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Jimmy L. Mitchell
Editor

Cover Illustration: Cecil's Rockshelter, Heidi Mitchell. See article by Rita Neureuther in this issue.

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E D I T O R I A L

WRITING THAT REPORT

One of the responsibilities of any archaeologist, professional or avocational, is to write a report of the results of his or her work, whether that work is an excavation, a survey, or simply documenting a collection of artifacts collected from some site or locality. Until the report is done, the project is not completed. We need to keep this basic responsibility in mind as we think of future projects and activities, both as individuals and as an organization.

La Tierra is an appropriate place to publish reports of your archaeological activities in South and Southcentral Texas. While sometimes we are a little slow in getting issues out (and I again must apologize to the membership for that), nontheless, we are, relatively speaking, a fairly quick route to publication for your work. I would encourage you to draft up a report of your sites, collections, or other work, and to submit them for publication as soon as possible.

The STAA Board has indicated that we need to get caught up and back on the normal publication schedule this year. To do this, I need your help! Please take the time to do that write-up which you've been putting off and get it submitted for consideration for a future issue of OUR journal. With your help, we can get back on schedule and can continue to make a substantial contribution to the archaeology of southern Texas.

The Editor

NOTES ON SOUTH TEXAS ARCHAEOLOGY 86-2

Thomas R. Hester

The Texas-Idaho Obsidian Connection

Recently, the UTSA Center for Archaeological Research issued Volume 10 in the Choke Canyon series, detailing the results of investigations during the second, and final, phase, of archaeological research at that reservoir basin near Three Rivers (Hall, Hester and Black 1986). During the excavations at site 41 LK 51, a subcircular, worked piece of obsidian was uncovered, dating to Late Prehistoric times. Obsidian is a volcanic glass, usually black in color, and there are no known geologic sources of artifact-quality material of this sort in Texas. However, an occasional flake or artifact of obsidian is found in Texas sites, and quite a number have come from South Texas. For more than 15 years, I have been working with colleagues at the Lawrence Berkeley Laboratory to ascertain the sources of these specimens. This is done by obtaining a "chemical fingerprint" of rare trace minerals through the techniques of x-ray fluorescence (XRF) and neutron activation analysis (NAA). Since each geological occurrence of obsidian has its own distinctive chemical characterization, such research makes it possible to link obsidian artifacts back to their original quarry source. The nuclear scientists at Berkeley, along with others working at Brigham Young University and several other institutions, have built up a substantial reference collection of materials from obsidian sources throughout Mexico and Guatemala, New Mexico, California, and elsewhere in the American West.

During the early stages of our obsidian source research, we began to notice a series of obsidian artifacts from Texas that did not fit any known source. Since the first specimen of this sort had been found at Escondido Ranch in Dimmit County, we called it the "Escondido Ranch Group." When the obsidian specimen from 41 LK 51 at Choke Canyon was analyzed, it also fit into this group. The group was very distinctive because of its high Barium (Ba) content and was quite unlike any known source from Mexico or the southwestern United States.

Fortunately, Dr. Fred Nelson of Brigham Young University had been working with obsidian source characterization for southern Idaho. One of these sources, the Malad source in southeastern Idaho, also had high Barium content and seemed to fit the "Escondido Ranch Group" from Texas. Further analyses were conducted by the Berkeley laboratory, using samples provided by Nelson from the Malad source and comparing the results to analyses of "Escondido Ranch" artifacts from Texas. The initial research was done using the non-destructive XRF technique (this is, by the way, the predominant form of analysis used for studying Texas obsidian, since it is relatively fast, comparatively inexpensive, and does not damage the artifact). However, it became clear that a linkage between Malad and "Escondido Ranch" could not be firmly established unless the NAA technique was employed. This is much more precise than XRF, but requires the sacrifice of all (or part) of the obsidian specimen. The analysis proved conclusively that the so-called "Escondido Ranch" obsidian artifacts from Texas could be linked to the Malad source in Idaho. Other specimens from Texas that are now known to be derived from this source are shown in Figure 1 and listed in Table 1 (Hester **et al.** 1986).

Though the chemical link between these Texas specimens and the distant Malad source could be demonstrated, these analyses could not tell us how the obsidian got from southern Idaho to areas as far away as southern Texas. Luckily, Timothy Baugh (then of the University of Oklahoma) and Dr. Nelson had been working with obsidian occurrences at sites in Oklahoma. They documented Malad obsidian at five west Oklahoma sites and moreover, these dated to Late

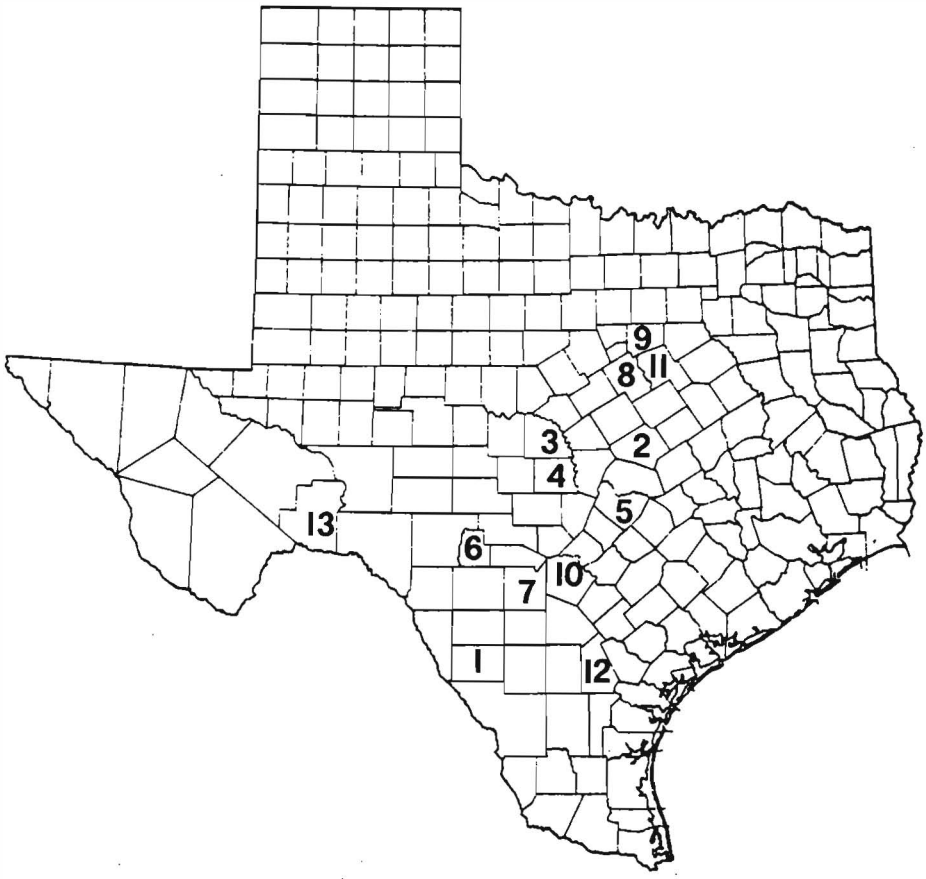

Figure 1. Location of Sites with Escondido/Malad Obsidian in Texas. Each site represents a locality at which one or more pieces of obsidian representing the Escondido Ranch group, now linked to a source in Malad, Idaho, was found. Numbers may be correlated by referring to Table 1. (Figure 1 and Table 1 are reprinted from Hester **et al.** 1986.)

TABLE 1

PROVENIENCE AND CONTEXT OF ESCONDIDO/MALAD OBSIDIAN ARTIFACTS FROM TEXAS SITES

Figure 1	Designation	Provenience	Context/Date	Description
1	Escondido Ranch	Escondido Ranch, Dimmit County	surface	stemmed point
2	41 BL 104	Evoe Terrace site, Bell County	Late Archaic(Zone 4)	flake
3	41 SS 2 (8 specimens)	Fall Creek site, San Saba County	Late Prehistoric in most cases	1 arrow point fragment; 2 unifaces; 5 flakes
4	41 LL 4	Buchanan Reservoir, Llano County	Late Prehistoric	flake
5	41 TV 133 (4 specimens)	Trammel Rockshelter, Travis County	excavated; date?	flakes
6	Keystone Patch (LBL TEX-23)	Near Leakey, Real County	surface	flake
7	Medina River* (LBL TEX-1)	Judson site; Medina County	buried; context? (Late Prehistoric)	side-notched arrow point
8	41 BQ 46 (LBL HORN-2)	Horn Shelter No. 2, Bosque County	Late Archaic	flake
9	Ham Creek site (LBL TEX-8-12) (5 specimens)	Johnson County	Late Prehistoric to Transitional Archaic	1 biface fragment 5 flakes
10	41 BX 300 (LBL TEX-19)	Bexar County	Late Prehistoric	flake
11	X41 HI 130 (LBL TEX-13)	"Hi-6"; Aquilla Lake	surface	biface
12	41 LK 51 (LBL TEX-22)	Choke Canyon, Live Oak County	Late Prehistoric	core?
13	41 TE 98**	rockshelter, Terrell County	Late Prehistoric	stemmed arrow point

*erroneously attributed to site 41 BX 229 in earlier descriptions.
**probably Escondido/Malad; erroneously linked to Guadalupe Victoria, Mexico, in earlier studies.

Prehistoric times. As Table 1 indicates, most Texas obsidian specimens from the Malad source are also from this era. Baugh's ethnohistoric research in Oklahoma and the Plains suggested to him that the obsidian might have been transported via a north-south trade network that existed in the Plains in Late Prehistoric and Protohistoric times. Research by K. A. Spielmann (1983) on trade and exchange on the Plains supports Baugh's hypothesis. Even earlier evidence of long-distance movement of obsidian through the Plains to the eastern United States can be documented at Hopewell sites in Ohio where Obsidian Cliff (Wyoming) obsidian has been found (it should be noted that Obsidian Cliff materials have also been recognized at two sites in Travis and San Saba Counties, Texas; Hester **et al.** 1986:519).

In addition to the discovery of Malad obsidian at those localities shown in Figure 1, we have since identified this obsidian at 41 ME 29 in Medina County (an obsidian arrow point excavated by archaeologists from the State Department of Highways and Public Transportation), at 41 HI 34 in Hill County (C. K. Chandler reports this in a paper in Volume 56 of the **Bulletin of the Texas Archeological Society**, currently in press), and at 41 BL 24 in Bell County, an obsidian chip just recently analyzed.

Thus, it is clear that, by whatever means, obsidian from a southeastern Idaho outcrop was being distributed as far away as southern Texas in prehistoric times. Indeed, we have a pattern of these Texas occurrences, supported by the three recent analyses, that trends north-south along the Balcones Escarpment. There are various implications of these data for the study of Late Prehistoric populations in the region, one clearly being the existence of trade or exchange systems that likely moved not only obsidian, but also other materials and perhaps more importantly, new ideas and technologies. Certainly, there are some intriguing possibilities to be explored in coming years.

ACKNOWLEDGEMENTS

The author is grateful to Drs. Frank Asaro and Fred Stross, and their coworker Helen Michel, for their continuing collaboration through the Lawrence Berkeley Laboratory. Dr. Fred Nelson of Brigham Young University and Dr. Timothy Baugh of the University of Colorado, Boulder, have also provided great assistance. Some of the obsidian analyses related to the Malad source investigations were funded by the Friends of Archaeology, the Center for Archaeological Research, The University of Texas at San Antonio.

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TWO EARLY CERAMIC WHISTLES FROM SOUTHERN TEXAS

Charles K. Chandler and Joseph H. Labadie

ABSTRACT

This report documents two fired clay whistles from the San Antonio area of South Texas. Research on these and other clay whistles suggests that one particular type in South Texas may have had pre-17th century origins in technology and style. This type of ceramic whistle may have survived virtually unchanged through the mid-19th century.

INTRODUCTION

Recently, two ceramic artifacts were studied which appear to be a form of whistle. One is from Natalia, Medina County, and the other is from San Antonio, Bexar County (Figure 1). Such unusual pottery specimens warrant thorough study and documentation. As artifacts, fired clay whistles appear to be extremely rare. Those that have survived in the archaeological record defy rigid classification. They have generally been considered children's toys, but there is no real evidence to conclusively support such ideas. Windblown instruments appear to have been very common among the Indians in Texas during early historic times and may well have been used in some utilitarian fashion beyond the obvious pleasures derived from their use.

