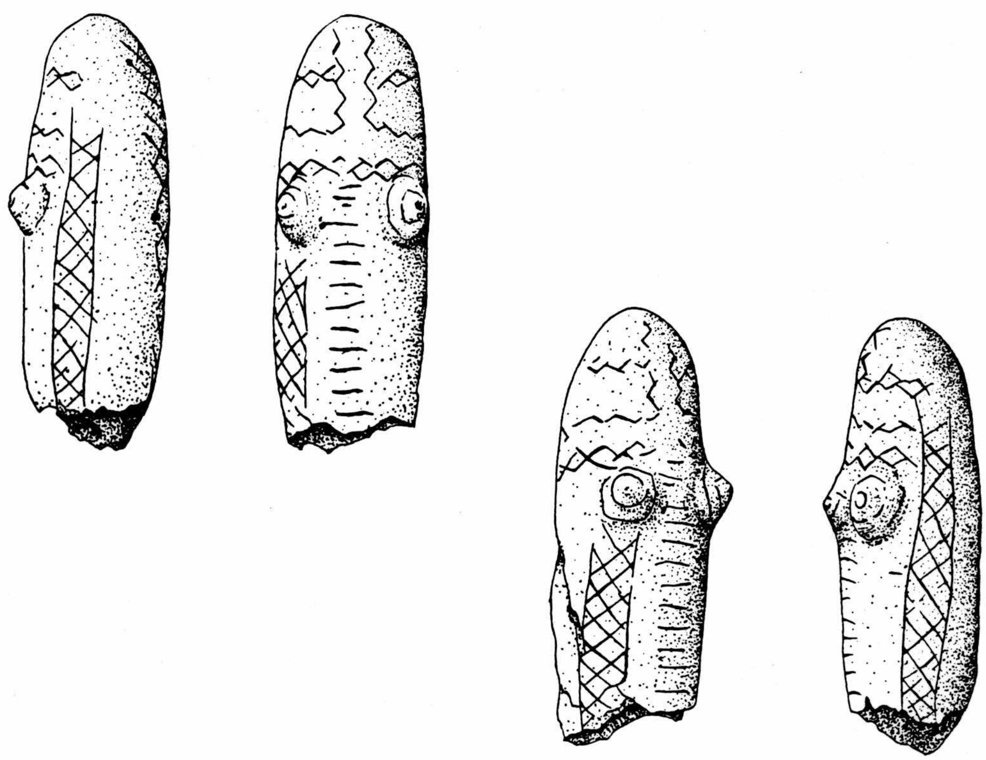
LA TIERRA



JOURNAL OF THE
SOUTHERN TEXAS
ARCHAEOLOGICAL
ASSOCIATION

VOLUME 18, No. 4
October, 1991

LA TIERRA

QUARTERLY JOURNAL OF THE SOUTHERN TEXAS ARCHAEOLOGICAL ASSOCIATION

Volume 18, No. 4 — Evelyn Lewis
October, 1991 — Editor

About the Cover: Richard McReynolds has drawn several views of a fired clay figurine found in Nueces County. See article starting on page 10.

Manuscripts for the Journal should be sent to: Editor, *La Tierra*, Evelyn Lewis, 9219 Lasater, San Antonio, Texas 78250. Past issues of the Journal and Special Publications available from: Bette Street, 7119 Poniente Lane, San Antonio, Texas 78209. Dr. T. R. Hester may be contacted at the Texas Archeological Research Laboratory, Univerity of Texas, Austin TX 78712.

For membership information contact the Membership Chairman, Kay Allison, 301 East Rosewood, San Antonio, Texas 78212 (512-733-1744).

For use of the STAA Lending Library, contact Anne Fox or Kay Allison at the Archaeology Laboratory, The University of Texas at San Antonio, San Antonio, Texas 78249.

Library of Congress Catalog No. 76-649774.

All articles in *La Tierra* are now summarized in *Abstracts in Anthropology* published by the Baywood Publishing Company.

La Tierra is now printed on acid-free paper.

HOW ANCIENT ARE ANCIENT NORTH AMERICANS?

Was ancient man in North America 20,000 or 30,000 years ago? A widely accepted view of human occupation of the New World is that it is no older than about 12,000 years B.P. This concept has developed over several years of dating of human and animal bone found in association with evidence of man's occupation or activities. In particular, the carbon-14 ages of human fossils from locations which might be considered to be considerably older than 12,000 years, have consistently been well below that time value.

An alternative dating method for determining the age of bone is the slow alteration of amino acids with time. This process is called Amino Acid Racemization and is a natural process which occurs with all protein. One particular amino acid, aspartic acid, has been found to have a very convenient rate of conversion and low potential for contamination. Dates based on Aspartic Acid Racemization (AAR) have been much older than carbon-14 dates for early human fossils in North America. For this reason AAR dates have usually been considered to be erroneous when they do not fit the conventional model of human occupation.

Recently, Accelerator Mass Spectrometry (AMS) has made it possible to measure carbon-14 dates on very small samples. Individual amino acids from bone protein or collagen can be separated and purified for dating. Oudemans and Bonn (1991) have coined the term *Molecular Archaeology* for archaeological studies using molecular species as the basis for the investigation. Using purified amino acids, Stafford et al. (1990, 1991) discovered that non-collagenous protein residues from bone contained impurities which caused carbon-14 dates to be hundreds to thousands of years too young. For those fossil bones which do contain collagen, the AMS dates of purified amino acids were consistent with the known fossil ages. These ages were also generally consistent with AAR ages on the same material.

