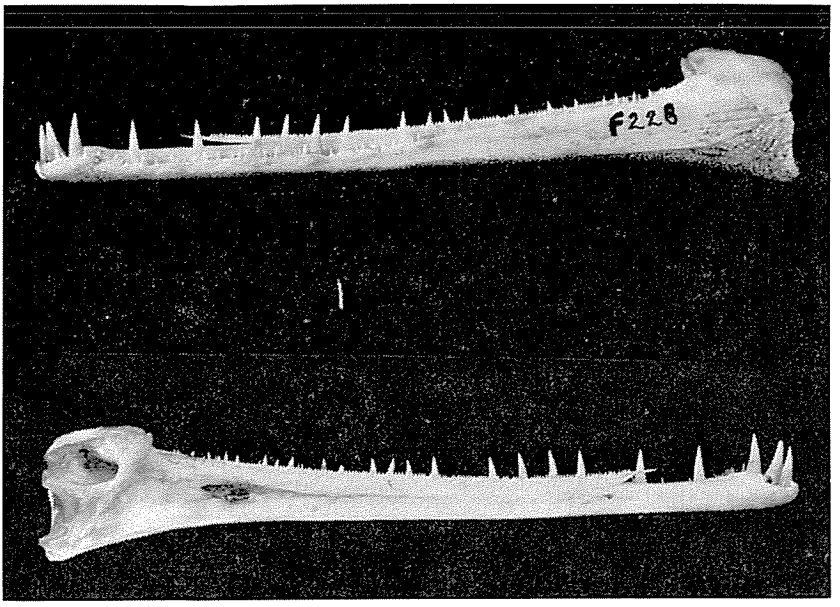

FIGURE 1 (above) Labial view of left mandible of spotted gar, taken in Town Lake, Austin, Texas. Original length 10.8 cm. (below) Buccal view of the same mandible shown above. The jaw is composed of several bones; note the simple articulation and the rounded, anterior end.

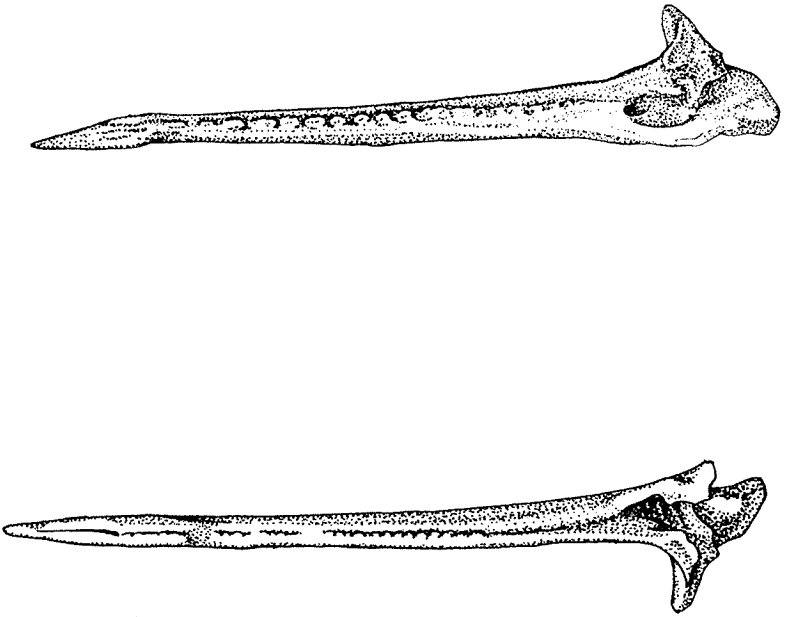

FIGURE 2 (above) Left pectoral spine of a channel catfish, found in Baker Cave, Val Verde Co., Texas. Note tooth-like projections along the long axis, and the tapering distal end. One articulating process was broken off during excavation. (below) Right pectoral spine of a channel catfish taken in Town Lake, Austin, Texas. Original length 54 mm. Note the complex articulations. Drawing by Hal Story.

Unfortunately, pectoral spines have not always been recognized as such. A pectoral spine of a catfish was identified as being a gar mandible (Epstein, 1963, Fig. 23 E), an inadvertent error that has tended to perpetuate itself. Later, Ross (1965: 107) considered a similar spine as being a "gar jaw-bone." The bone illustrated by Ross (1965, Fig. 26 H) appears to me to be a pectoral spine having the proximal, articulating end broken off. Recently I examined pectoral spines from several other sites; all were assumed by the archeologist to be mandibles of gar.

Figure 1 shows the left mandible of a spotted gar, *Lepisosteus productus*. This fish (F228) was taken in Town Lake, Austin, Texas; it weighed 2333 grams and was 80 cm. in length.

Figure 2 shows the left pectoral spine of a channel catfish found in Baker Cave, Val Verde County, Texas. One articulating process was broken during excavation. The lower illustration in Fig. 2 is of a spine from the right side of a channel catfish, *Ictalurus punctatus*,

taken in Town Lake. This fish (F234) weighed 1127 grams and was 43 cm. in length. Skeletons of the fish mentioned above (F228, F234) are in the skeletal collection of the Archeological Research Laboratory, University of Texas at Austin.