In Campbell's (1984:8) account of the Spanish expedition of 1665 to punish the raiding "Nations to the north," an engagement between this expeditionary force and a group of Cacaxtle Indians is reported with this comment: "It is said that while the Cacaxtle men were fighting, an elderly woman encouraged them by playing on a flute (**flauta**)." Other historic accounts report that "Over much of the Gulf area, when it was first visited by Europeans, it was customary to welcome strangers of quality coming in peace by sending men forward, usually including the chief himself, blowing upon flutes, or rather flageolets" (Swanton 1946:628). "Their instruments were nothing but a thick sort of reed or cane, with two openings, one at the top to blow into and the other end for the wind to come out of, like organ pipes or whistles" (Lemoyne, cited in Swanton 1946:628). There have been other reports of the use of bird bone war whistles for making cries or signals in combat, and some forms of whistles were sometimes used in game calling.

DISCUSSION

Our search for published information on ceramic whistles has not been very productive. Whistles made of bird bone have been reported by Bell and Barreis

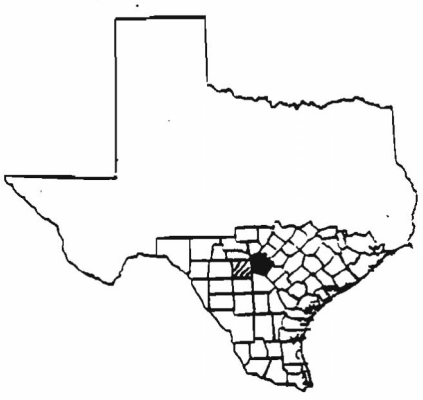

Figure 1. South Texas Counties. Bexar County darkened, with Medina County striped.

(1951) from Fourche Maline sites in east central Oklahoma and by Jackson (1937) from a cave site in eastern Culberson County, Texas. Schuetz (1960:181) reported several different types of cane whistles (flageolets) from the Lower Pecos Region in Val Verde County, Texas. All of these sites are preceramic. Aten (1976:36-37) reports three bird bone flageolets in direct association with a burial from an early Tchefuncte ceramic site in the Galveston Bay area of Harris County, Texas. He describes the two nearly complete specimens as "...each are about 19.5 cm long with a single stop hole about 12 cm from one end and without decoration." Similar artifacts have not been reported from other Texas coastal sites although they have been reported from sites in the McGee Bend Reservoir area of East Texas (Jelks 1965). These were also found associated with burials and in each case the flageolet was in or beside one of the hands of the deceased." Mounger (1959:176) reports two clay whistles recovered from Mission Espíritu Santo near Goliad, Texas. She describes them as "roughly finished, light in color and without obvious tempering material but well polished and having a length of approximately 3.8 cm." She refers to them as "bird-shaped." The authors were unable to obtain these specimens for comparative analysis, but Mounger's description and illustrations indicate they are unlike the specimens reported here.

THE ARTIFACTS

In **Indian and Eskimo Artifacts of North America** (Miles 1963), a clay whistle is illustrated. This specimen (Figure 2,A) is catalogued as being from an "unknown" location (Miles 1963:201). Its similarity to the two whistles reported here from South Texas is striking. However, the provenience of this specimen is questionable.

The 1967 excavations at San Juan Mission in San Antonio resulted in the recovery of two ceramic whistles but only one of these was described and illustrated (Schuetz 1969). This specimen (Figure 2,B) "in profile looks like a duck's head, and an incised line on one side is placed like an eye" (Ibid.). It is light tan grading to a reddish tan. It has a very sandy paste and is not burnished, and has a single vent hole where the stem joins the bulb. Dimensions are: 4.2 cm overall length, 1.15 cm stem length, 1.53 cm stem diameter, and 1.8 cm bulb diameter. There is an extension beyond the bulb, opposite the stem, of 1.5 cm in length. It is poorly fired at low temperature in an oxidation atmosphere and readily absorbs water. The provenience for this specimen was Room 9, Level 4 at Mission San Juan. The undescribed whistle was discovered by the senior author among the Mission San Juan artifacts during his research for comparative analysis specimens. It is described and illustrated elsewhere in this report.

Two additional specimens from South Texas reported here are nearly identical to the one reported by Miles (1963; Figure 2,A) and to the undescribed specimen from Mission San Juan (Figure 2,E). Specimen A (Figure 2,C) is from Medina County and Specimen B (Figure 2,D) is from Bexar County.

Specimen A (Figure 2,C) is a surface find that was found by Steve Frazier in 1978 in the backdirt from a posthole following a heavy rain. It is now in the possession of Mary Pundt of Natalia, Texas. It is well fired and has a surface color of dark reddish-brown to black and is smooth and well burnished on all surfaces. In addition to the blow hole in the stem end, there are two vent holes on the top side. One hole is located where the stem joins the bulb and the other is located on the upper portion of the bulbar end. This whistle has two different tones. It emits a shrill whistle when blown with both vent holes uncovered. By covering the distal hole, the tone produced is much lower. Metric data is presented in Table 1. This specimen is illustrated at actual size in Figure 2,C and is shown at twice life size in Figure 2,F and F'. Plan view drawings are presented in Figure 3,A^1, A^2, A^3, A^4.

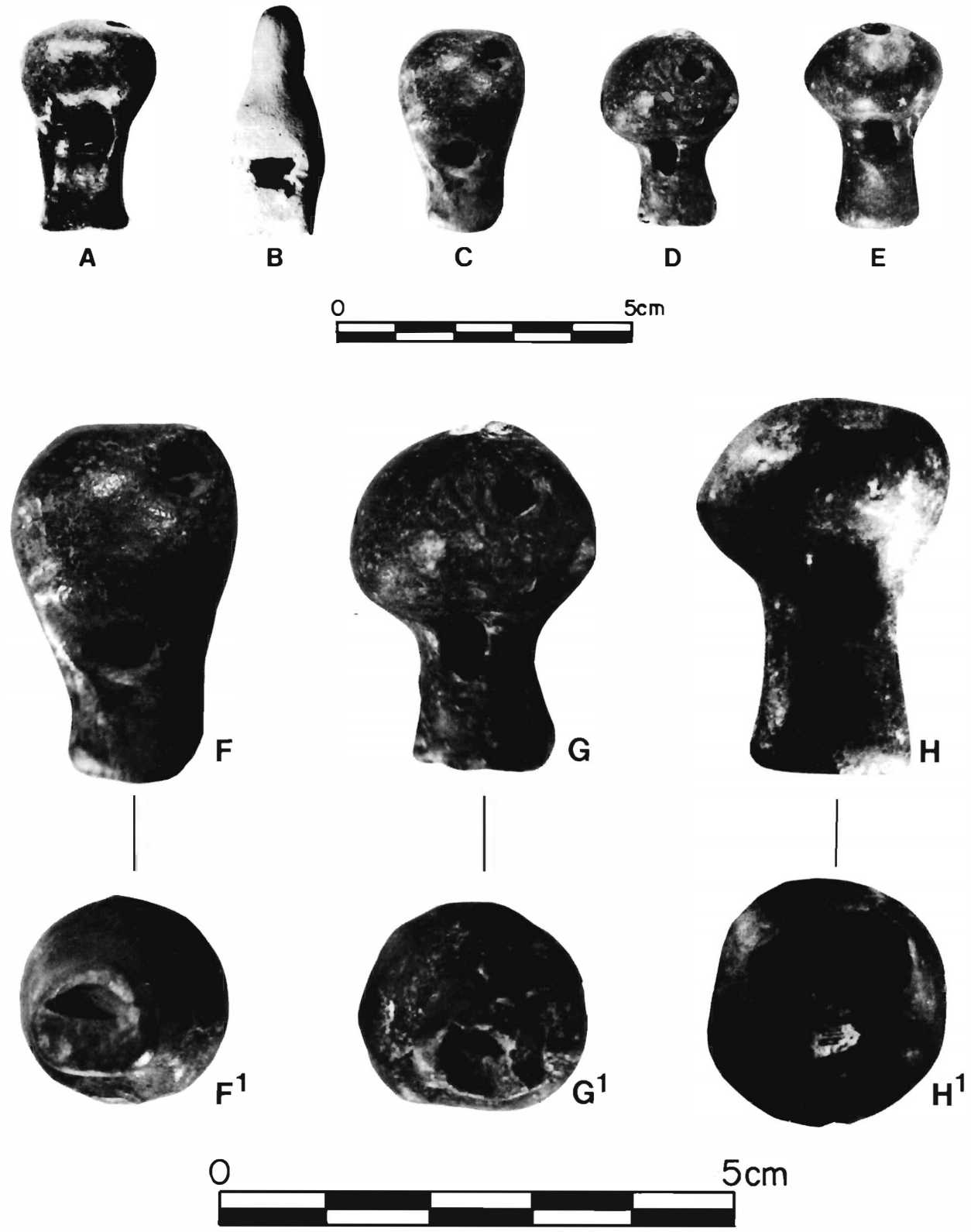

Figure 2. Ceramic Whistles: A, Location Unknown (Miles 1963); B, San Juan Mission (Schuetz 1969); C, Chacon Creek, Medina County; D, La Villita Earthworks, Bexar County; E, Second Specimen from San Juan Mission, Bexar County; F-H, Enlarged view (twice life size) of C-E.

TABLE 1. Metric Data for Clay Whistles from South Texas*

	Natalia	41 BX 677	41 BX 5
Overall Length	3.3	3.4	3.4
Stem Length	1.5	1.9	1.9
Stem Diameter	1.3	2.5	2.5
Bulb Diameter	2.3	2.9	2.9
Weight (in grams)	7.2	8.0	9.0

* All measurements except weight are in centimeters

Specimen B (Figure 2,D) was recovered from the La Villita Earthworks site (41 BX 677) in downtown San Antonio in Unit D, Level 4. It is very similar to Specimen A (Figure 2,C) in size, color, and surface treatment but overall appears to be a little blacker in color and is less well burnished than Specimen A. Specimen B has two vent holes in the top side that are in the same locations as Specimen A but will only produce one low tone when covering the distal hole. It will not whistle unless this outer hole is covered. Dimensions for Specimen B are the same as Specimen A (Table 1) but it has a slightly different planform or outline. Metric data is presented in Table 1. Specimen B is illustrated at actual size in Figure 2,D and is shown at twice life size in Figure 2G,G' Plan view drawings are presented in Figure 3,B^1,B^2,B^3,B^4.

Specimen C (Figure 2,E) is the previously undescribed specimen from Mission San Juan in San Antonio. Its provenience within the mission excavation is unknown. It is very similar to Specimens A and B with dimensions identical to Specimen B (Table 1). It is black, highly fired and well burnished. It has two vent holes like Specimens A and B but one is centered in the bulbar end instead of set to one side. This specimen is like Specimen B in that it will emit only one low tone by covering the distal hole. It will not whistle with this hole uncovered. Metric data is presented in Table 1. Specimen C is illustrated at actual size in Figure 2,E and is shown at twice life size in Figure 2,H and H'. Plan view drawings are presented in Figure 3,C^1,C^2,C^3,C^4.

The Natalia specimen was found about 140 meters SW from Chacon Creek very near an area where dart points and burned rock occur. Leon Plain ceramics have not been found in this vicinity but have been identified about five miles up the creek. This specimen may be from a prehistoric context but this is not certain. The use of clay whistles by Indians at Mission San Juan (established 1731) has been demonstrated by Schuetz's (1969) excavations. The La Villita Earthworks specimen was excavated with other refuse removed from a cannon emplacement used by General Santa Anna during his attack on the Alamo in 1836. Specimen B is therefore firmly dated to 1836 and may have survived from earlier times to eventually wind up with the other refuse from the Battle of the Alamo.