Unfortunately, accurate Holocene ages for ancient human fossil bone in North America have not been established because those bones which have been examined, until now, are non-collagenous.

This is not the end of the story; it is just the beginning. We can expect additional information from Molecular Archaeology which may require us to reexamine our ideas about human occupation of North America.

Dr. Donald R. Lewis
Associate Editor

References

Oudemans, T. F. M. and J. J. Boon
1991 Molecular Archaeology: Analysis of charred (food) remains from prehistoric pottery by pyrolyses - gas chromatography/mass spectrometry. *Journal of Analytical and Applied Pyrolysis* 20:197-227.

Stafford, Thomas W. Jr., P. E. Hare, L. Currie, A. J. T. Jull and D. Donahue
1990 Accuracy of North American Human Skeleton Ages. *Quaternary Research* 34:111-120.

Stafford, Thomas W. Jr., P. E. Hare, L. Currie, A. J. T. Jull and D. Donahue
1991 Accelerator Radiocarbon Dating at the Molecular Level. *Journal of Archaeological Science* 18:35-72.

NOTES ON SOUTH TEXAS ARCHAEOLOGY: 1991-4

On the Importance of Archaeological Collections

Thomas R. Hester

It may seem to the reader that, based on the title, this is an article that does not need writing. Surely everyone agrees that archaeological collections are "important." What usually results from archaeological work is an archaeological collection of some sort! But it is not just the "scientific" archaeological collections, those from surveys or excavations by professional archaeologists, that have significance. Indeed, many highly important research collections are those made by avocational archaeologists. Even serious or casual collectors, without avocational goals or training, have assembled important sets of materials. My great-great uncle, A. E. Hale of Marble Falls, Texas, was a relic collector. When I was age 9, Mr. Hale passed away, and since he had known I was already picking up projectile points on the family farm in Dimmit County, his collection was "willed" to me. This consisted largely of big frames of dart points arranged in stars and spelling out Texas (replete with Hill Country scenes painted by an itinerant artist). These had no provenience, though mostly from Burnet County, and to this day I still do not know what to do with them. But the collections also included a number of Reservation period specimens that he had been given in years past by E. Dean Dorchester, then of Austin. Only recently have I been able to use the microfilmed records of the Commissioner of Indian Affairs, along with the help of Dave Dorchester (long-time TAS member in Midland), to link these artifacts to the period of 1888-1892. At that time Dr. Daniel Dorchester III was Superintendent of Indian Schools, and traveled by horse, wagon and train more than 89,000 miles to 140 Indian reservations and agencies across the country.

Also, throughout my career, I have been involved in the documentation and publication of private collections. Many professional archaeologists undertake such studies, as do avocationals in the Southern Texas Archaeological Association. Currently, I am working on a very well documented major collection from southern Texas, from Uvalde, Dimmit, Zavala, Maverick and other counties. It has been carefully cataloged over the past 25 years by C. M. Whatley, influenced in large part by his association with Wade House in Carrizo Springs in the late 1960s. Future contributions in this series will involve materials from the Whatley collection. I have also completed analysis of Byron D. Barber's collection from McMullen County, and a large collection from a Webb County ranch awaits me!

At the Texas Archeological Research Laboratory (TARL), we maintain collections from more than 8,000 Texas sites (and records on 45,000). These are not just collections and records from recent professional excavations or surveys, but rather come from a variety of sources -- from university WPA fieldwork in the 1930s and from avocational donations going back to the 1920s. Just recently Norman Flaigg (Austin) has placed his collection of lithics from Coke County (west central Texas) at TARL. This was accompanied by a detailed manuscript describing and documenting the collection. And, as noted in *La Tierra* 18(3), the O. B. Bramblett Collection, mostly from Dimmit County, has been given to the lab and will be valuable for research and teaching.

These kinds of collections, whether from 50 years ago or from more recent accessions, are used continually. Let me cite two brief examples. Christine Ward is doing her master's thesis on the extensive collections -- largely perishables -- from Shelby Brooks Cave in Culberson County. This was excavated in 1934 by A. T. Jackson, and he published only a brief summary on the materials in the 1937 TAS *Bulletin* (Vol. 9). Pamela Headrick has just completed her master's thesis on the large collections from the Kirchmeyer site (41NU11). Much of this information resulted from survey and excavation by Jim Corbin and me, along with Al Wesolowsky, E. H. Schmiedlin and others at the site in 1969. But, an important segment of the TARL collection was donated by Cecil A. Calhoun in the 1960s, including artifacts from a historic Indian feature. Indeed, the collections at TARL, as they are at many labs around the state, see daily use by researchers -- graduate and undergraduate students, professional archaeologists and avocationals carrying out important projects. C. K. Chandler was at TARL recently in search of glass arrowpoints for a paper he has in preparation. Col. Tom Kelly has wrestled with the Lerma typological conundrum using collections at TARL from northeastern Mexico and southern Texas.