Mandibles of bony fish are composed of several bones, whereas pectoral spines are composed of only one bone. The articulation of a gar's mandible is much simpler than the complex articulations of a pectoral spine. Pectoral spines of catfish have bony projections along one or both sides of the long axis, depending upon the species involved; these projections may be mistaken for teeth, unless the specimen is examined closely. This feature probably has contributed to the misidentifications of this bone and the resultant reports in the literature.

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Legal Safeguards for Preserving the Past

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INTRODUCTION

Since man does have a brain, he has a tendency to pause and reflect. One aspect of this reflection is that of speculation about his origin.

Archaeologists may use speculation to build theory, but they must be able to unearth some evidence of and about the past. Much of our historic, and still more of our prehistoric, past has been lost due to careless destruction preparatory to new construction or due to treasure hunting. For this reason, some legislation is necessary to protect against inept and willful demolishment of tangible evidence of previously existing human communities. This type of legislation falls in the category called antiquity laws.

The purpose of this paper is a delineation of the historical background of this concern; a presentation of federal and state legislation in the field; and some discussion of the probable effectiveness of the antiquities codes in the various states.

HISTORICAL BACKGROUND

A. CAUSE FOR CONCERN

As primitive man moved up through time his shelter evolved through time from "lean-to's" to mud huts to earth lodges to grass dwellings to stone houses. It is conceivable that he left some remains at each occupational level or living site that can be interpreted by those with proper training and the inclination to do so. The "reading" of these prehistoric and historic "records" has become the main business of modern archaeology. As a matter of fact, because of their broad socio-cultural interpretation of the data—some might be called "ethno-archaeologists."

Now that we have subdued the wilderness and conquered our geographical frontiers in these United States, we are becoming increasingly concerned about our historic and prehistoric past. The notations of Lewis and Clark in their expedition of the great West beyond the Mississippi are considered valuable ethnographic records. The diary-like history-guidebook on "Michilimachinac" by John R. Bailey, a phy-

sician, is a valuable ethnographic document and contains some data that help to explain the "gaps" and the seeming inconsistencies between the archaeological findings and the historical record in Michigan history books.

Thomas Jefferson, the third U.S. President, was the first to excavate an ancient Indian Village in this country. According to Dr. J. O. Brew (in Wendorf, 1962), "Not only did he do the digging but he also published an account of it, thereby setting an example not always followed by successors. Jefferson's *Notes on Virginia* dated 1782 and published in Paris in 1784, carries a report of his excavation of a site in Virginia which inaugurated American Archaeology."

Brew goes on to point out that the 19th century discoveries of ancient Pompeii, the excavations at Troy and in Egypt, plus the discoveries of topographic and railroad surveys in western United States "brought archaeology to the threshold of professional status." The first professorship was established in 1866 at the Peabody Museum, Cambridge, Massachusetts, and the chair was known as the George Peabody Professor of American Archaeology and Ethnology. "Museums transformed themselves," continues Professor Brew, "from collectors 'cabinets' of natural, unnatural, and so-called scientific curios to presentations of prehistoric cultures and stories of man's steps in his development toward his dominant position in the modern world. The whole field of the history of mankind took on meaning, content, and purpose."

Within the last twenty years a new dimension has come into archaeology with phenomenal consequences. This new dimension is known as salvage archaeology. Regarding its amazing development Fred Wendorf (1962:6), one of its pioneer architects, observes:

> In the last few years, salvage archaeology has become a major concern to archaeologists throughout this country, and, indeed, throughout the world. In many areas industry has come to consider salvage archaeology as a normal, standard part of its construction projects; it has recognized a legal and moral obligation to protect our cultural and scientific resources from needless destruction.

In discussing the genesis of this concern in one of the scientific journals, Dr. Brew points out the fact that population growth all over the world has always threatened the preservation of historical and archaeological items. In other words, we may say that for thousands of years different civilizations have wrecked the structures of previous generations to "make way for tomorrow"—to quote a 20th century radio program. Modern Athens, Rome, Cairo, Damascus and New York have all gone through this process. Dr. Brew's delineation asserts that "to meet the threat resulting from unprecedented rural and urban

developments of the 20th century, the idea of salvage archaeology developed. . . . Since not all old buildings, information or artifacts can be saved, the idea of salvage archaeology is to survey and record. . . . This does not impede progress and occasionally an alternative route for a road or a dam can be found in order to save a threatened monument" (1960:294).

The first major program in salvage archaeology in the United States took place in Kentucky and Tennessee and adjacent territory in connection with the work of the Tennessee Valley Authority during the first term of the presidency of Franklin Delano Roosevelt. It was carried on under the direction of Major William S. Webb, then chairman of the Department of Anthropology at the University of Kentucky. Numerous sites were surveyed and excavated before any water came into the reservoirs.