The Natalia, San Juan, and La Villita Earthworks clay whistles all have tiny particles of bone in their paste. Bone-tempering is considered to be the hallmark of the **Leon Plain** ceramic tradition which was widespread throughout South Texas during the Late Prehistoric beginning about A.D. 1000 (Hester and Hill 1971). All three specimens are well burnished to varying degrees and are remarkably alike in size, shape, and color. The specimen in Miles (1963) is nearlv identical to these three whistles from South Texas. The recovery of the La Villita Earthworks specimen from an early 19th century context, the San Juan specimen from an early Mission context, and the Natalia specimen possibly from a pre-Mission context, suggest that at least one form of clay whistle displays remarkable continuity over time within South Texas. We have found no other comparable specimens reported elsewhere and would greatly appreciate comparative data from **La Tierra** readers on the topic of South Texas ceramic whistles.

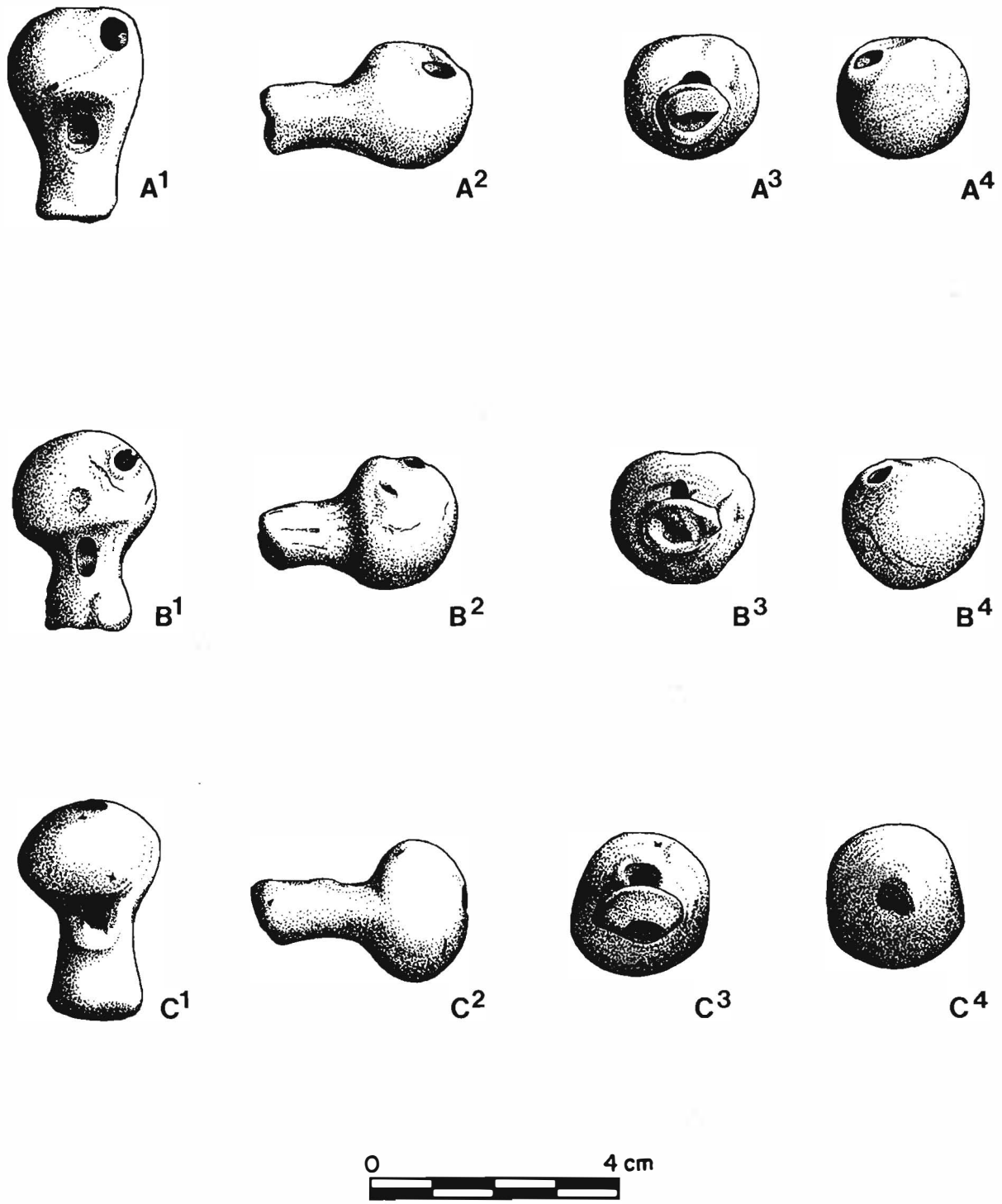

Figure 3. Plan View Drawings of South Texas Ceramic Whistles: A, Chacon Creek, Medina County; B, La Villita Earthworks Site (41 BX 677); C, Previously undescribed specimen from San Juan Mission (41 BX 5).

ACKNOWLEDGMENTS

The authors wish to thank Warren McDonough who brought the Natalia specimen to our attention and arranged for its loan from Mary Pundt. The scale drawings are by Richard McReynolds and the photographic work was funded by the UTSA Friends of Archaeology. We would also like to thank Dr. Gilbert Cruz, Historian for the San Antonio Missions National Historical Park, for the loan of the San Juan specimens for this report.

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CECIL'S ROCKSHELTER: THE GOSS CREEK SHELTER NO. 2 (41 KE 110), KENDALL COUNTY, TEXAS

Rita Neureuther

ABSTRACT

Excavations at the Goss Creek Shelter No. 2 Site (41 KE 110) revealed extensive shelter fill (3.2 meters) suggestive of a long occupational sequence. The relative stratigraphic distribution of various projectile points types implies Early Archaic to Late Prehistoric use of the shelter. A charcoal sample from the 280- to 300-cm level of Unit 3S-1E was dated to 5410 ± 230 years B.P. (Beta 16640). Manos and metates, suggesting plant processing, were most frequently found in Late Archaic zones, but some were in earlier levels including one mano at 309 cm.

INTRODUCTION

In the spring of 1982, members of the Southern Texas Archaeological Association (STAA) surveyed part of the Goss Creek drainage on the Allen and Vera Haag Ranch in northeastern Kendall County, southcentral Texas (see Figure 1). Details of this survey were summarized in an earlier report (Neureuther 1985). Sites identified in the survey were designated as Kendall County Survey (KCS) Numbers 1 through 24; the sites have since been documented with the Texas Archeological Research Laboratory (TARL) in Austin as Sites 41 KE 94 through 41 KE 117 (Carolyn Spock, personal communication 1986). See Appendix 1 for details.

Two rockshelters were identified in the survey and the larger of the two was considered of sufficient significance to warrant further study. Hester (1975) believes that rockshelters are the sites with the greatest potential since they may have preserved perishable materials and occasional rock art. The Goss Creek Shelter No. 2 (KCS #17) was subsequently excavated by Cecil Peel, with occasional assistance by other STAA members (1982-1983). The site has become affectionately known as "Cecil's Rockshelter" and is recorded with TARL as Site 41 KE 110.

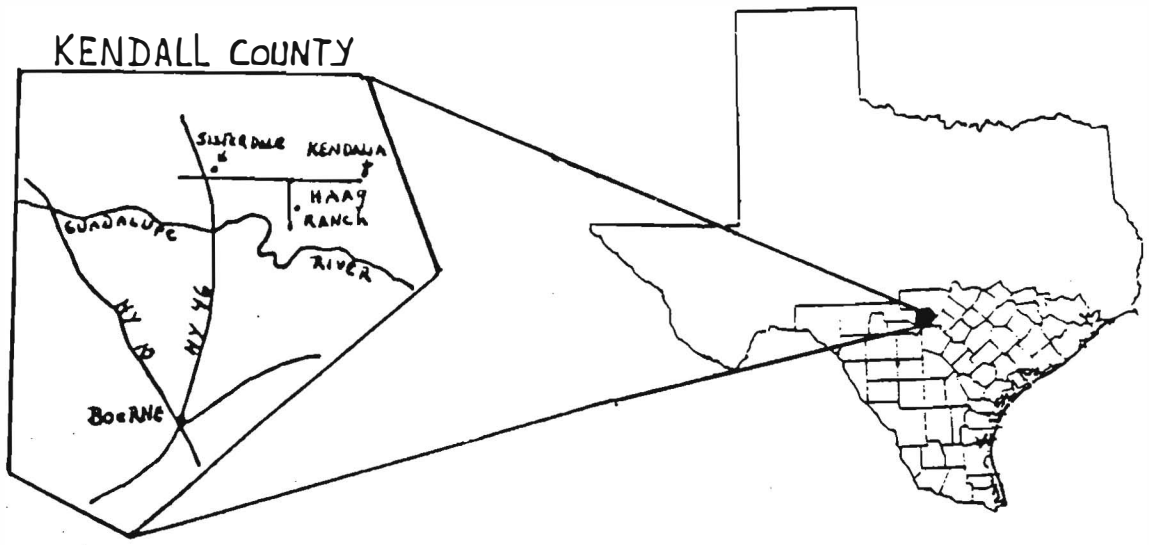

Figure 1. Location of Kendall County and the Allen Haag Ranch.

CECIL'S ROCKSHELTER (41 KE 110)

The shelter is located at the head of a narrow ravine on the east side of Goss Creek. The elevation is about 1,360 feet above sea level. The mouth of the shelter is located approximately nine meters below the top of the bluff and about 20 meters above the valley floor (see Figure 2). It was described in the earlier survey report as follows:

> "The dimensions of the shelter are: 14.5 meters (47 feet) wide, 5.9 meters (19 feet) deep, and a maximum height of 1.5 meters (5 feet). The opening of the shelter was partially walled off by travertine deposits. Materials observed included decorticate flakes, cores, bifaces, and clusters of burned rocks. In 1958 Cecil Peel found a **Montell** point on the surface and dug into an apparent hearth feature" (Neureuther 1985:35).

The shelter appears to be a solution cavity, created as moisture seeped out of the surrounding limestone. Many such cavities exist in the limestone bluffs along Goss Creek, and they apparently drain a large area since they actively discharge water for a substantial time after precipitation occurs in the area. The percolation of moisture through the limestone has resulted in the formation of travertine deposits in most areas of the shelter. These were concentrated along the shelter mouth in the form of stalagmites, and the eastern section of the shelter mouth was almost completely blocked by such deposits. Small stalagtites are also present on the shelter ceiling. The formations are still active; the travertine formed a "curtain" at the opening and extended into the shelter about a meter and a half in the form of a flow which capped part of the floor. The flow slanted downward from the opening to the back of the shelter. During removal of the travertine crust some flakes, one

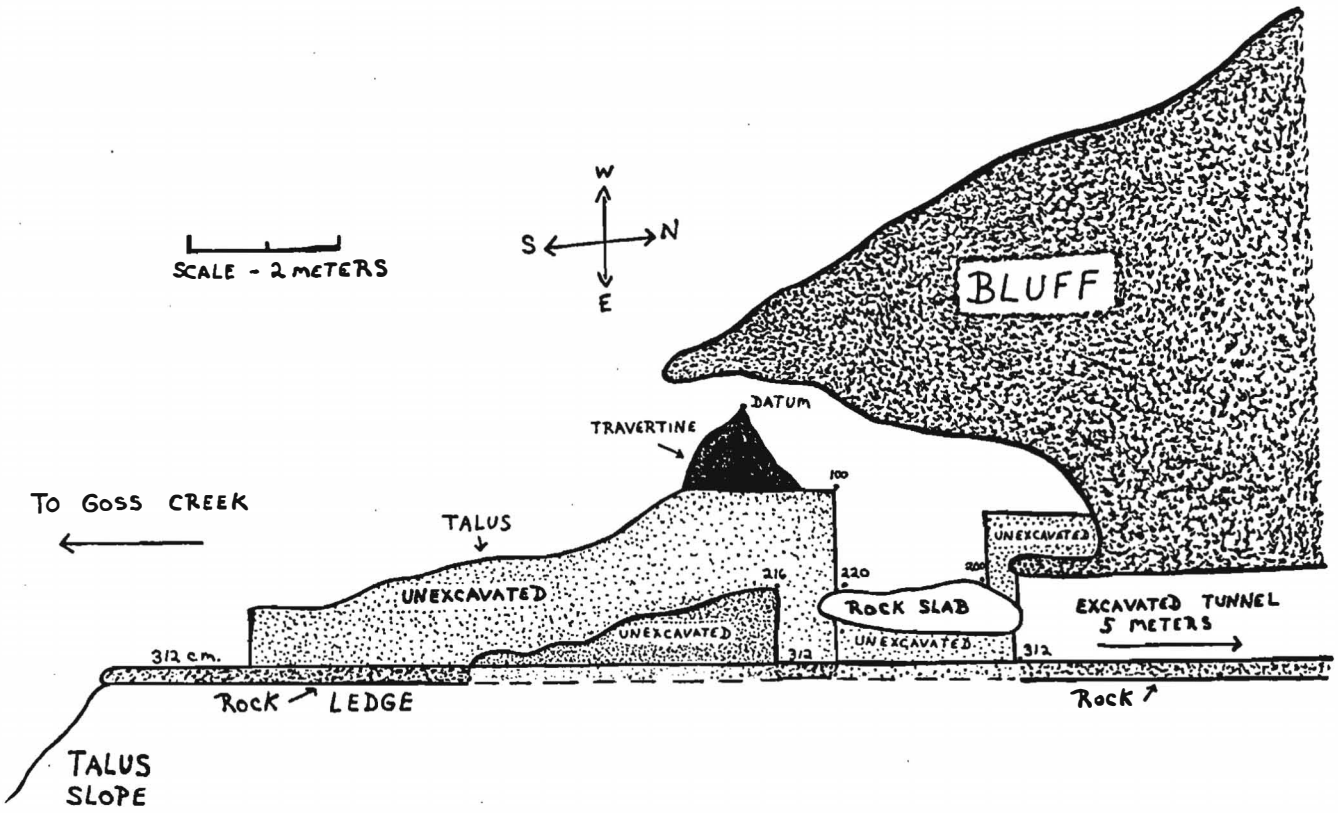

Figure 2. Profile of the Goss Creek Shelter No. 2 (41 KE 110), Kendall County, Texas.