Although we are all aware of the value of archaeological collections, my concern here is with the future of such collections -- especially those of avocational archaeologists in South Texas and, indeed, around the state. Many avocationals keep their collections for personal reasons and for ongoing research. The pages of each *La Tierra* reflect the serious research effort being done by avocational archaeologists with either their personal collections or with the documentation of other collections. But what is the ultimate fate of these collections and those held by the casual or untrained collector? If archaeology teaches any lesson, it is that any issue or problem must be restudied and reassessed as new questions or new analytical techniques emerge. While it is absolutely critical that documentation and publication of collections continue in *La Tierra* and other journals, we should also be concerned about where those collections are going to end up, as they will surely have new and important research roles in the future. Once a person no longer has an interest in a collection (by choice or by our shared fate), is it then to be dispersed among family members, perhaps losing its research value? Will we find it on sale at a "flea market," auctioned off at an estate sale or snapped up by the increasing number of commercial collectors? After a person has spent so many years in assembling and documenting a collection, it is a real tragedy -- and one which we have all seen -- to learn that the collection has been disposed of in a way that robs future professional and avocational archaeologists of the data it contains.

It may seem to avocational researchers that museums and universities are bursting at the seams, just housing their own collections. Certainly, I would not deny that we are crowded at TARL. But our lab (and I suspect any other repository) can always find room for collections that have long-term scientific importance, both for research and teaching. No museum or laboratory in Texas can (or should) purchase collections (though tax benefits can accrue to the donor), and none can realistically promise to have the materials always on display. A collection donor should be sure, however, that the repository has serious research goals, that the collection will be used for scholarly purposes, that the collection will be secure, and that the institution is a stable one -- not likely to close down (as have some local or county museums), or change its staff's research orientation away from archaeology.

In closing, let me offer my viewpoint that the mission of the Southern Texas Archaeological Association, or any other serious avocational organization, should include a major concern for the placement of collections -- in addition to training, education, publication, and preservation. "Doing archaeology" today is not enough; we have to ensure that there is a legacy that allows the study of future archaeological problems 50 or 100 years from now.

Documenting your collection, and those of others, and making the necessary provisions for the placement of collections in research-oriented repositories should be goals equivalent to that of publication and site preservation.

AT THE ESCARPMENT'S EDGE: AN INITIAL REPORT ON EXCAVATIONS AT CUEVA CORBIN

Thomas H. Guderjan

ABSTRACT

This is a preliminary report on the small rockshelter of Cueva Corbin located on the borders of Medina and Bexar Counties near San Antonio, Texas. The site is important because of its location at the edge of the Edwards Plateau and the potential it holds for reconstructing past environments as well as human behavior in the region.

INTRODUCTION

This paper is an initial report of the excavation of the small rockshelter of La Cueva Corbin near the Medina and Bexar County border (Figure 1). Study of the materials excavated from the shelter is not yet complete. However, it is appropriate that the excavation and its theoretical context be available to other researchers.

Where San Geronimo Creek leaves the Edwards Plateau and enters the south Texas plains, it cuts a deep gorge several miles long. Within and around the canyon, ancient settlement has been affected by the availability of water, lithic raw materials, access to both environmental regions and a generalized ecotone.

Occupants of the area have always benefitted by its ecotonal setting. In a general sense, an ecotone is where two broad-scale environmental zones join. Characteristically, an ecotone will have greater biological mass and diversity than either of the regions which merge to form it. Ecotones provide very sensitive indicators of climatic shifts as well. Relatively minor shifts can have rather great impacts on pollen in ecotones. Archaeologists have argued that human habitation in ecotones parallels that of biological communities in that populations are larger and settlement patterns are more diverse than in either of the adjacent regions.

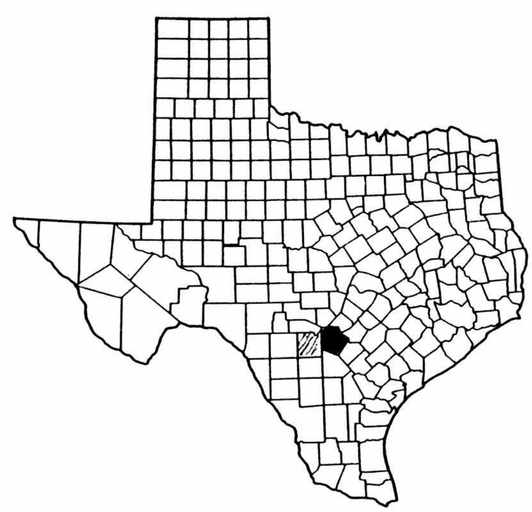


Figure 1. Bexar County (black) and Medina County (striped).

Equally interesting is the "oasis" setting of San Geronimo and other locations along the escarpment's edge. Not only is water more available due to the springs which existed (and in some cases, still exist) along the escarpment, but downcutting of the canyons expose raw materials for the manufacture of stone tools as well. These locations provide plant and water resources which attract other animals to the "oasis." These animals, in turn, are easy prey for human hunters. Though previous investigators have had their theoretical differences, the importance of oases to the early occupants of Texas has been recognized for some time (i.e., Shiner 1983, Johnson and Holliday 1984).

This background, combined with the presence of a number of known sites, led us to choose the San Geronimo drainage as a study area to investigate the nature of prehistoric adaptation to the Edwards Escarpment. This is the first report on those studies. Additionally, the canyon and its immediate vicinity have now been surveyed by the Texas Highway Department (McGraw, personal communication) and STAA members (Kuykendahl, ms.)