The most extensive salvage yet undertaken by the United States government followed World War II. The U.S. Bureau of Reclamation and the Corps of Engineers had been authorized to create 108 dams in the Missouri River Basin with countless other projects to follow. A group of archaeologists was quick to realize that because "almost all of the prehistoric and early historic occupation of the Missouri was on the banks of the main stream and its tributaries, a large part of our heritage was scheduled to go under water (Brew, 1962:14). They organized the *Committee for The Recovery of Archaeological Remains* in order to prevent much of our American heritage from literally "going down the drain." Archaeologists active in the 1945 effort included Dr. J. O. Brew, Dr. Frederick Johnson, and Dr. Frank H. H. Roberts of the Bureau of American Ethnology in the Smithsonian Institute. The *Committee* was co-sponsored by the American Council of Learned Societies, the Society for American Archaeology, and the American Anthropological Association. The efforts of this dedicated group of scholars, though inexperienced politically, won support in Washington. With the assistance of the archaeologists at the Smithsonian and undergirded by the Antiquities Act of 1906, the Historic Sites Act of 1935, and the guidance of the National Park Service—brought into being the INTER-AGENCY ARCHAEOLOGY SALVAGE PROGRAM OF THE UNITED STATES GOVERNMENT (Brew, 1947:209-25).

B. Types of Salvage Archaeology

The three main types of salvage archaeology are: (1) River Basin Salvage, (2) Pipeline Salvage, and (3) Highway Salvage.

Beginning with the Missouri River Basin projects the report of the number of archaeological, paleontological and historical surveys has been an impressive record of cooperation between government

agencies and the public with scholars and universities in the direction of primarily epistemological goals.

A publication of the *Committee for the Recovery of Archaeological Remains* reported on the accomplishments from 1946-1957 in a pamphlet entitled *The Inter-Agency Archaeological Salvage Program After Twelve Years.*

It is interesting to note in summary that:

(a) 9,000 sites were located and recorded, including prehistoric villages, burial grounds, trails, quarries, fur-trading posts, military forts, pioneer cabins and early frontier settlements.

(b) Surveys were made in 310 reservoirs in 42 states;

(c) Sixty-nine (69) excavations were conducted in 69 reservoir areas in 31 states; and

(d) Over 4,000,000 specimens were gathered for compiling and classification.

As demand for oil and natural gas increased and tank car transport proved inadequate to meet the supply needs, a new threat came to our prehistoric past as engineers perfected methods of moving gas and oil through pipelines. Thus Pipeline Salvage Archaeology was born. Archaeologists are now standard personnel on pipeline projects.

Then in 1956, President Eisenhower inaugurated a 56 billion dollar road building program. The Society for American Archaeology was immediately alert to this new danger to American antiquities and set up within the organization a Highway Salvage Committee under the leadership of Dr. Fred Wendorf, then director of anthropological research at the Museum of New Mexico (now as of 1964—Head of the Department of Anthropology, Southern Methodist University). By 1962, Highway Salvage Archaeology was organized in eleven states. In eight years, 250 new highway routes in the state of New Mexico alone had been surveyed by archaeologists and seventy-two sites excavated.

On an international scale, UNESCO of the United Nations Organization established a world committee in 1960 with King Gustaf VI of Sweden, himself an archaeologist, as chairman. In 1961, President Kennedy delivered a strong message to Congress calling for U.S. support (to be undergirded by funds) and appointed Professor John Wilson of the University of Chicago as executive of the U.S. Committee to cooperate with the World Committee under the United Nations Educational, Scientific and Cultural Organization (UNESCO).

Whereas archaeological salvage, properly planned and executed, neither denies nor impedes progress, it cannot take place without certain prescribed rights of passage. Hence the body of legislation which

is known as "antiquities acts"—to be discussed in the remaining sections of this paper.

FEDERAL ANTIQUITIES LEGISLATION

The first antiquities code was not conceived by archaeologists, nor did its framers have archaeology in mind. Its authors were so farsighted that the Federal Antiquities Act of 1906 is yet a model in the field. Not only that, but it proved to be a significant development in the growth of the national park system; it made possible the quick preservation of great works of nature and portions of the nation's landscape that might have been exploited or destroyed as the U.S. frontier moved westward.

FEDERAL ANTIQUITIES ACT

Public Law—209
34th Congress S. L. 225
June 8, 1906

An Act For the preservation of American antiquities.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled. That any person who shall appropriate, excavate, injure, or destroy any historic or prehistoric ruin or monument, or any object of antiquity, situated on lands owned or controlled by the Government of the United States, without the permission of the Secretary of the Department of the Government having jurisdiction over the lands on which said antiquities are situated, shall upon conviction, be fined in a sum of not more than five hundred dollars or be imprisoned for a period of not more than ninety days, or shall suffer both fine and imprisonment, in the discretion of the court.

SEC. 2. That the President of the United States is hereby authorized, in his discretion, to declare by public proclamation historic landmarks, historic and prehistoric structures, and other objects of historic or scientific interest that are situated upon the lands owned or controlled by the Government of the United States to be national monuments, and may reserve as a part thereof parcels of land, the limits of which in all cases shall be confined to the smallest area compatible with the proper care and management of the objects to be protected: *Provided,* That when such objects are situated upon a tract covered by a bona fide unperfected claim or held in private ownership the tract, or so much thereof as may be necessary for the proper care and management of the object, may be relinquished to the Government, and the Secretary of the Interior is hereby authorized to accept the relinquishment of such tracts in behalf of the Government of the United States.