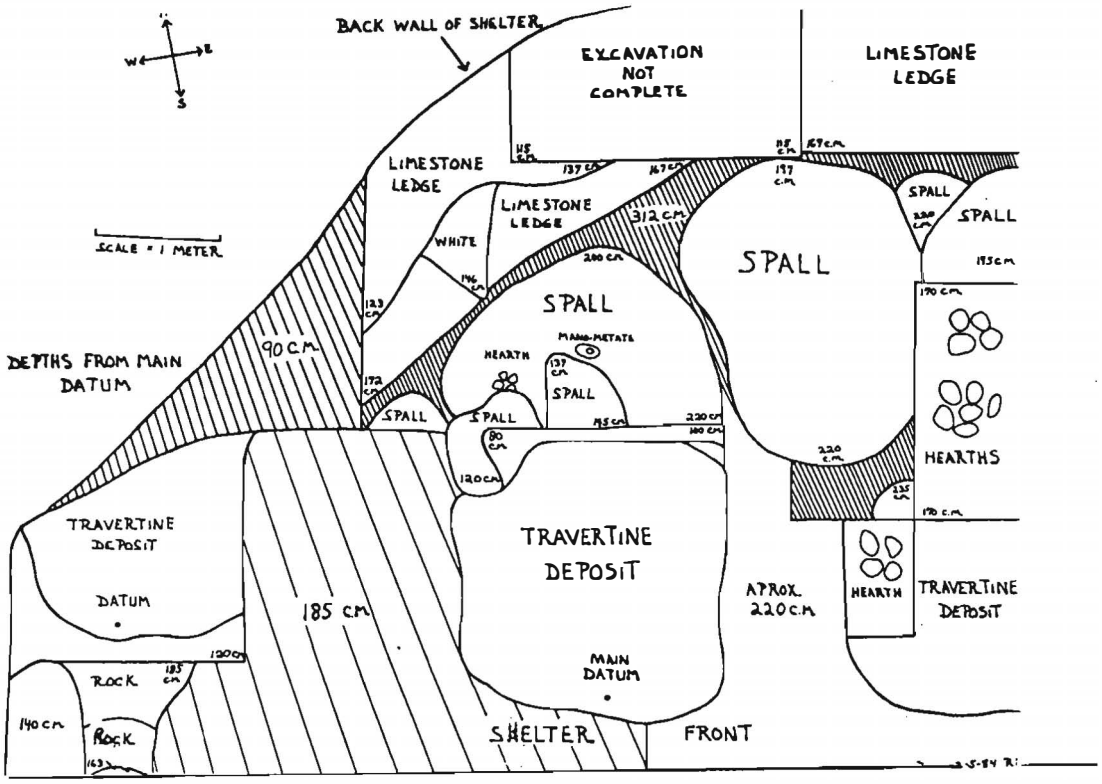

Figure 3. Floor Plan, West Section of Shelter, 41 KE 110.

broken point, and some casts of leaves and twigs were found in the travertine. The shelter has been utilized by the sheep and goats on the ranch, and a layer of loose dung and dirt covered the floor.

The temperature of the shelter remains fairly constant except during extremes in the weather. It is approximately 68°F in the summer and 40° F during the winter. The southerly exposure enables the sun to warm the shelter, and the bluff blocks the north winds resulting in fairly pleasant conditions in winter, a factor which prehistoric occupants undoubtedly did not overlook.

EXCAVATION

A datum point was established on a prominent travertine deposit in the mouth of the shelter. The datum is 45 cm from the ceiling. Four test units were originally laid out, one outside the shelter in front of the datum. This was a 3 x 1 meter trench. The other three test units were laid out inside the shelter -- two on the west side and one on the east side. These test units were 2 x 2 meters each. the test units in the western half of the shelter were excavated first. These were taken down in arbitrary levels of twenty centimeters (cm) each. The depth from the datum to the first level of excavation was approximately 100 cm. At a depth of 160 cm the test units were divided into one meter square units with arbitrary vertical levels of 10 cm each. At this point other one-meter units were laid out on a grid for the entire western half of the shelter. Some of the units along the back of the shelter were not a full meter due to the contours of the wall (see Figure 3).

The units were excavated, with materials being screened through 1/4-inch mesh screen. The units in the western section of the shelter were excavated to bedrock - a limestone floor approximately 312 cm below the datum. This limestone floor extends approximately seven meters out from the mouth of the shelter, and runs under the present talus slope. Part of the talus slope was removed down to the limestone to facilitate access and screening (see Figure 4). The talus was screened but little was found.

MATERIALS RECOVERED

Since excavations are not entirely complete at this time, the materials recovered have only been briefly studied and information is not complete.

HISTORIC - Only one artifact of historical manufacture was recovered from the shelter. This consisted of a modern day bullet. There were no cans, bottles, etc. present. The bullet was recovered near the mouth of the shelter, on the extreme western wide, near the limestone.

FLORAL - Floral remains were not well preserved due to the wetness of the shelter. While removing the travertine layer which capped the floor, some casts of leaves and twigs were found. A pocket of seeds (unidentified, probably grass) was also found under the travertine in a disturbed area, probably a rodent burrow. Hackberry seeds were occasionally noted. Walnut shells, some burned, were also present. Only a few specimens occurred and these were mainly in the upper levels and may be related to rodent activities. The burned specimens were recovered from a deeper level (Unit 1S/2E, Level 150-160 cm) and would seem to represent utilization as a food source. Pecan, while present in the area today, is absent in the shelter.

CHARCOAL - Charcoal was abundant in the shelter. It occurred in most levels and in most units. The amount ranged from flecks and bits to quite large chunks with the wood grain still visible. Charcoal was found in association with some of the artifacts and most of the hearth features.

A number of charcoal specimens were recovered using procedures to avoid contamination. Two charcoal specimens from the lower levels of the shelter were submitted by Al McGraw of the University of Texas at San Antonio (UTSA) Center for Archaeological Research (CAR) to the Beta Analytic Laboratory, Coral Gables, Florida, for radiocarbon dating. Sample 1 proved to be unsuitable for processing and was discarded. Sample 2, which came from the 280-300 cm level of Unit 3S/1E, was of sufficient size and quality to permit processing. This specimen yielded a date of 5410 ± 230 B.P. (uncorrected) which translates roughly to 3460 B.C. ± 230 years or somewhere between 3690 to 3230 B.C. (Beta No. 16640, Letter Report, June 1986).

This initial radiocarbon dating analysis was made possible through private funds and gifts (see Acknowledgements). Additional specimens are available for dating but must await additional funding.

FAUNA - The faunal material recovered was most abundant in the upper levels of excavation. Much of the bone was fragmentary. The bone has not been analyzed yet, but certain animal species were recognizable. The recognizable specimens included: deer, rodent, bird (some large, probably turkey), and a snake vertebrae. Some of the faunal material was burned.

MUSSEL - Evidences of fresh water mussel, or clams as they are commonly called, were present in the shelter. Unfortunately, the specimens were usually restricted to a few fragments. Perhaps this is due to poor preservation or to lack of heavy utilization of mussel as a food source. The levels which contained evidence of mussel usually contained occupational debris

(flakes, bone, points, etc.) which would seem to indicate use of the mussel as a food source. Some of the specimens recovered were extremely smooth, almost as if "stream rolled." Does this indicate use of the shell as a tool, or perhaps is the result of water flow within the shelter during wet periods? The samples seemed too small to make any educated guesses. Mussel was recovered from seventeen units and in twenty-four different levels. Level 170-180 cm had mussel present in four different units. The only exception to specimens being restricted to fragments was in Unit 4S/1E, Level 230-240 cm. A "baggie" of mussel was recovered from this level.

SNAILS - The snails recovered from the shelter have only been given a preliminary study; hopefully at some time in the future they will be studied in more detail. The preliminary study was accomplished by the use of the STAA comparative lab samples, The Dallas Museum of Natural History Bulletin on the snails of Texas, an article in the TAS Bulletin (Allen and Cheatum 1960) and with the help of Ken Brown, UTSA CAR. Snails, while occurring in the shelter, were not as abundant as expected. Six families of snails were present, with eight species occurring. Of the eight species, seven were land snails and one was aquatic.

Family **Planorbidae**, Species **Helisoma** - The **Helisoma** is the only aquatic snail recovered from the shelter. One type prefers fresh flowing water, the remaining type is found in either permanent or temporary pools, but grows the largest in quiet shallow water - semi-stagnant. The specimens from the shelter were not identified as to type, but one large specimen was recovered. Ten specimens of **Helisoma** were recovered from the shelter. Five of the specimens came from Unit 2S/1E, three of these were in one level (170-180 cm) which was apparently a living area, as bone, charcoal, a biface, and flakes were also present. One **Helisoma** occurred in Level 180-190 cm which also contained a **Frio** point. Level 220-230 cm produced one **Helisoma** along with some mussel shell fragments. Unit 1S/2E contained two samples of **Helisoma**, one from Level 110-120 cm which also contained a dirt dauber's nest, flakes and bone fragments, the other from Level 180-190 cm which contained a medial biface, core and numerous flakes. Unit 1N/4E contained one example of **Helisoma** at Level 150-160 cm which also had bone, charcoal and some flakes present. Unit 1N/2E, Level 160-170 cm, contained one **Helisoma** along with a **Frio** point, a triangular point, burned bone and numerous flakes. Since **Helisoma** is aquatic, it would have been introduced into the shelter artificially (man, animal). The presence of the snail with apparent living areas may explain its introduction into the shelter by man. Perhaps it was gathered with aquatic plants which were a food source, or with techniques used in the retrieval of freshwater mussels. Two of the samples occurred in levels containing mussel fragments.

Family **Polygyridae**, Species **Polygyra** and **Practicolella** - The family **Polygyridae** is represented by nine scattered specimens, six **Polygyra** and three **Practicolella.** The majority of the snails in this family occur in woodlands under logs, humus, and rocks, particularly limestone. It is nocturnal and a fungus feeder.

Family **Oleacinidae**, Species **Euglandina** - One example of this family was recovered in Unit 2S/1E, Level 220-230 cm. This level also contained mussel fragments, 11 **Rabdotus**, 18 **Helicina** and 1 **Polygyra.** This family prefers well-protected places with abundant moisture. This snail is predatory.

Family **Urocoptidae** - This family is associated with limestone rocks, and in crannies. It apparently thrives in semiarid habitats. Six specimens were recovered from the shelter. Unit 2S/1E, Level 170-180 cm: one sample; Unit

1S/2E, Level 190-200 cm: one sample; Unit 0S/5E, Level 130-140 cm: one sample; Unit 0N/3E, Level 130-140 cm: one sample, and Level 160-170 cm: two samples.