CUEVA CORBIN

The site of La Cueva Corbin was discovered by Kit Corbin of San Antonio while looking for an appropriate unexcavated site, similar in nature to Scorpion Cave. Scorpion Cave had been excavated by a group of avocational archaeologists. While a report of the materials excavated has been published by Lynn Highley and the excavators (Highley et al. 1978), it is clear that a more professional excavation would have yielded considerably more information. When Corbin located the shelter, parts of it had already been damaged by looting. Furthermore, the imminent construction of State Highway 211 near the shelter made long-term protection nearly impossible.

The shelter is quite small with a floor area of less than 20 square meters. Much of the floor is gently sloping bedrock and retained no artifactual material or fill. Today the shelter is largely open to the canyon. However, in the past it had only a small entrance. Since the deposition of archaeological materials occurred, a large piece of the wall separating the shelter from the canyon has fallen into the shelter. This has further restricted the amount of the shelter deposits which can be safely investigated.

Cueva Corbin was excavated in October 1989 by a team organized by the author. Digging was limited to approximately three square meters which had remained intact between the two large looter's pits (Figure 2). While the primary goal of the work was to mitigate the impacts of looting before the site was entirely destroyed, we also had other specific goals. First, we wanted to obtain biological data which could be used to develop a chronology of climatic shifts in the ecotone. Such a chronology could then be related to changes in human adaptation as seen from the survey and related excavations. Such information would come in the form of pollen, macrobotanical and faunal remains. Secondly, we hoped to develop a cultural baseline for the study area. In the looters' backdirt we found numerous large pieces of lithic debitage. As we excavated, it became obvious that these had all originated from the same level and, perhaps, resulted from a single stone knapping event. The opportunity to obtain a detailed view of the stone technology through core reconstruction seemed to be in our hands.

STRATIGRAPHY

Thirteen distinct strata were present, seven of which were occupational layers. At this time, radiocarbon dates and pollen sample have not yet been processed; therefore, chronological control and environmental data are not yet available. These will be reported later when the tests are completed. Figure 3 shows a profile of Unit 1 which includes portions of each stratum. The strata are numbered 1-13 with the numbers increasing with depth. Occupational layers are denoted with an alphabetic designation following the number. Therefore, Stratum 5C is the fifth layer below the surface and the third occupational layer.

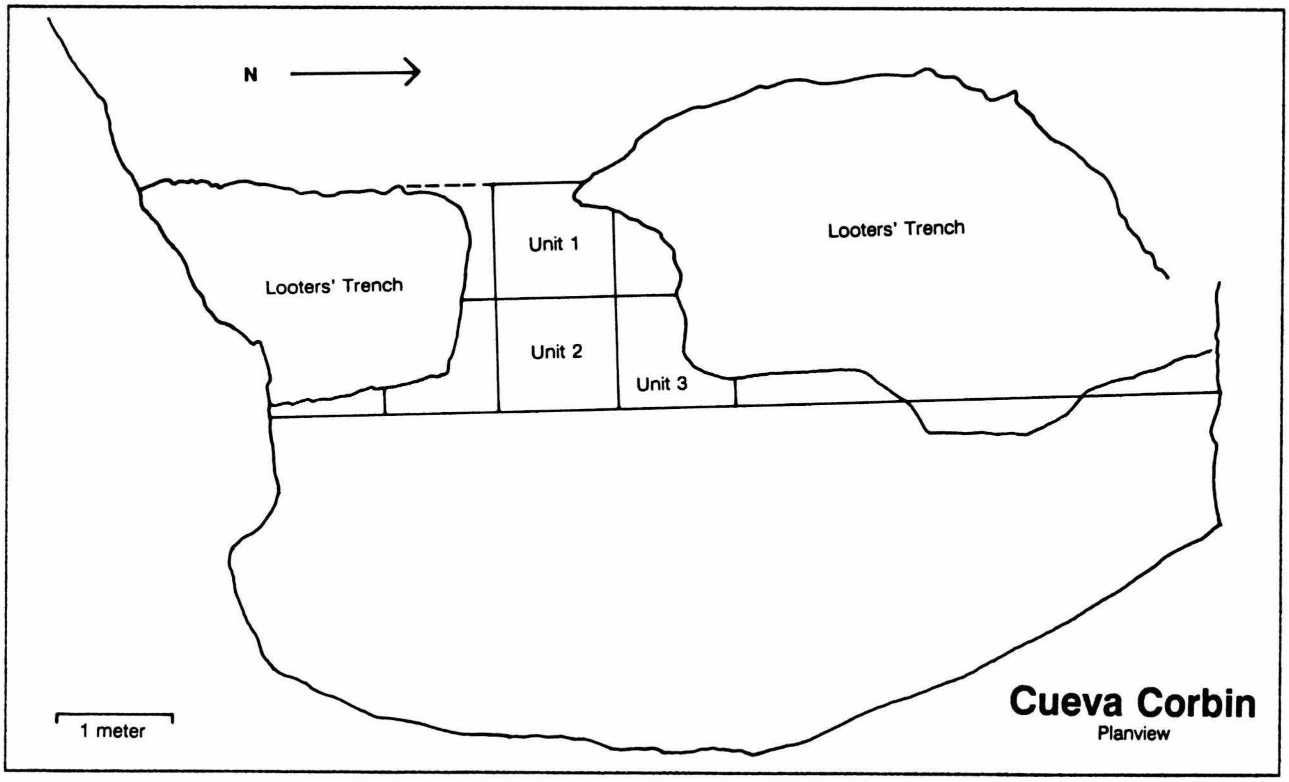


Figure 2. Planview of Cueva Corbin, near San Antonio, Texas.