SEC. 3. That permits for the examination of ruins, the excavation of archaeological sites, and the gathering of objects of antiquity upon the lands under their respective jurisdictions may be granted by the Secretaries of the Interior, Agriculture, and War to institutions which they may deem properly qualified to conduct such examination, excavation, or gathering, subject to such rules and regulations as they may prescribe: *Provided,* That the examinations, excavations and gatherings are undertaken for the benefit of reputable museums, universities, colleges, or other recognized scientific or educational institutions, with a view to increasing the knowledge of such objects, and that the gatherings shall be made for permanent preservation in public museums.

SEC. 4. That the Secretaries of the Departments aforesaid shall make and publish from time to time uniform rules and regulations for the purpose of carrying out the provisions of this Act.

Approved, June 8, 1906 (34 Stat. L.225)

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UNIFORM RULES AND REGULATIONS

Prescribed by the Secretaries of the Interior, Agriculture, and War to carry out the Provisions of the "Act for the Preservation of American Antiquities," Approved June 8, 1906 (34 STAT. L., 225)

1. Jurisdiction over ruins, archeological sites, historic and prehistoric monuments and structures, objects of antiquity, historic landmarks, and other objects of historic or scientific interest, shall be exercised under the act by the respective Departments as follows:

By the Secretary of Agriculture over lands within the exterior limits of forest reserves, by the Secretary of War over lands within the exterior limits of military reservations, by the Secretary of the Interior over all other lands owned or controlled by the Government of the United States, provided the Secretaries of War and Agriculture may by agreement cooperate with the Secretary of the Interior in the supervision of such monuments and objects covered by the act of June 8, 1906, as may be located on lands near or adjacent to forest reserves and military reservations, respectively.

2. No permit for the removal of any ancient monument or structure which can be permanently preserved under the control of the United States *in situ*, and remain an object of interest, shall be granted.

3. Permits for the examination of ruins, the excavation of archeological sites, and the gathering of objects of antiquity will be granted by the respective Secretaries having jurisdiction, to reputable museums, universities, colleges, or other recognized scientific or educational institutions, or to their duly authorized agents.

4. No exclusive permits shall be granted for a larger area than the applicant can reasonably be expected to explore fully and systematically within the time limit named in the permit.

5. Each application for a permit should be filed with the Secretary having jurisdiction, and must be accompanied by a definite outline of the proposed work, indicating the name of the institution making the request, the date proposed for beginning the field work, the length of time proposed to be devoted to it, and the person who will have immediate charge of the work. The application must also contain an exact statement of the character of the work, whether examination, excavation, or gathering, and the public museum in which the collections made under the permit are to be permanently preserved. The application must be accompanied by a sketch plan or description of the particular site or area to be examined, excavated, or searched, so definite that it can be located on the map with reasonable accuracy.

6. No permit will be granted for a period of more than three years, but if the work has been diligently prosecuted under the permit, the time may be extended for proper cause upon application.

7. Failure to begin work under a permit within six months after it is granted, or failure to diligently prosecute such work after it has been begun, shall make the permit void without any order or proceeding by the Secretary having jurisdiction.

8. Applications for permits shall be referred to the Smithsonian Institution for recommendation.

9. Every permit shall be in writing and copies shall be transmitted to the Smithsonian Institution and the field officer in charge of the land involved. The permittee will be furnished with a copy of these rules and regulations.

10. At the close of each season's field work the permittee shall report in duplicate to the Smithsonian Institution, in such form as its secretary may prescribe, and shall prepare in duplicate a catalogue of the collections and of the photographs made during the season, indicating therein such material, if any, as may be available for exchange.

11. Institutions and persons receiving permits for excavation shall, after the completion of the work, restore the lands upon which they have worked to their customary condition, to the satisfaction of the field officer in charge.

12. All permits shall be terminable at the discretion of the Secretary having jurisdiction.

13. The field officer in charge of land owned or controlled by the Government of the United States shall, from time to time, inquire and report as to the existence, on or near such lands, of ruins and archeological sites, historic or prehistoric ruins or monuments, objects of antiquity, historic landmarks, historic and prehistoric structures, and other objects of historic or scientific interest.

14. The field officer in charge may at all times examine the permit of any person or institution claiming privileges granted in accordance with the act and these rules and regulations, and may fully examine all work done under such permit.

15. All persons duly authorized by the Secretaries of Agriculture, War, and Interior may apprehend or cause to be arrested, as provided in the act of February 6, 1905 (33 Stat. L., 700), any person or persons who appropriate, excavate, injure, or destroy any historic or prehistoric ruin or monument, or any object of antiquity on lands under the supervision of the Secretaries of Agriculture, War, and Interior, respectively.

Supplementary legislation has been enacted by the 74th and 86th Congresses. In 1935 Congress passed Public Law 74-292 known as the *Historic Sites Act* which provides for the preservation of sites, buildings, objects and antiquities of national significance for the "inspiration and benefit of the people of the United States."