Family **Bulimulidae**, Species **Rabdotus** - This family is considered colonial and occurs in arid and semiarid conditions. It is speculated that **Rabdotus** were utilized as a food source by prehistoric man. Eight hundred eighty-nine specimens of **Rabdotus** occurred in the shelter, which seems to be a low incidence when the amount of fill removed is considered. Most occurrences of **Rabdotus** were few in number per level. Only in thirteen separate levels did more than 15 specimens occur in any one level. A few large concentrations occurred. In Unit 1S/2E, Levels 250-260, 260-270, and 270-280 cm, 63, 126 and 22 **Rabdotus** specimens occurred respectively. In Level 200-210 cm, Unit 1S/1W, 48 specimens were recovered. These concentrations may represent the colonial nature of the **Rabdotus**. Very little of cultural significance was present in the levels containing the concentrations except in Unit 1S/2E, Level 260-270 cm, which contained some bone fragments, a few flakes and a fair amount of charcoal. This may suggest utilization of the **Rabdotus** as a food source.

Family **Helicinidae**, Species **Helicina orbiculata tropica** - The **Helicinidae** family is a sturdy species which is almost drought resistant. It is usually associated with limestone in deciduous or juniper woodlands and is one of the few species that is aboreal (climbs in trees). The area surrounding the shelter contains much cedar and limestone so that the presence of the **Helicina** is not surprising. Approximately 1,427 **Helicina** were recovered from the shelter. They were present in almost all units and almost all levels. Several areas produced concentrations (25+) of this species. Seven different units had eleven different levels with concentrations. Four of the seven units were located in the southeast section of the shelter, two units in the northeast section, and one unit in the southwest section. The concentrations of **Helicina** contained from 25-150 specimens. The **Helicina** seems too small to be a food source. Their preference for limestone probably explains their abundance in the shelter. Since they are arboreal, they may also have been introduced into the shelter on wood brought in by the occupants.

LITHIC DEBRIS - The lithic debris in the shelter consisted of primary flakes, secondary flakes and interior flakes; a few cores were also recovered. Some of the flakes exhibited evidence of exposure to heat. This may have been direct exposure, as in heat treatment of the chert to facilitate working of the chert, or indirect exposure, as the result of the heat from later hearths being placed on an area containing chert debris from a previous occupation, or as the result of "clean up" material being thrown into a hearth.

Primary flakes represent the initial stage of artifact manufacture. Primary flakes seldom occurred in the shelter. The highest number present in one 10-cm level was six specimens. When primary flakes occurred they were usually limited to one or two specimens in a level. The lack of primary flakes indicates that the initial stages of tool manufacture were not carried out within the shelter.

Secondary flakes were defined as flakes having some cortex present on the flake; they represent intermediary stages of tool manufacture. Secondary flakes were more numerous in levels which also contained higher numbers of interior flakes. This pattern probably represents raw material being partially prepared away from the shelter and then transported to the shelter for the final stages of reduction.

Interior flakes were defined as flakes having no cortex present. Interior flakes represent the final stages of tool manufacture or resharpening techniques. The presence of large quantities in several areas of the shelter probably represent tool manufacturing areas, while the smaller concentrations

represent tool maintenance (resharpening). Many of the interior flakes were very small and are pressure-flaking debris.

ARTIFACTS

A total of 104 projectile points have been recovered thus far during excavation; of these 88 were recovered with provenience and 16 were unprovenienced (see Figures 5 and 6). The majority of the unprovenienced artifacts come from a disturbed area of the shelter. The materials in the disturbed area, including a possible **Perdiz** arrow point, were mixed and could not be reliably plotted as to depth.

Twelve type categories were present for the provenienced projectile points. These range in age from Early Archaic to Late Prehistoric. The majority fall within the Late Archaic.

Edgewood - a Late Archaic type common in northeast Texas. One specimen was identified.

Edwards - the **Edwards** point was probably the first arrow point form in South Texas; it is dated A.D. 960-1040 at the La Jita Site (Hester 1971, 1978; Sollberger 1978; Mitchell 1978). Ten specimens were recovered. One unprovenienced arrow point (possible **Perdiz**) was the only other evidence for a Late Prehistoric occupation at the site.

Ensor - a Late Archaic type (Turner and Hester 1985). One specimen was recovered.

Castroville - Late Archaic form. It was dated at 700 B.C. at Bonfire Shelter in Val Verde County (Dibble and Lorrain 1968). Two broken specimens were recovered.

Fairland - a Late Archaic form. Three specimens were recovered from the shelter.

Frio - the **Frio** point is a Late Archaic form. It was the most represented type in the shelter with twenty-six specimens recovered.

Langtry - a Middle Archaic form which dates 1000-2000 B.C. in Southwest Texas. It is more common in Southwest Texas than in Central Texas. One provenienced base was recovered.

Martindale - an Early Archaic form of Central and South Texas. Four specimens were recovered from the lower levels of the shelter.

Nolan - an Early Archaic form dated ca. 2000 B.C. at 41 BX 1. One specimen was recovered from the shelter in a level which was primarily characterized by **Frio** points. This probably represents introduction into the shelter by later peoples (a curiosity?).

Pedernales - a Middle Archaic form dating from 1000-2000 B.C. Four provenienced specimens were recovered - two from levels which were primarily represented by **Frio** points. This may represent a time period of the area which was a transition between the Middle and Late Archaic.

Tortugas - a triangular point form of the Middle Archaic in South Texas. It is dated prior to 1000 B.C. Four specimens were recovered. One specimen was recovered from an upper level and may represent introduction into the shelter by later peoples or may reflect extended use of the type across time.

Figure 4. Clockwise: Top and Right, appearance of 41 KE 110 prior to excavation; Bottom, Cecil Peel and the author on break during excavation; Left, Excavated entryway to provide access to the shelter interior (note mano and metate pedestaled in foreground).

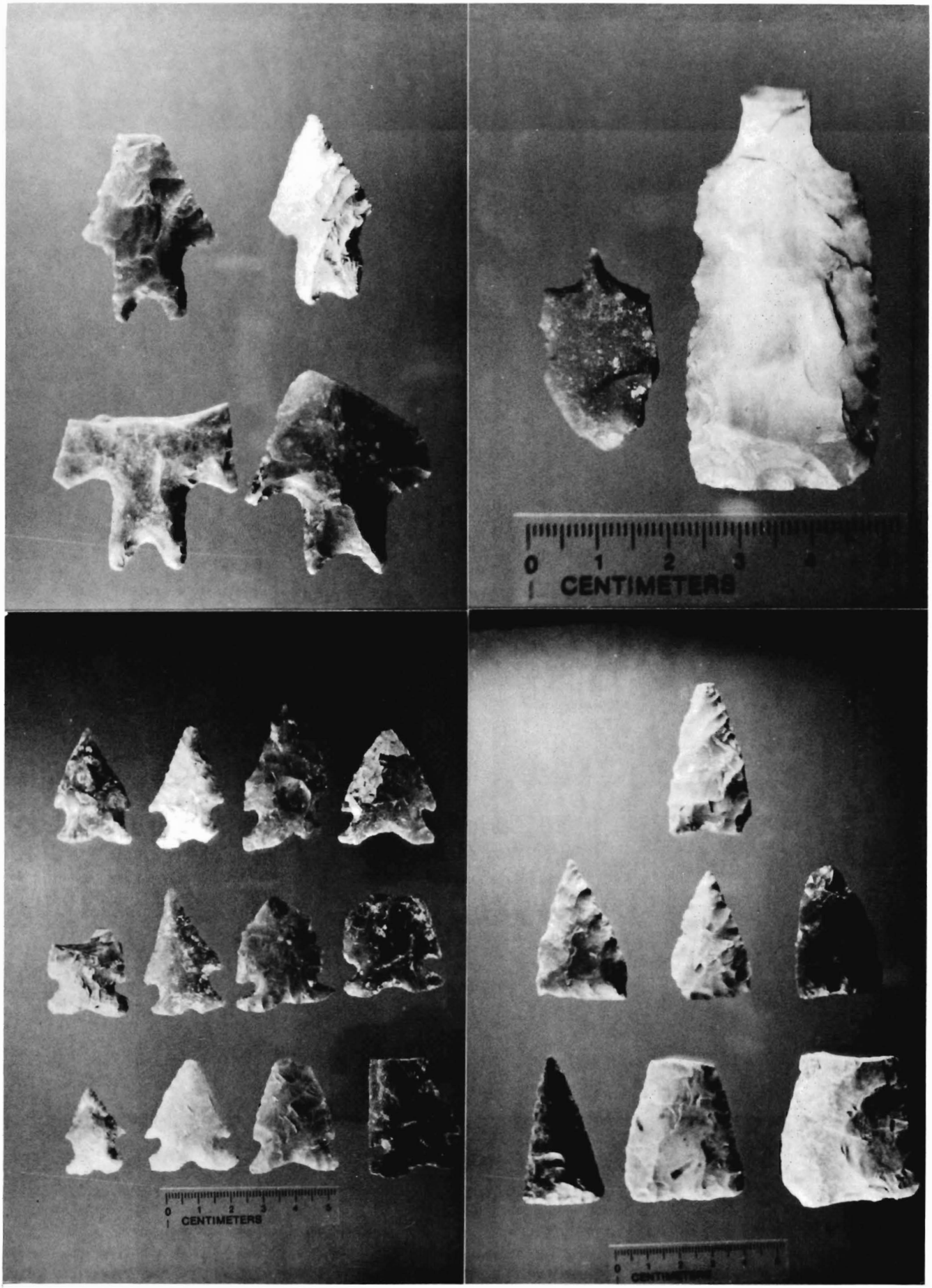

Figure 5. Bifaces recovered from 41 KE 110: Upper Left, broken **Pedernales** points; Upper Right, possible graver and drill; Bottom Left, **Frio** points; Lower Right, Triangular bifaces including **Tortugas.**

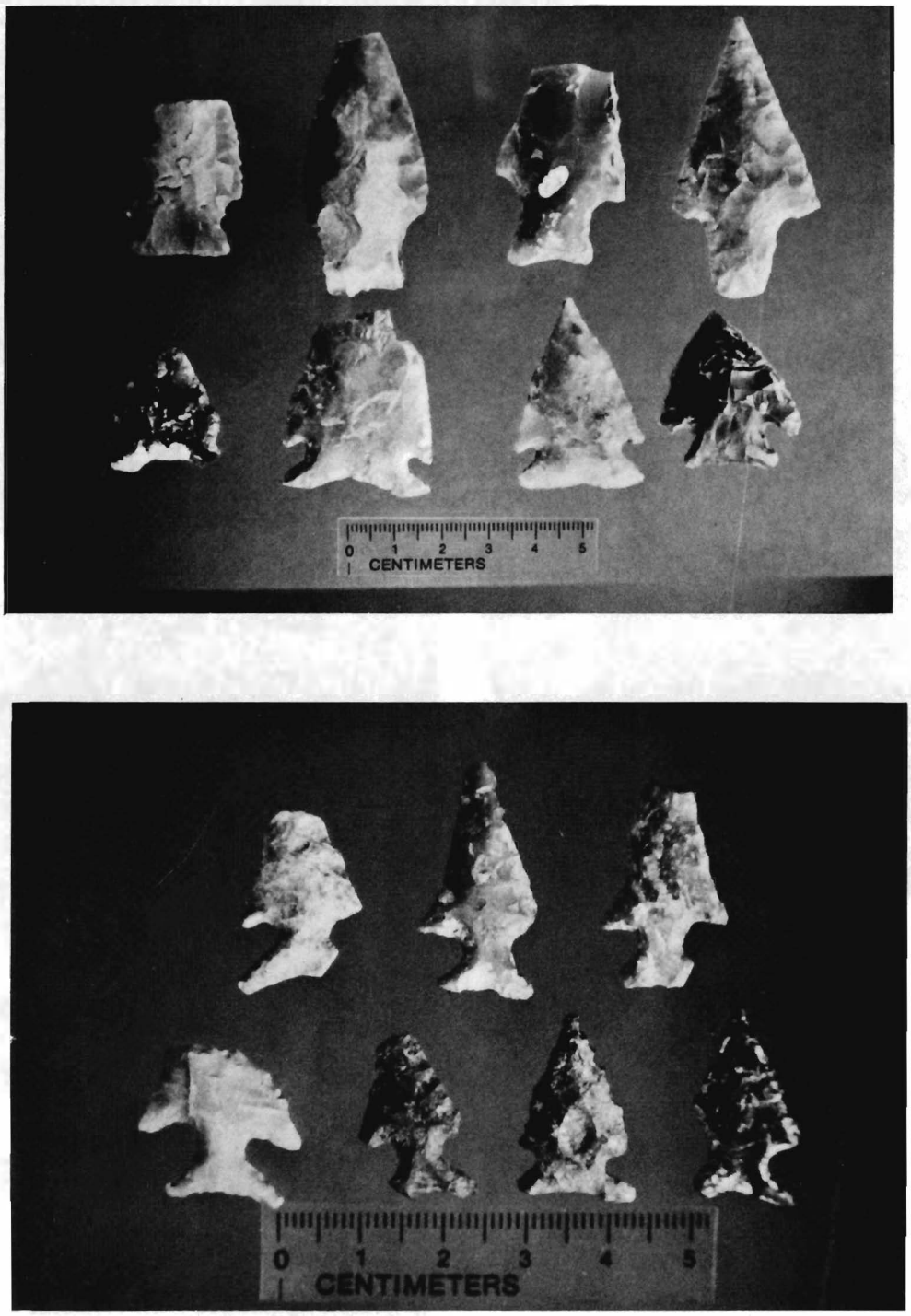

Figure 6. Additional Bifaces from 41 KE 110: Upper-Top Row, left to right, **Edgewood, Nolan**, unidentified, **Langtry**; Bottom row, **Uvalde**, two **Martindale, Castroville**; Lower, **Edwards** arrow points (note difference in scale of reproduction). Photos (Figures 5 and 6) courtesy of W. R. Van der Veer.