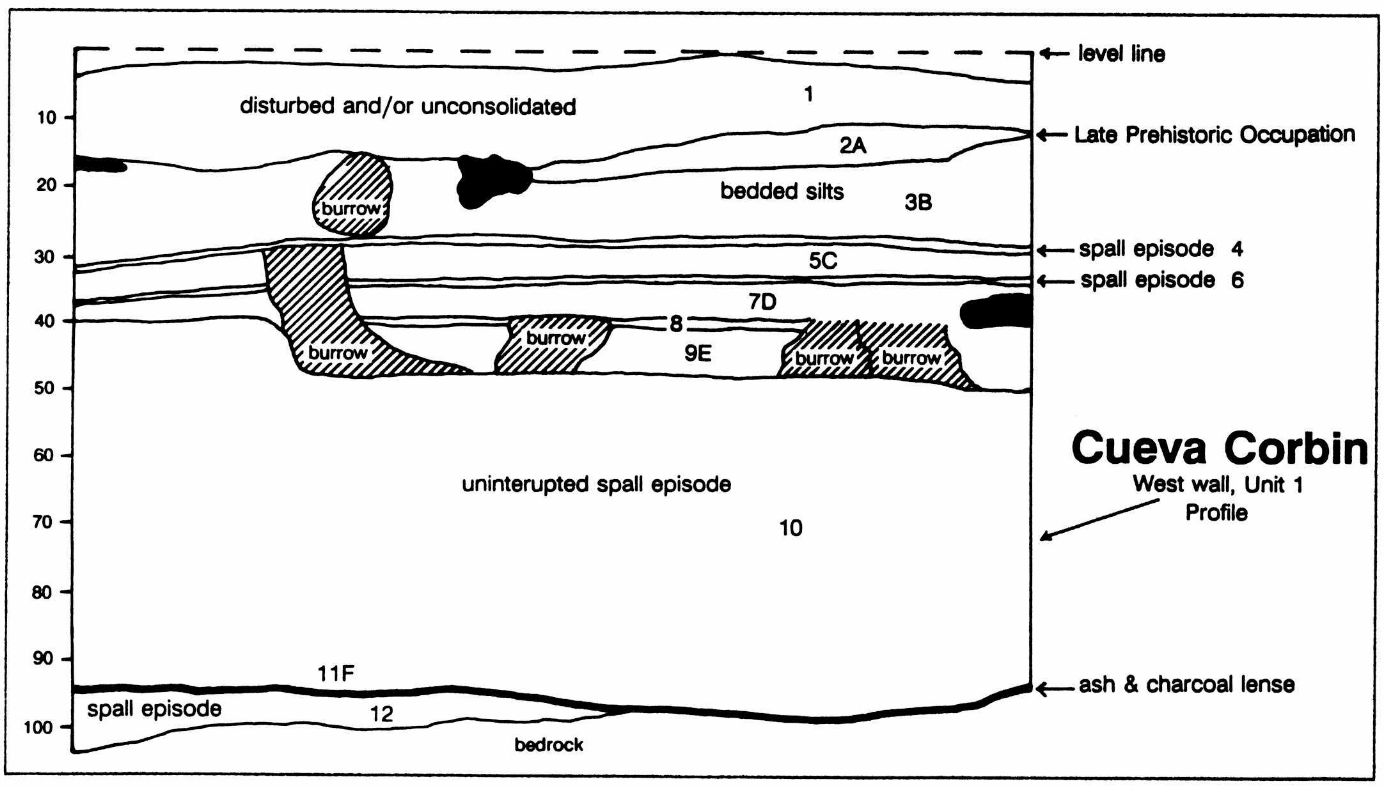


Figure 3. Cueva Corbin, Profile, Unit 1.

Stratum 1 consists of loose, unconsolidated and disturbed material. Like all but one of the other occupational layers, Stratum 1 is a mixture of particulate roof-fall and ash. While some artifacts were recovered from this stratum, they were obviously mixed with looters' backdirt and recent historic artifacts.

Stratum 2A is the most recent certain occupational layer. A Perdiz point was recovered indicating a date in the 1200-1500 A.D. range (Turner and Hester 1985). This layer was composed of particulate roof-fall, ash and other occupational debris.

Stratum 3B marks an important sequence of events in an environmental sense. The stratum is composed of bedded alluvial silts which represent an enormously increased flow in the San Geronimo drainage which has not occurred since or, within the bounds of our information, before. Water in the canyon reached the height of the shelter entrance. This water then intruded into the shelter, flooding it and leaving behind silts which were originally swept into the canyon by the flood waters. While artifacts were recovered from this stratum, they may have been redeposited from elsewhere in the cave. The repetition reflected in the bedded silts would seem to indicate that this flooding reoccurred several times.