In 1960 Congress enacted Public Law 86-523 "to provide for the preservation of historical and archaeological data (including relics and specimens) which might otherwise be lost as the result of the construction of a dam."

STATE ANTIQUITIES LEGISLATION

The fourth section of this paper is a digest of existing antiquities acts and/or preservation programs among the several states. An attempt has been made to indicate the probable effectiveness of the regulations in each state by grouping the states into categories ranging from strong antiquities codes to "no provisions."

The categories and the states so classified follow:

A. ANTIQUITIES ACTS—strong codes including regulations requiring the service of a State Archaeologist. There are seventeen (17) states so classified. They are:

Delaware	New Mexico
Florida	New York
Iowa	North Carolina

Kansas
Kentucky
Maryland
Minnesota
Nevada
Oklahoma
Oregon
Texas
Utah
West Virginia
Wisconsin

B. SPECIFIC LEGISLATION—official enabling laws but without the position of State Archaeologist. There are seven (7) states that fall in this category. They are:

Alaska
Arkansas
Michigan
Missouri
North Dakota
South Dakota
Wyoming

C. OFFICIAL REGULATIONS—designed to prohibit treasure seekers, et al. from destroying valuable historical and/or archaeological items. There are seven (7) states expressing this degree of concern. They are:

Alabama
Arizona
California
Hawaii
Montana
Nebraska
Washington

D. ARCHAEOLOGICAL PROGRAMS with Government Support—no official legislation but with resolutions expressing concern and designating certain funds to support the program through State Museums, and/or Universities. The thirteen (13) states so committed are:

Connecticut
Colorado
Idaho
Illinois
Indiana
Maine
Massachusetts
New Jersey
Ohio
Pennsylvania
South Carolina
Tennessee
Virginia

E. STATE ORGANIZED CONCERN—without any official program but with the organized efforts of State Universities, Museums, State Historical Commission and related agencies. The two (2) states so classified are:

Georgia
Louisiana

F. VOLUNTEERS ONLY—states where no official concern is manifested and preservation efforts carried on by State Archaeo-

logical and/or State Historical Societies. There are two (2) such states, namely:
New Hampshire Vermont

G. NO PROVISIONS—where there is no known attempt at preservation of archaeological remains of historical significance. One such state:
Rhode Island

Note: No report available on the state of Mississippi.

The succeeding pages will present the synopsis of the regulations and program highlights for Texas and each of the boundary states.

Texas—Chapter 153; Title 4, Articles 147a and 147b; Chapter 152; Chapter 227; Chapter 150; Chapter 193; Chapter 194; and Chapter 195. (See Appendix A for 1969 Proposal)

Chapter 153 and Article 147a are general antiquities laws which protect archeological remains on State-owned and -controlled lands and on (all?) lands west of the Pecos River in the State. Also declared to be a misdemeanor is the forging or alteration of article of antiquity for profit. Within this section (Article 147b), are the law requirements for nonresidents in obtaining permits to explore or excavate archeological remains on State or private lands. The State legislature has authorized counties to set up advisory historical commissions, to be appointed by the county judge; and has allowed cities and counties to acquire museums, buildings, sites, and landmarks of archeological interest (Chapters 152 and 227, respectively), and to set up historic markers or monuments in such areas as of significance to the county (Chapter 150). Provisions have been enacted which protect the integrity of the properties declared significant. (Chapters 193 and 194). The Texas State Historical Survey Committee was established to coordinate the State program designating sites of historical, archeological, or paleontological significance (Chapter 195). The position of state archeologist, attached to the State Buildings Commission (409 Sam Houston State Office Building, P.O. Box 12172, Austin, Texas 78711), was created in 1965, but operating funds are available for primarily administrative and educational functions. Archeological research is correlation of survey systems. The University of Texas, Austin, Texas, has the most extensive site survey records; other records are at Southern Methodist University, Texas Memorial Museum, Panhandle Plains Historical Museum, Centennial Museum, Witte Museum, and other institutions. Plans have been initiated to combine all the site survey records.

Arkansas—Act 82 of 1959; Act 59 of 1967

The 1967 act serves as antiquities legislation in regard to making fieldwork an exclusive right of the designated State institution, and at the sime time encourages private landowners to abide by the precepts of the legislation, in relation to its protective and investigative measures. The act of 1959 establishes the State program for archeological research, designating the director of the Coordinating Office of the University of Arkansas Museum (Fayetteville, Arkansas 72701) as the keeper of the statewide survey records.

Louisiana—(no known legislation)

No legislation has been passed on antiquities, though strong efforts have been made. No position of state archeologist exists; although the State Museum and Commission of Parks and Recreation cooperate in antiquities efforts. The State University (Baton Rouge, Louisiana 70803) serves, fairly successfully, as the clearinghouse for State survey records. Some of the work entailed in the program is with the aid of amateurs. The site records are filed with the standard trinomial numbering system.

New Mexico—1931 Laws, Chapter 42, page 81; 1953 Laws, Chapter 7, Article 13.