Figure 7. Clockwise: Top Right, Mano and Metate; Lower Right, Hearth Features; Left, Interior of Shelter during excavation.

Three specimens were recovered from levels containing **Pedernales** (Middle Archaic) and **Frio** (Late Archaic). Again, this might represent a transition time between the Middle and Late Archaic. **Tortugas** is a common form in South Texas and its presence in the shelter may represent trade with southern peoples or introduction into the area by southern groups either as a permanent migration or as a seasonal, temporary presence.

Triangular Form - several small, straight-based triangular forms were found in the upper levels of the shelter. Since these points did not readily fit into the recognizable triangular point categories, they were classed as Triangular Form.

Uvalde - an Early Archaic form. Two specimens were recovered.

OTHER TOOLS AND ARTIFACTS

Utilized Flakes - forty-five utilized flakes were recovered from the shelter. The majority occurred in the heavily occupied levels. These levels were characterized by **Frio** points (130-180 cm). Another cluster was in Level 110-120 cm; **Edwards** points occurred in this level.

Bifaces - thirty bifaces were recovered. Seven of these were thin and would be better characterized as knives.

Unifaces - seven unifaces were recovered from the shelter. Six of these came from near the shelter mouth and in the upper levels of the western part of the shelter. The unit next to the one containing the unifaces contained five scrapers. This probably represents a special activity area. The remaining uniface came from within the shelter at Level 180-190 cm.

Scrapers - ten scrapers were recovered -- as noted above, five from upper levels (30-60 cm) near the shelter mouth. The remaining five came from within the shelter at various levels. No clustering of these five was noted.

Choppers - four choppers were recovered. Two came from Unit 1S/1W, Level 170-180 cm, and two came from Unit 4S/1E, Level 230-240 cm, which also contained other occupational debris.

Drill - one possible drill was recovered from Unit 0S/4E, Level 130-140 cm (see Figure 5, upper right).

Graver - one small graver made on a flake was recovered from Unit 1S/2E, Level 160-170 cm (see Figure 5, upper right).

Hammerstone - one specimen was recovered from Unit 0S/3E, Level 160-170cm.

Manos - fifteen manos were recovered, four in upper levels near the shelter mouth (see Figure 7). One was recovered near the bottom of the shelter at 309 cm. Two manos were unprovenienced under a rock ledge in the shelter. The remaining eight manos came from levels which also contained **Frio** points. One of these manos was of pink granite, a material not available in the immediate area. Pink granite is available within fifty miles of the shelter near Fredericksburg, Texas.

Metates - four metates were recovered (see Figure 7, upper right). A quartzite metate was found at Level 130 cm in a 2m x 2m test. A mano and metate were found on a large roof spall within the shelter at approximately the

215 cm level. The metate was turned upside down with the mano underneath it. Two metates were found outside the shelter. One was a large, roughly circular metate with a mano. It was situated just above the limestone "patio" (see Figure 4, left). A rectangular slab metate of a red sandstone type material (not available in the area) was found near the shelter mouth in Unit 5S/1E (no exact depth was given).

FEATURES

The features in the shelter consist mainly of hearths (see Figure 7). They have not been fully analyzed at this point. Horizontal relationships of the hearth features is made difficult because the designations for the grid system were changed several times and the previously excavated bags of material and notes were not always changed to reflect this.

At present, the majority of the hearth features seem to occur in the eastern half of the shelter. One large burned rock feature was present in the upper levels of the western section of the shelter. It may possibly be a small midden instead of a hearth. It extended down through several levels, and while charcoal and flakes were present in it, the surrounding units had comparatively little occupational debris. This possible midden feature is in an area that had thick deposits of consolidated, powdered roof sediment.

The eastern half of the shelter contained numerous hearths, particularly around the 170-180 cm level -- the level which also yielded the greatest frequency of points (see Figure 8). At this level the hearths varied in size, some being small ("one-burner" size) and others quite large, covering a major portion of a one-meter unit. Some of the hearths had slabs in the center. Occupational debris, flakes, points (**Frio**), bones, etc. were found in areas around the hearths.

The back profile of the shelter on the eastern half exposed a feature which is not a hearth. It consisted of what appears to be a pit scooped out of the powdered ceiling sediment. It could be a natural feature, but it seems unlikely.

STRATIGRAPHY

Seven major strata were recognized in the shelter. The thickness of the strata varied from side to side and from back to front of the shelter. The eastern side contained the majority of the organic occupation deposits, while the western side of the shelter contained the thicker, consolidated, powdered roof sediment, large spalls, and a limestone ledge which curves around the back of the shelter. It is difficult to assign the artifacts recovered to a particular stratum as the field notes did not always reflect the soil composition in a particular level. In general, the majority of the artifacts were recovered from the darker, organic deposits. The shelter deposits were underlain by a limestone floor. This floor is fairly level, ranging from 312-315 cm below the main datum. The limestone floor extends from the back of the excavated five-meter-long tunnel to seven meters out from the shelter mouth to form a "patio" in front of the shelter.

Stratum I

Stratum I (lowest) lies on top of the limestone floor (312-315 cm) and consists of a consolidated, light gray-white, powdered roof sediment. This stratum dips to the east and south, becoming very thin at the shelter mouth (see Figure 9). It is very thick at the back of the excavated tunnel, as if it had washed in and settled. In the excavated part of the shelter it varies from ca. 15 cm on the west side to 3-5 cm on the east side.

Level	Edwards	Castroville	Edgewood	Ensor	Fairland	Frio	Langtry	Martindale	Nolan	Pedernales	Tortugas	Triangular	Uvalde	Unidentified	Total
40-60 cm	1										1			1	3
70-80	2													2	4
90-100	3													1	4
100-110					2									3	5
110-120	1											1		3	5
120-130	2					1	1					2		4	10
130-140	1				1	2								2	6
140-150						6									6
150-160			1			5					1		1	2	10
160-170						2			1	1	1			2	7
170-180				1		6				2	1			3	13
180-190		1				2							?		3
190-200		1				2								1	4
210-220										1				1	2
270-280								1							1
280-290								2							2
300-310														1	1
310-320								1							1
Talus slope							1								1
Unprovenienced	1				1	5				2	1			6	16
Total	11	2	1	1	4	31	2	4	1	6	5	3	1	32	104

Figure 8. Provenience of Projectile Points. (Levels not shown contained no projectile points.)

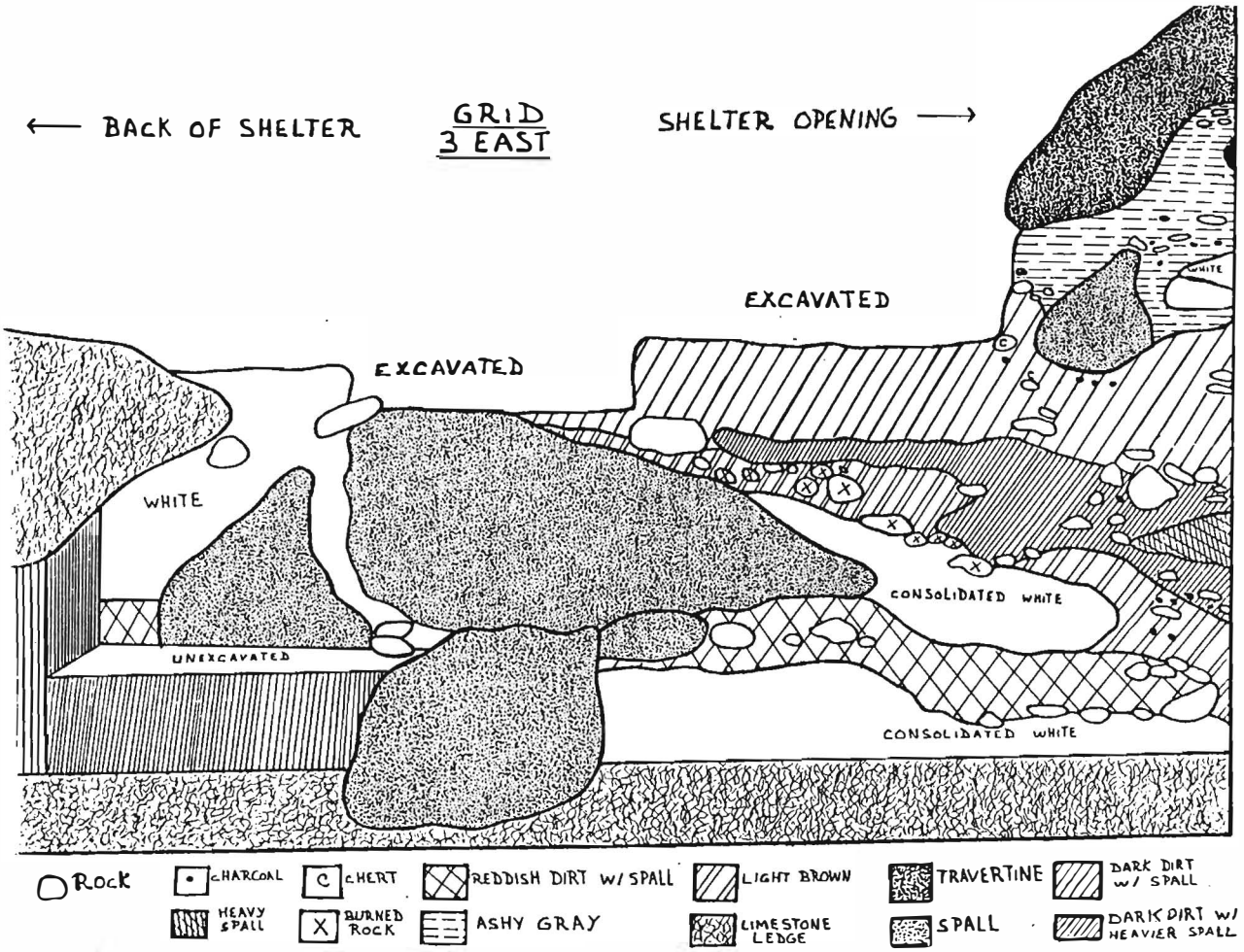

Figure 9. North-South Profile, Goss Creek Shelter, 41 KE 110.

Stratum II

Stratum II is a thick red gravelly deposit. Again, it is very thick in the tunnel where it appears to have flowed in and settled. It is thickest on the western side of the shelter and at the back. It varies from 30-50 cm in the excavated part of the shelter. Some artifacts were recovered in this stratum (**Martindale**).