Stratum 4 reflects a spalling episode during which time the cave was unoccupied and spalls from the ceiling sealed all previous deposits. No carbon was recovered from any of the spalling events. However, pollen samples were. We cannot assume that spalling occurred at a consistent rate or that the thickness of the spalling episode strata are related to the amount of time elapsed between occupations.

Stratum 5C is a very thin occupational layer composed of ash, particulate roof-fall and cultural debris. In this layer and in looters' backdirt, we recovered evidence of a stone knapping event which will be discussed later. Again, until radiocarbon assays are completed, we cannot assign a chronological date to this layer.

Stratum 6 is another spalling episode which seals all previous deposits.

Stratum 7D is a thin occupational layer composed of particulate roof-fall, ash and other cultural debris. Again, no date can be assigned at this time.

Stratum 8 is another spalling episode.

Stratum 9E is another thin, undated occupational layer which is composed of particulate roof-fall, ash and cultural debris.

Stratum 10 is a major, uninterrupted spalling episode, 45-55 cm thick. This appears to either mark a long, continuous period of the cave's history during which it was unoccupied, or dramatically different environmental conditions.

Stratum 11F is a very thin, almost technically untraceable occupational layer.

Stratum 12 is the basal spalling episode.

Stratum 13G was present only in Unit 2. It may be a distinct occupation, perhaps below Stratum 12, a discontinuous portion of Stratum 11F, or a rodent burrow of unknown origin.

STRATUM 5C STONE KNAPPING EVENT

From the looters' backdirt, we recovered a number of large flakes and other residue of core reduction. As we began the excavation, we could not find similar materials until we reached Stratum 5C. Furthermore, no other such materials appeared in any other location of the excavation. In Units 1 and 3, Stratum 5C is seen as a thin deposit on top of a spalling episode. Large lithic debitage lies conformably with the Stratum 6/5C surface in one or two courses.

By grouping the 30 artifacts from Units 1 and 3 with the 87 artifacts found in the looters' backdirt of the same materials, we were able to obtain a relatively clear picture of the behavior involved with the knapping event. Table 1 summarizes the artifacts which were recovered.

TABLE 1. Artifacts Associated with Stratum 5C Knapping Event.

Typological definitions are as follows (from Guderjan 1981)

Flake - tertiary flakes with 0-30% cortex
2nd - secondary flakes with 30-90% cortex
Primary - 90-100% cortex
BTF - biface thinning flake
CTE - core trimming element

	Surface				
	Brown	Black	Gray*	Unit 1:4	Unit 3:5C
Core			4	1	1
Flake	6**	1	35	2	11
2nd	4***		24	3	6
Primary			3	1	4
BTF	1		3		
Debris	1		6	1	
Tool	1**				
CTE			4		
Totals	13	1	79	8	22

* Includes material from at least 3 cores
** Flake tool included in both categories
*** Includes 4 flakes which were refitted.

Several observations are of interest. First, when we initially recovered the materials (and, not incidentally, when they were covered with dirt), we thought that we might be able to reconstruct the core in order to conduct a detailed analysis of the lithic reduction strategy. Careful examination and attempted refitting, however, showed that several cores were involved and that many of the flakes were missing. Furthermore, those which were left behind were unutilized with one exception, that being a flake which had its distal end snapped off. This was then retouched on the distal end and right lateral edge juncture. Both the flake tool and the distal end were recovered. Further strengthening the association between the surface materials and the in situ materials was the refitting of a surface flake with a flake from Unit 3. The centrum of the knapping activity seems to have been just to the north of Unit 2 where the looters' trench destroyed intact deposits. There was a marked decrease in density as we proceeded east and south of that point.

Consequently, we can argue that the knapping event did, indeed, occur as a single event. Lacking a large number of primary flakes in the collection, we can further argue that initial reduction or "core testing" occurred outside of the shelter. Then, after the cores had been fully reduced, the most usable flakes were removed to another location. The anomaly of the single flake tool is almost the exception which proves the rule.

CONCLUSION

The most important information to come from Cueva Corbin will be the environmental information which will result from analyses and correlation of geoarchaeological data, such as the flooding event and spalling episodes, with palynological and radiocarbon data. This will be correlated further with regional geoarchaeological studies and will serve as a baseline for further interpretation of the remains in the San Geronimo drainage. As these data are assembled, they will be published separately.

ACKNOWLEDGEMENTS

The Cueva Corbin excavation was conducted under the auspices of the University of Texas Institute of Texan Cultures at San Antonio. Many thanks are due to Kit Corbin and the 1989 excavation team. On behalf of the team, I wish to thank the management of the Sitting Duck in Rio Medina for their very supportive contributions.

References Cited

Guderjan, Thomas H.
1981 *Archaeological Investigations in the Big Rock/Forest Grove Areas, North-Central Texas*. Archaeology Research Program, Southern Methodist University, Dallas, Texas.

Highley, Lynn, Carol Graves, Carol Land and George Judson
1978 Archeological Investigations at Scorpion Cave (41ME7), Medina County, Texas. *Bulletin of the Texas Archeological Society* 49:139-195.

Johnson, Eileen and Vance T. Holliday
1984 Comments on "Large Springs and Early American Indians" by Joel L. Shiner. *Plains Anthropologist* 29:65-70.