The Statute of 1953 is the principle State antiquities law. It is this law which creates the office and position of state archeologist (to be held without salary), and establishes a State Science Commission for the purpose of expediting the provisions of the act. Also, the act declares that permits are necessary for all archeological investigations on State lands, and that these are to be granted by the Commissioner of Public Lands upon recommendation from the Science Commission; collections made under the provisions of the act are to be deposited in the Museum of New Mexico (Santa Fe, New Mexico 87501), unless otherwise designated by the commission. The Director of Research at the Museum serves in the capacity of state archeologist. Some State funds are available for projects, though the Museum, along with the University of New Mexico (Albuquerque, New Mexico 97106) and Eastern New Mexico University, is mainly dependent upon grants and contracts. The two universities correlate their differing catalog systems with that of the Museum. The Museum's records are primarily site surveys only for work done by that institution.

Oklahoma—Chapter 50, Section 3309; Chapter 139, H.B. No. 1262.

State law requires all persons desirous of investigating archeological remains on any lands in the State of Oklahoma to hold a permit, for which a fee of 50 dollars is charged. Fifty percent of all collections made under such a permit are to be deposited with the Museum of

Science and History of the University of Oklahoma (Norman, Oklahoma 73069). Oklahoma law declares that it is a misdemeanor to vandalize prehistoric or historic remains on property owned or administered by the Oklahoma Historical Society. The Chairman of the Department of Anthropology at the University is authorized to issue licenses, and he functions as the state archeologist, though no such official office exists. The University is the clearinghouse for site survey records, which are numbered in the standard fashion. The Oklahoma Anthropological Society and the Museum of the Great Plains both submit their site reports to the University's catalog. No funds are directly available for research or salvage other than those used by the University's field training school and moneys obtained via contract or grant.

CONCLUSIONS

Included in this paper is a copy of the proposed (spring, 1969) Antiquities Code for the State of Texas (Appendix A). This is a rather comprehensive piece of legislation and, necessarily so, considering the nature and richness of culture history in Texas territory and environs even prior to 1492, and in light of the distinctive contribution to human knowledge that might accrue from excavations in coastal regions and submerged lands.

One observation seems pertinent. Antiquities legislation must be strong enough to deter ruthless treasure seekers but flexible enough to keep amateurs not only curious about man's past but actively participating in its preservation.

The United States government and the many fields of knowledge and academic disciplines are now pooling their resources into an interdisciplinary program of action to preserve the past that will aid us in the study of man through time.

This program of historical archaeology gives us some assurance that in the United States this portion of the record of mankind will not forever disappear from the face of the earth.

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1962 Introduction in *A Guide for Salvage Archaeology* by Fred Wendorf, Museum of New Mexico Press, Santa Fe.

Wendorf, Fred
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Resource:

Antiquities Codes Files, Office of Archeology and Historic Preservation, National Park Service, United States Department of the Interior, Washington, D.C.

APPENDIX A

1969 PROPOSAL FOR ANTIQUITIES CODE OF THE STATE OF TEXAS

An Act establishing and adopting an Antiquities Code for the State of Texas; setting forth the public policy of the State with respect to archeological and historical sites and items; providing for a system of permits and contracts for the salvage of treasure troves and the excavation or study of archeological and historical sites and objects; making it unlawful to damage or destroy archeological and historical items and sites on public lands; providing a penalty for violations of the Act; providing for cooperative efforts on the part of state officers, agencies and law enforcement officers to carry out the provisions of this Act; providing for injunctive relief; providing a saving clause; repealing prior status; and declaring an emergency.

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF TEXAS:

SECTION 1—Short Title

This Act shall be known, and may be cited, as "Code of Antiquities."

SECTION 2—Public Policy

It is hereby declared to be the public policy and in the public interest of the State of Texas to locate, protect and preserve all sites, objects, buildings, shipwrecks and locations of historical, archeological, educational or scientific interest, including, but expressly not limited to, prehistoric and historical Indian or aboriginal campsites, dwellings and habitation sites, archeological sites of every character, treasure troves, sunken or abandoned ships or any part or contents thereof, maps, records, documents, books, artifacts and implements of culture in any way related to the inhabitants, prehistory, history, natural history, government or culture of the lands now comprising the State of Texas, its tidelands and submerged lands.

SECTION 3—Property Rights of the State, Permits

All sites, objects, buildings, shipwrecks, treasure troves, artifacts, implements and locations of historical, archeological, scientific or educational interest located on or within any lands, tidelands, or submerged lands of the State of Texas, or upon any lands in any way claimed or controlled by the State of Texas, or by any county, city or political subdivision of the State, are the sole property of the State of Texas and may not be taken, altered, damaged, destroyed, salvaged or excavated without a permit from an antiquities committee composed of the Director of the State Historical Survey Committee, the Director of the State Parks and Wildlife Department, the Commissioner of the General Land Office, one professional archeologist and one professional historian who shall serve without additional compensation other than travel and per diem expenses which may be available from existing appropriations. All permits shall be granted for a specified location, activity and time period. All activities carried out under such a permit shall be under the general supervision of the State Archeologist, and any permit may be revoked by the Antiquities Committee at any time for the violation of this Act or of any rule or regulation set forth in the permit.