Stratum III

Stratum III is a consolidated, powdered gray-white roof sediment. It is very soft when wet and like concrete when dry. This stratum is thickest at the back and on the western parts of the shelter. It is absent at the front of the shelter on the eastern section. Few artifacts were found in this stratum.

Stratum IV

Stratum IV is a medium to dark brown soil with small pieces of roof spall mixed throughout. It is absent from the back of the shelter and intrudes Stratum III on the western section of the shelter. Occupational debris is present in this stratum.

Stratum V

Stratum V is a dark soil mixed with small spalls. It thins to the west. This stratum is interspersed with pockets of ash and reddish burned areas. Occupational debris including hearths, burned rock, charcoal, points, bone, lithic debris, etc., is present throughout this stratum.

Stratum VI

Stratum VI is composed of loose dirt and sheep dung. It is thickest at the back of the shelter. It is about 10 cm thick.

Stratum VII

Stratum VII is a travertine layer. It is thickest at the shelter mouth and almost absent from the back of the shelter. The travertine almost completely blocks the eastern side of the shelter. The travertine is composed of microlayers of alternating dirt and travertine, representing depositional episodes. Perhaps this is a seasonal occurrence, the dirt layer occurring during the dry summer period and the travertine occurring during the wet winter periods. It could also reflect climatic changes, from dry and wet periods. Frank H. Watt has suggested that there may be a possibility of these alternate layers of deposition being dated along the lines that tree rings are dated (Watt 1936). A few artifacts were recovered from the travertine layers in the western section of the shelter.

OCCUPATIONAL SEQUENCE

It has not been possible at this point to separate the discrete occupational strata in the shelter. This may be possible in the future through analysis of the occupational material recovered from individual levels. In general, the occupation of the shelter seems to have been a brief Early Archaic occupation, occasional use during the Middle Archaic, particularly the latter part of this period, heavy utilization during the Late Archaic, and moderate utilization during the early Late Prehistoric. Specific occupational sequences were defined by the use of "index fossils" -- points characteristic of certain time periods.

Early Archaic

The presence of an Early Archaic occupation was marked by the occurrence of three **Martindale** points and an unidentified, parallel flaked, thin barbed point. Other cultural material was minimal. The presence of a mano would indicate plant processing. Another mano and metate were recovered outside the shelter at what was probably the Early Archaic level, but they cannot positively be said to come from this time period as no diagnostic artifacts were directly associated. Some mussel fragments and bone were also recovered indicating exploitation of a variety of food resources.

Middle Archaic

In the shelter there is no distinct separation between the Middle and Late Archaic point types. The Middle Archaic types are present in the lower levels of the period represented by the Late Archaic types. The Middle Archaic types occur at what seems to be a time at the end of the Middle Archaic. Middle Archaic types included **Pedernales**, a common type of the Middle Archaic in the local area; **Tortugas**, a typical Middle Archaic type of South Texas; and one **Langtry**, a type common in Southwest Texas in the Middle Archaic. The presence

of points from South and Southwest Texas is interesting. Perhaps the end of the Middle Archaic was a period of movement in the region, either in the form of trade to and or from the west and south or movement into the Hill country by peoples from these areas. It has been proposed (Bryant and Shafer 1977) that this time period at the end of the Middle Archaic and into the Late Archaic was one of a slightly cooler climate, and that bison were present. These factors perhaps added additional economic resources to the subsistence base, creating less economic stress or a more stable economy. The result of this could be: items for trade; more leisure -- a group could afford to have members either procuring items for trade or off on trading trips; better nutrition -- travel on jerky would be more efficient than on acorn meal; lessening of territoriality -- a deer, bison, etc., would probably incur less wrath if taken from the territory of a group having full bellies than from a group with empty bellies. Times of relative economic plenty can also support specialists. Perhaps the occurrence of certain point types, over a widespread area is the result of a specialty trade -- travelling knappers or groups near good sources of raw material being the major manufacturers. This is just a speculation at this point.

Late Archaic

The Late Archaic period is characterized by the presence of **Frio** points, the predominent point recovered from the shelter (total frequency in Figure 8). The major occupation of the shelter appears to have been during this period. Occupational debris included: mussel, bone, a variety of hearths, and manos. The manos clustered during the Late Archaic and included one specimen of a pink granite which is not available locally. The Late Archaic occupation seems characterized by a broad based economy.

Transitional Late Prehistoric

The Transitional Late Prehistoric period is characterized in the shelter by **Edwards** arrow points but no pottery. This period represents the second heaviest utilization of the shelter (see frequency in Figure 8). Unifacial tools, scrapers, and utilized flakes clustered in the upper levels which were characterized by **Edwards** points. There was also a small clustering of manos during this period. As in the Late Archaic, the occupational debris during this period would seem to indicate a broad based economy with exploitation of a variety of resources.

SUMMARY

The archaeological evidence of the shelter covers a timespan from the Early Archaic through the early Late Prehistoric period. The Early Archaic time period is characterized by sites situated on high terraces, evidenced in the earlier survey (see Neureuther 1985), but also includes occupation of the shelter. Manos and metates present in the shelter at the lower levels characterized by Early Archaic (**Martindale**) points and the high terrace sites would indicate a broad based utilization of the area during the Early Archaic period. The Middle Archaic period is characterized by numerous burned rock middens along Goss Creek. These would seem to indicate a specialized, perhaps narrower economy. Settlement patterns during this period would indicate heavier use of the riverine and floodplain areas. The Late Archaic period on the Haag Ranch is characterized by heavy occupation of the shelter. Emphasis on plant processing is seen by the clustering of manos during this period. Other occupational debris would indicate a broad based economy of hunting and gathering during this period.

The presence of materials from outside the immediate area would indicate either trade or a fairly wide-ranging territory of exploitation. The early Late Prehistoric period is also evidenced by artifacts recovered from the shelter. Materials representing this period are generally rare in other areas of the ranch, but considering the size of the **Edwards** point, this may be attributed to sample bias. Again, the economy during this period would seem to be a broad based hunting-gathering economy.

The presence of manos with **Edwards** arrow points but the absence of pottery may be significant. The manos suggest a major campsite as opposed to just a hunter's campsite. Yet the absence of pottery suggests a preceramic component more related to the Late Archaic occupation of the rockshelter than typical open Late Prehistoric sites. Most significant is the linkage of **Edwards** arrow points with the use of rockshelters; they occur in both Goss Creek shelters. Such small, isolated rockshelters may have served as winter campsites for the people who made and used **Edwards** arrow points.

The major portion of the Late Prehistoric (circa A.D. 1200+) is very tentatively represented in the Goss Creek drainage by one possible **Perdiz** arrow point in the shelter excavations and two unifacial **Perdiz** or **Scallorn** fragments at KCS 9 (41 KE 102). This apparent lack of a major Late Prehistoric occupation might reflect that the shelters had become unsuitable for living due to roof spalling or fill, a change in cultural preferences (easier hunting of bison near or east of the Balcones Escarpment), or could be a function of sampling bias.

CONCLUSIONS

Archaeological work on the Haag ranch to this point has concentrated on a limited survey and the excavation of one shelter. Other areas remain to be studied. The ranch would seem to hold possibilities for shedding more light on the Early Archaic period. Materials from this period are present in the shelter and on some high terrace sites. Controlled excavation could perhaps add some more information on the use of these high terrace sites.

At the other end of the spectrum, the early Late Prehistoric period is only lightly represented in areas other than the two shelters. The question remains whether the area was only sparsely utilized during this period or whether Late Prehistoric materials have just eluded our investigations.

The STAA survey (Neureuther 1985) and the shelter excavation have significantly increased our knowledge of the archaeology of Kendall County. Recorded sites have been increased from 93 to 117, an increase of over 25 percent, through our study of the Goss Creek drainage area of the Haag Ranch. Some 1,700 acres were included in the survey (Black and Knepper 1982); our examination of this limited area identified about one site per every 71 acres. This reflects a much higher incidence of archaeological sites in Kendall County than previously documented and implies that considerable archaeological work remains to be done in the area.

ACKNOWLEDGEMENTS

A very special thanks to Allen and Vera Haag for permitting us to evaluate sites on their ranch; such landowner cooperation is a model for future studies of Texas Cultural and Historical Resources. A special thanks to Cecil and Dortha Peel as well for arranging access to the area, for their excavation and laboratory work, and for their continued outstanding hospitality to any and all STAA workers. Cecil has been recognized for his major contribution at 41 KE 110 by his being awarded the 1984 Robert F. Heizer Award (see Volume 12, No. 1). Additional thanks go to Kris McDowell of Garland, Texas, and Fern Brady of Boerne, whose financial contributions made possible radiocarbon dating of

samples from the site, and to Al McGraw of UTSA-CAR for arranging this dating with the Beta Analytic Lab.

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Appendix 1

KENDALL COUNTY SURVEY SITE DESIGNATIONS *

Kendall County Survey Number	TARL Trinomial	Site Description
KCS #1	41 KE 94	Oval-shaped burned rock midden
KCS #2	41 KE 95	Lithic scatter; historic glass
KCS #3	41 KE 96	Lithic scatter on ridge; two Early to Middle Archaic point fragments
KCS #4	41 KE 97	Historic house site
KCS #5	41 KE 98	Burned rock midden on low terrace **Montell** base, core, flakes
KCS #6	41 KE 99	Lithic scatter on high terrace
KCS #7	41 KE 100	Lithic scatter on high terrace **Nolan** and Early Expanding Stem
KCS #8	41 KE 101	Disturbed midden on low terrace
KCS #9	41 KE 102	Lithic scatter on low terrace **Angostura, Nolan, Martindale** and two unifacial arrow points.
KCS #10	41 KE 103	Midden on high peninsula, possibly potholed (abandoned screen)
KCS #11	41 KE 104	Lithic scatter on high promontory Early Expanding Stem point
KCS #12	41 KE 105	Oval lithic scatter on low promontory
KCS #13	41 KE 106	Circular lithic scatter on hilltop **Gower, Travis, Angostura**-like
KCS #14	41 KE 107	Lithic scatter on hilltop
KCS #15	41 KE 108	Keeble Site; "ring" midden (potholed) and small rockshelter, **Edwards**
KCS #16	41 KE 109	Lithic scatter on high terrace
KCS #17	41 KE 110	Cecil's Rockshelter
KCS #18	41 KE 111	Lithic scatter, burned rock
KCS #19	41 KE 112	Shallow burned rock midden
KCS #20	41 KE 113	Burned rock midden on an intermediate terrace
KCS #21	41 KE 114	Lithic scatter on 2nd terrace; chopping tool and proximal point fragment
KCS #22	41 KE 115	Lithic scatter on low terrace
KCS #23	41 KE 116	Widespread lithic scatter across three terraces
KCS #24	41 KE 117	Thin lithic scatter on high promontory

* For details of the survey, see **La Tierra** 12(4):25-39.

TEXAS COASTAL CLAY OBJECTS: HYPOTHESES TESTING BY ARCHAEOLOGICAL EXPERIMENTATION

Jeffery A. Huebner

ABSTRACT

Experimental replication of several styles of hearths was undertaken in order to evaluate suggestions on the creation and use of clay balls often found at prehistoric sites on the Texas coast. Results of this experiment tend to support Corbin's hypothesis that such objects are natural byproducts of hearth building and use.

INTRODUCTION

During archaeological surveys of the lower Texas coast in the late 1920s, George C. Martin was the first to report the occurrence of burned or baked clay lumps (Martin n.d.). Since that time many other archaeologists have reported these objects in coastal sites (Corbin 1963; Hester 1971a and b; Smith 1982). As well as numerous reports of these objects, a nearly equal number of possible explanations for them exist. Out of these many explanations, four specific hypotheses about their manner of formation and function have been formulated.

The first hypothesis comes from Martin (1931); during a survey along Oso Creek he found clay objects eroding out of the bank. He noted that many pieces had a smooth side, and a few fit together that "certainly formed part of a cast of the inside of a pot" (Martin 1931:54).

The next hypothesis belongs to Corbin (1963). During a survey of the north shore of Corpus Christi Bay he encountered a myriad of "fire-hardened clay lumps." He attributes these lumps to fires built directly on the clay surface.