Kuykendahl, Mark
ms. Archaeological Survey of the San Geronimo drainage. Manuscript on file, Department of Research and Collections, University of Texas Institute of Texan Cultures at San Antonio.

Shiner, Joel L.
1983 Large Springs and Early American Indians. *Plains Anthropologist* 28:1-7.

Turner, Ellen Sue and Thomas R. Hester
1985 *A Field Guide to Stone Artifacts of Texas Indians*. Texas Monthly Press, Austin.

FIRED CLAY FIGURINES FROM McMULLEN AND NUECES COUNTIES, SOUTH-CENTRAL TEXAS

C. K. Chandler, Kay Hindes and Edward R. Mokry, Jr.

ABSTRACT

Two fired clay figurines from south-central Texas, are documented and illustrated. One specimen appears to be from the Late Prehistoric Rockport time period and the other may be more recent.

THE ARTIFACTS

Specimen 1 is the torso of a fired clay figurine which was found on the surface of a large midden site along the Nueces River in central McMullen County in south central Texas (Figure 1). One Scallorn point and one potsherd were also recovered from this site but they can not be considered directly associated with the figurine. The figurine (Figure 2) originally had head, arms and legs, which are now missing. It is rather barrel-chested with a constricted waist and prominent buttocks. It has no definite indication of sex but is believed to be a male figure. Bosoms are often present on clay figurines as an indication of a female but these features are not present on this specimen. There is some evidence that there may have been a male organ intended but this is not sufficiently developed to identify it as a male figure.

The constricted waist is accentuated by pinching the sides inward between the fingers. There are two to three fingernail marks on each side much like fingernail punctates found on many Caddoan pottery vessels; however, these marks are rather small for an adult fingernail. The barrel-chested front is smoothed but not polished. The back is a little irregular and has a flat area toward the left side as if it was laid on a flat surface while it was still plastic. It is of medium tan color and the interior paste is light gray grading to tan nearer the surface. The paste is very sandy with coarse grains tending to concentrate near the surface. Most of these are reddish to brown with an occasional clear angular piece. Numerous tiny black inclusions are found throughout the paste. These have the appearance of finely ground black pepper and have not been identified. Finely ground bone particles are common in South Texas fired clay vessels, but no bone has been found in this figurine.

Present measurements are: Length, 41.5 mm; Width, 33.6 mm across shoulders, and 19 mm at the waist. It is 19 mm thick through the chest and weighs 21.4 grams.

On the top of each shoulder and each hip there is a large circular scar that appears to be where this figurine was attached to some other object. There is no evidence to indicate what this might have been.

The one potsherd recovered from this site is rather thin (5 mm). It has a light creamy-tan slip on both interior and exterior surfaces. The

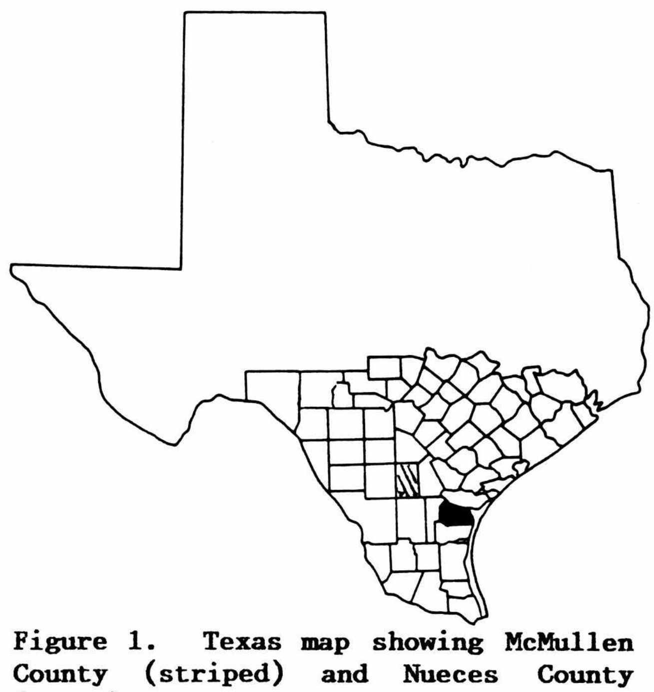


Figure 1. Texas map showing McMullen County (striped) and Nueces County (black).