SECTION 4—Salvage of Treasure Troves

In addition to its other powers, and without limiting same, the Antiquities Committee shall be authorized to enter into contracts with other state agencies or institutions and with qualified private institutions, companies or individuals for

the discovery and salvage of treasure troves and shipwrecks on or under the tidelands or submerged lands of the State of Texas or its political subdivisions or agencies thereof. The contract may provide for fair compensation to the salvager in terms of a percentage of the reasonable cash value of the objects removed, or at the discretion of the Committee, of a fair share of the objects recovered. Superior title to all such objects is retained by the State of Texas until and unless they are released to the salvager by the Committee. All such salvage operations must be carried out under the general supervision of the State Archeologist, in such a manner that the maximum amount of historic, scientific, archeological and education information is recovered and preserved in addition to any treasure trove. The Antiquities Committee shall determine the repository of all items recovered from any such salvage operation, in order that the maximum scientific benefit shall accrue to historians, archeologists, anthropologists and the citizens of Texas. No person, firm or institution shall be entitled to a salvage contract as a matter of right, but all such contracts are to be entered into at the discretion of the Committee upon a showing of good cause for salvage operations.

SECTION 5—Salvage or Removal of Treasure Trove Without Permit

It shall be unlawful for any person to engage in the salvage operations described in Section 4 of this Act, or to remove or recover all or any part of any treasure trove from any lands, tidelands, or submerged lands of the State of Texas, its political subdivisions, or of any agency thereof, without having in possession a valid permit from the Antiquities Committee to conduct that specific activity.

SECTION 6—Damage to Historical Archeological or Vertebrate Paleontological Sites

It shall be unlawful for any person to intentionally excavate in or upon, collect artifacts from, or to disturb, deface, disfigure, damage, alter, destroy, or remove any historic or prehistoric ruin, shipwreck, artifact, burial, burial ground, mound, prehistoric or historical Indian campsite, or any form of archeological or vertebrate paleontological site, or any site containing fossilized footprints, or inscriptions, paintings, pictographs or petroglyphs made by any human agency, or any other archeological or paleontological feature, or any historical marker, medallion or monument, or other historical feature, situated in, under or on any lands, public property, tidelands or submerged lands owned or in any manner controlled by the State of Texas, its political subdivisions, or by any agent, official or agency thereof, without having in his possession a valid permit from the Antiquities Committee to conduct such activity.

SECTION 7—Defacing Indian Paintings, Carvings and Hieroglyphics

It shall be unlawful for any person to intentionally deface, damage or destroy any Indian paintings, carvings, petroglyphs, hieroglyphics, or other marks of carvings on rock or elsewhere which pertain to the prehistoric or historical Indian Inhabitants of the State of Texas.

SECTION 8—Forging Archeological Objects

It shall be unlawful for any person to intentionally reproduce, replicate, retouch, rework, or forge any archeological or other object which derives value from its antiquity, with intent to represent the same to be original or genuine and with intent to deceive or offer any such object for sale or exchange.

SECTION 9—Recovery of Objects Unlawfully Acquired

Any objects, artifacts, treasure trove, implements, or information recovered, taken or held in violation of any Section of this Act, as well as any proceeds thereof, may be recovered by the State of Texas or the rightful owner thereof from any person, firm, institution or corporation holding or having possession of same.

SECTION 10—Injunctive Relief

In addition to, and without limiting the other powers of the State Attorney General, and without altering or waiving any criminal penalty provisions of this Act, the Attorney General shall have the right to bring an action in the name of the State of Texas in any District Court for restraining orders and injunctive relief to enjoin and restrain violations or threatened violations of this Act, and venue of such action shall lie either in Travis County, Texas, or in the county in which or nearest the place where the activity sought to be restrained is alleged to be taking place.

SECTION 11—Cooperation Between State Agencies

The chief administrative officers of each state agency are authorized and directed to cooperate and assist the Antiquities Committee and Attorney General in carrying out the intent of this act. All law enforcement agencies and officers, state and local, are authorized and directed to assist in enforcing this Act and in carrying out the intent hereof.

SECTION 12

It shall be unlawful for any person, not being the owner thereof, and without written consent of the owner, proprietor, leasee or person in charge thereof, to enter or attempt to enter upon the lands of another and intentionally injure, disfigure, remove, excavate, damage, take, dig into, or destroy any historical structure, monument, marker, medallion or artifact, or any prehistoric or historic archeological site, Indian campsite, artifact, burial, ruin or other archeological remains located on or under any private lands within the State of Texas.

SECTION 13

Any person violating any of the provisions or Sections of this Act shall be guilty of a misdemeanor, and shall be punished by a fine of not less than Fifty Dollars ($50.00) and not more than One Thousand Dollars ($1,000.00), or by confinement in jail for not more than thirty (30) days, or by both such fine and confinement. Each day of continued violation of any Section of this Act shall constitute a distinct and separate offense for which the offender may be punished.