The final two hypotheses are Hester's (1971a, 1971b), the first being "that they served as surrogate hearthstones, since that area of the coast has no native stone (Hester 1971a). The second hypothesis proposes that they were cooking or boiling "stones" (Hester 1971b).

For the purposes of this experiment, only Corbin's and Hester's second hypotheses will be used. Martin's, and Hester's first point were not tested for the following reasons: Martin's idea is directly related to pottery. This would make all the lumps found postdate approximately A.D. 1000. Radiocarbon dates from charcoal in a clay lump concentration in Kleberg County, Texas were found to be 4500 ± 60 B.P. (Smith 1982). Because of the wide temporal range for clay objects, Martin's idea is rejected. Hester's hypothesis of surrogate hearthstones is not tested because of the great difficulty in evaluating this function separately from other functions being performed in association with hearths.

Empirical data on burned clay objects to date comes from only two sources. Aten (1967:40) subjected several morphologically different clay objects to x-ray diffraction tests. The results showed that the objects had been heated to 500-600°C and that their compositions were quite similar. The other test data are reported by Smith (1982:35), who created clay lumps by exposing soils to the concentrated flame of a blowtorch for 90 seconds. The clay lumps from this experiment proved to be microscopically indistinguishable from the artifact lumps. It was also noted that the "clay lumps" were not all clay, but products of heat and the local soil (Smith 1982:35).

The experiment was undertaken to test both Hester's and Corbin's hypotheses. To test Hester's hypothesis, cooking balls were manufactured from local soils and montmorillonite clay, fired, and then examined after immersion in water. To test Corbin's concept, the hearths were examined after firing for

formation of natural clay lumps. The resulting clay objects from both tests were then evaluated for similarities to those from archaeological sites.

DESCRIPTION OF EXPERIMENT

Hearths:

In this experiment four fire hearths were used to fire the clay objects. The hearth environments allowed for testing the types of hearths commonly found near the coast and eventually will give long-term data on the erosion and collapse of these hearth types. Basic hearth types are: clay-lined, stone-lined, and natural. The clay-lined hearth will simulate the hearths dug directly into the clay dunes found on the coast. The stone-lined hearth accurately replicates stone "broiling" platforms found in many hearths. The third, the natural hearth, represents a hastily prepared firepit.

Hearth one (H-1) was dug with a shovel in approximately five minutes to the dimensions of 60x40x11 cm. The hearth was then scooped clear of loose soil by hand and prepared for clay lining by pressing the soil down firmly with the palms of the hands. The red clay for lining the hearth was obtained near Kountze in Hardin County, Texas. The clay is a montmorillonite type which is commonly found along the Texas coast. Preparation of the clay did not require any pottery techniques and involved breaking the clay into small (3-4 cm) lumps. These raw lumps were uniformly spread on the base of the pit and pressed down into the soil matrix with the heel of the hand. This method was found to be slow, painful, and inconsistent at producing the uniform thickness of clay desired. This manual method was replaced by tool -- in this case a 25x50x400 mm stake of pine, which was used to beat and tamp the plastic clay into a solid, uniformly thick base for the hearth. This technique was repeated a final time to give a uniform thickness of 1.5 cm of clay on the hearth floor. From start to finish, H-1 took one hour, ten minutes to complete.

Hearth two (H-2) was dug with a spade to the dimensions of 54x52x10 cm in approximately five minutes. The hearth was scooped clear of loose soil by hand and prepared for stone lining. The floor of the hearth was lined with flat stones obtained within a 100-m radius of the hearth site. The lining used eight stones and covered approximately 90 percent of the floor. Including the gathering of local stone, H-2 took 15 minutes to complete.

Hearth three (H-3) was dug with a spade to the dimensions of 54x54x10 cm in approximately five minutes. The hearth was then scooped clear of loose soil by hand and left in this natural state.

During excavation of H-2 it was noticed that the very act of digging produced lumps similar to those mentioned by Hester (1971), but these were still in the raw, unfired state. These lumps ranged from 0.5-10 cm in diameter. This phenomenon was also noted during excavation of H-3.

At that time it was decided to dig a fourth hearth (H-4), but to do it with a digging stick as noted in the ethnographic literature. The digging stick was the same 25x50x400 mm stake used to tamp H-1. The stick was held with both hands and operated along the medial plane of the body in a pulling, pushing, and plowing action. this activity yielded a 45x48x9 cm hearth in approximately eight minutes. In H-4, the floor of the hearth was not prepared by scooping all the loose dirt out. Six rapid swipes were made with one hand along the bottom of the hearth and what remained after this was left in the hearth. There were nine objects of a size greater than 3 cm long which were allowed to remain through the firing.

Clay objects:

Two different sets of clay objects were made for the experiment. The first set was made from the same red clay that was used to line H-1. The other

set was constructed from the backfill of H-1. Nine balls, of three sizes, were made from each material. One ball of every size was used in each of the first three hearths (6 objects per hearth). The fourth hearth had no manufactured objects placed in it.

The clay balls were made by rolling and wedging the red clay for a very short time, then hand rolling the clay into spheres. Each object took less than five minutes to complete. After manufacture, all nine were allowed to dry in the shade until use the next day. The earth balls manufactured from the backfill were hastily made by packing and hand rolling the soil.

In all cases, the balls were made with bare hands to optimize the chances of leaving finger and hand prints on each of the objects, like those mentioned by Hester (1971a). The objects were not grooved or scored; they were not made in various shapes such as objects found in Poverty Point cultural areas (Webb 1968).

Fires:

All fires were ignited using flint and steel along with organic tinder and fuel. No petroleum products were used to assist in ignition. Dried grass was used for tinder, a large handful was balled up and placed in the center of the fire pit. Over the tinder pieces of split wood were stacked, and the fire was sparked. It took approximately ten strikes of the flint and steel to ignite each of the fires. The problem is not in the spark production but in where the sparks fell. The temperature of the fires was measured by the use of "therma cones." Therma cones are ceramic cones constructed of different compositions of materials, that deform when their temperature threshold is reached. Four cones of different values were mounted in a block of kaolinite pottery clay and placed in the center of the hearths prior to ignition.

RESULTS OF EXPERIMENT

To test Hester's hypothesis, the clay balls were removed from the fire and added to one liter of water. This test was done separately for each hearth. The balls did function to raise the temperature of the water, but did not boil it.

When the balls were removed from the hearth, their colors were: buff, red, and dark brown. The surface of the balls had small amounts of ash clinging to them that separated when the balls were placed in the water. When the balls were removed from the water, the exterior surface of all of them had turned black. After the balls were allowed to dry in the shade, they were examined in the laboratory. Of the nine balls tested, five remained intact and four were fractured to varying degrees (see Table 1). The five intact balls were all uniformly black on the surface except for Ball #2 which had a reddish-brown spot. This spot could be due to the location of Ball #2 which was in contact with the stone lining of H-2 and consequently not affected by the flame of the fire. Though the surfaces of the fractured balls were uniformly black, the interior colors ranged from red to a dark brown. The fracturing of the balls occurred after they were added to the water.

No functional evidence was gained from the balls made of local soil. All nine of them fell apart in the fire prior to any attempt to remove them. The color of the balls from H-1 and H-3 ranged from dark red to dark brown. The balls in H-2 turned a buff color and did not disintegrate as much as the others.

To test Corbin's hypothesis, the hearths were examined after the fires went out. The fires were allowed to burn out on their own. Because this hypothesis involves erosional processes, only an initial assessment of each hearth can be made at this time. All debris from the fires was left in place

Table 1. Weights of Clay Objects, Pre- and Postfire, Percentage Recovered and Condition at Recovery.

Item No.	Hearth	Prefire Weight In Grams	Postfire Weight In Grams	Condition at Recovery	Percent of Original Weight
1	H-1	179.1	106.6	Fragmented	.595
2	H-2	134	112.9	Whole	.843
3	H-3	137.2	114.5	Whole	.834
4	H-1	113.5	90.3	Fragmented	.795
5	H-2	120.4	97	Fragmented	.805
6	H-3	122.4	102.5	Fragmented	.837
7	H-1	79.4	67	Whole	.843
8	H-2	70.1	57.7	Whole	.823
9	H-3	78.5	63.4	Whole	.807

in each of the four hearths. This was done to aid in later assessment of charcoal and other organic materials found in association with the hearths.

In H-1 the clay lining was well fired and of a uniform hardness, and dark reddish in color. The floor of the hearth had many cracks, but all pieces were in place. There was ash, charcoal, and unburned wood covering approximately 80 percent of the floor. The therma cones were retrieved from the center of the fire with minimal disturbance. Deformation of two of the four cones evidences a fire exceeding 668°C.

The stone-lined hearth, H-2, was little changed. The side walls of the hearth and the floor under the stones was lightly fired, and cracked into many small friable pieces but otherwise remained intact. The floor was covered with ash and charcoal, and the evidence of temperature was the same as H-1.

The first natural hearth, H-3, was fired hard in the center and was softer and friable at the periphery. The center was cracked into larger pieces than the side walls. A strip approximately 6 cm wide around the hearth was fired to the same extent as the side walls. The floor of the hearth was covered with ash and charcoal, and the temperature data is again the same.

The second natural hearth, H-4, was basically the same as H-3 with one major difference. Hearth four had not been "house cleaned" like the other three hearths. The raw soil lumps that were created by the act of digging were left in the bottom of the hearth. These lumps of soil fired hard and bear a resemblance to those pictured by Hester (1971b:Figure 6).

DISCUSSION

This experiment has yielded two significant pieces of data dealing with Texas coastal clay objects. The first is the reduction of the surface of the clay objects to a uniform black color, and the second is the creation of objects from the floor of H-4.

The surfaces of the clay balls were not blackened by soot or charcoal. A microscopic examination of a surface scraping at 100-power with polarized light showed: silicates, iron, some quartz, and no carbon. The black color on the surface was caused by the reduction of the magnetite component of the clay and the associated mineralogical structure change resulting from a 600°C heating followed by total immersion in water. The interior surfaces exposed from the fracturing of the balls after immersion were not blackened because they were not directly exposed to the reducing atmosphere of the fire. The uniform black color of the surface of clay objects is not mentioned in any Texas archaeological report. Heizer (1937:41) mentions "evidences of fire-blackening" in Cali-

fornia clay objects that were used for boiling but does not state whether it is associated with carbonaceous coating or mineralogical change. Assuming that these objects were blackened by mineralogical change associated with boiling technology, like the experimental objects, and considering the fact that most Texas coastal clays have a mangetite component and that there is no data on the black coloration, we must conclude that the clay objects were not used in boiling technology in Texas. This does not preclude their use in some other type of cooking technology such as roasting or broiling as has been demonstrated with Poverty Point clay objects (Hunter 1975).

The creation of objects on the floor of H-4 presents several questions which pertain to aboriginal behavior and experimental validity. When the first three hearths were dug, the floor was swept clear of all loose dirt and organic debris. In H-4, this chore was only a cursory effort, thus raising the question of validity by biasing this hearth from the others. Speculation on the behavior of an Indian digging a hearth is the reason H-4 was not fully cleared. When digging a fire pit with a stick in this experiment, raw lumps were created. There is no reason why this would not be the case if the hearths were dug in any temporal setting. It served the purposes of experimental validity to clear the first three hearths, but would it have served any purpose, other than more work, for an Indian to completely clear a pit prior to igniting a fire? With typical human (H. sapiens) behavior in mind, we can postulate that a total clearing of a fire pit would be, at best, a rare occurrence. With this in mind, and assuming experimental validity, the results suggest creation of such clay objects by natural, albeit anthropic means.

The above result argues in support of Corbin's hypothesis: that the objects are of natural formation. At this time, no further evidence to support this idea is available. Additional evidence to support or rebut this hypothesis will be gained over the next two years by monthly evaluation of the erosion of all the hearths. At the end of the two-year period, the hearths will be excavated in cross section to assess the production of natural clay objects in archaeological context.

CONCLUSION

In testing the two hypotheses by experiment, some amount of insight on clay objects has been gained. The evidence seems to support Corbin's argument for natural formation. Since this experiment is the first of its kind with Texas clay objects, it cannot hope to answer more questions than were asked. Further questions for future research could include: development of a way to test Hester's first hypothesis, or the use of the clay objects in a roasting experiment. These two ideas were not tested in this experiment but could be tested in similar fashion and at no great expense.

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