SECTION 14

The Sections of this Act and each part of such Sections are hereby declared to be severable and independent of each other, and the holding of a Section, or part thereof, or the application thereof to any person or circumstances, to be invalid or ineffective or unconstitutional shall not affect any other Section, or part thereof, or the application of any Section, or part thereof, to other persons and circumstances.

SECTION 15

All laws in conflict herewith and laws codified as Article 147a, Article 147b, Article 147b-1, and Article 147b-2, Vernon's Annotated Penal Code, are hereby repealed.

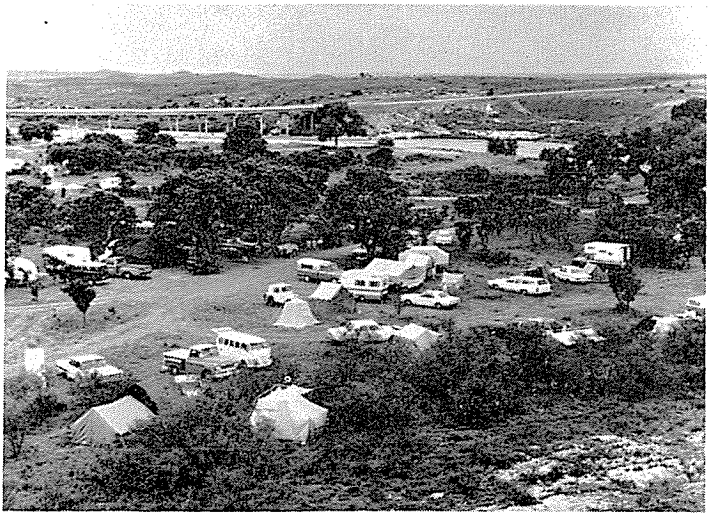
SECTION 16

The fact that irreparable damage and harm is rapidly being done to the archeological and historical heritage of the State of Texas and its citizens, and that historical and archeological sites, and treasures on public lands, are without adequate legal protection and supervision and are being destroyed and damaged without lawful authority, creates an emergency and imperative public necessity that the Constitutional Rule requiring bills to be read on three several days in each house be suspended, and this Rule is hereby suspended, and this Act shall take effect and be in force from and after the date of its passage, and it is so enacted.

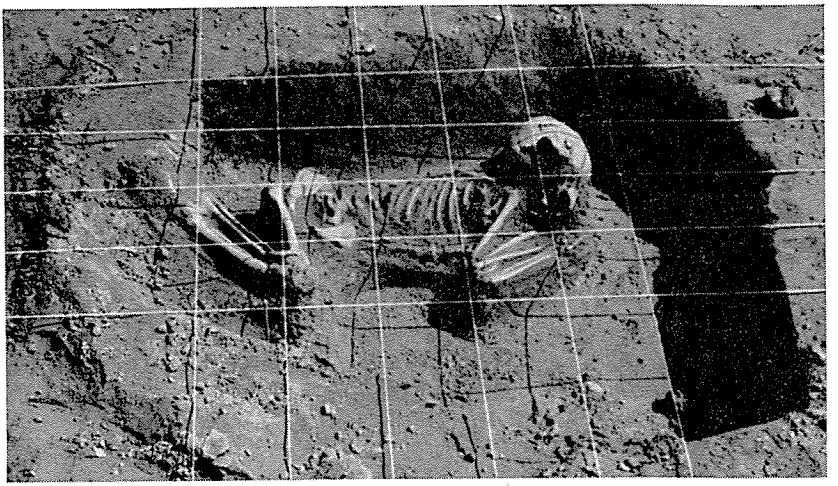
The Society's Summer Field School

Every summer the Texas Archeological Society holds a field school. Its objectives are primarily the teaching of proper field techniques for scientific archaeology.

The site is always chosen so that there will be adequate camping facilities. In 1969, the campground permitted opportunities for relaxation and socializing in the outdoors.



Besides the teaching of scientific techniques of excavation and the importance of conservation, there are accumulated important data. These data are recorded, processed, and prepared for publication.



Photographs by Hubie Achor and Paul Steed

Information and Contributors

The *Bulletin of the Texas Archeological Society* publishes original papers in the field of American archeology. Emphasis is placed on Texas and adjoining areas in the United States and Mexico, but papers on other areas are also acceptable.

Manuscripts should be typed on 8½ by 11 inch sheets of white paper, and ALL MATERIAL should be double spaced. Footnotes should be avoided or kept to a minimum.

Reference to published literature, by author, date, and page or figure number should be placed within parentheses in the body of the text, with full bibliographic citations listed at the end. See this issue of the *Bulletin* for models.

The proportions of full-page illustrations (picture or drawing plus caption) should be suitable for reduction to the effective Bulletin page size of 4 5/16 x 7 inches. Plates may be printed either horizontally or vertically, but be sure to allow for the caption to be printed the same direction as the plate. Captions for illustrations should be listed in numerical order and placed behind the list of references cited.

Each paper must be accompanied by an abstract (one or two paragraphs summarizing the main points of the paper). The abstract should be submitted as the first part of your paper.