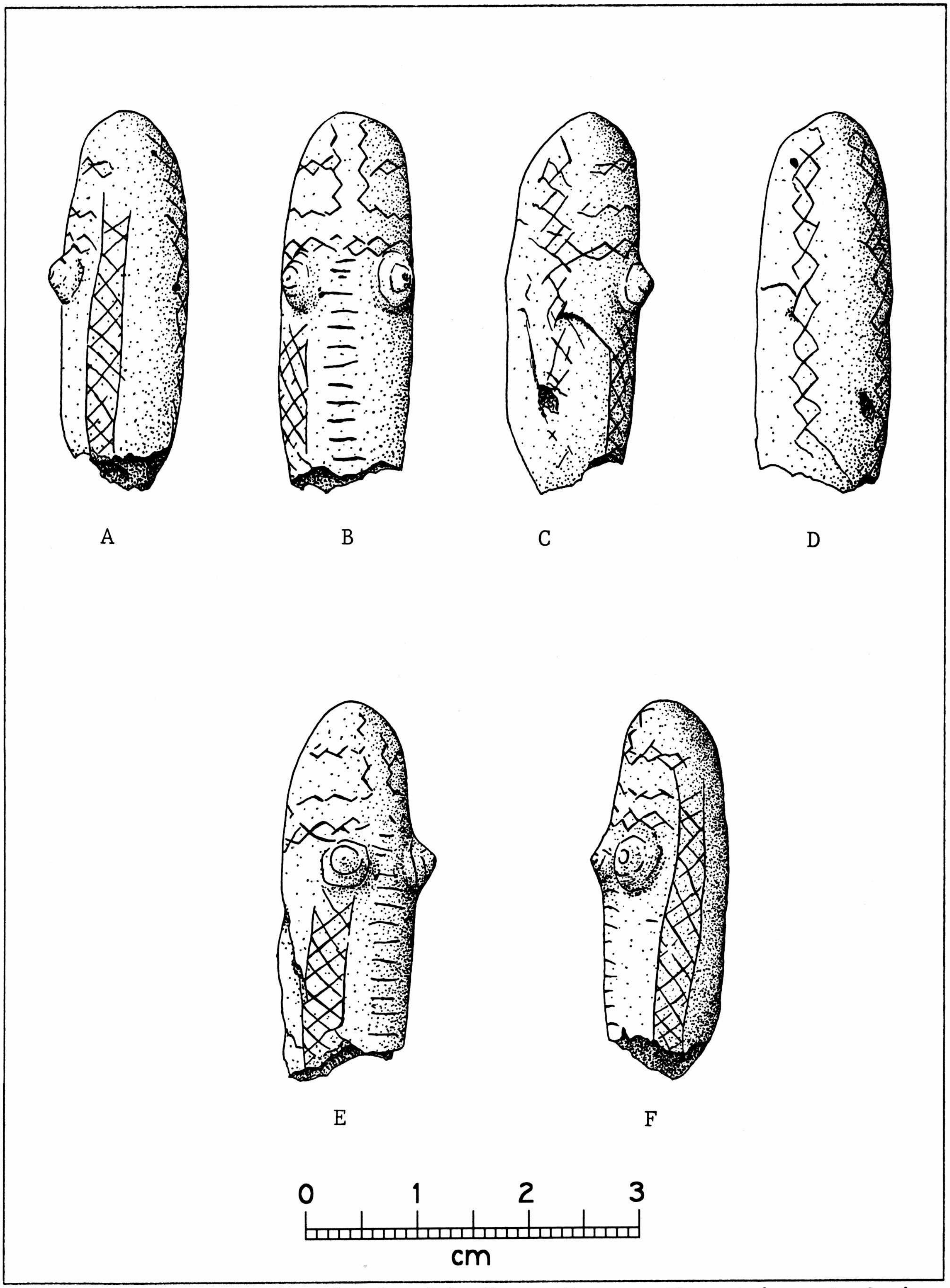


Figure 3. Fired clay figurine found in Nueces County. Shown twice actual size. A, left side; B, front; C right side; D, back; E, right front; F, left front.

slip on the exterior has some erosion but the interior appears to be reasonably intact. The interior paste is light to medium gray with numerous very angular black inclusions up to 1.5 mm maximum width. This black material is also layered. There is considerable sand in the paste and some of this is clear and very angular. Bone is present in very small quantities; only three fragments are visible and they are up to 1.5 mm maximum size. Under low power magnification tiny black to gray angular pieces are visible protruding through the slip along with many sand grains; however, the surface does not feel sandy. The larger black inclusions in this sherd are believed to be lignite, though efforts to confirm this have not been successful. Several testing laboratories were contacted and all of these said they did not have the capability to tell the difference between lignite and wood charcoal.

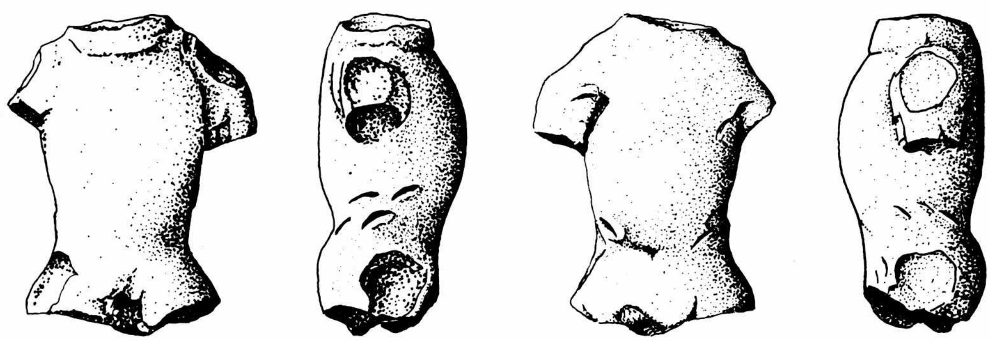


Figure 2. Fired clay figurine from a surface site on the Nueces River in central McMullen County. A, front; B, right side; C, back; D, left side.

Specimen 2, (Figure 3) is an unusually small, cylindrically shaped anthropomorphic female figurine. It is well fired and is made of a medium to light tan sandy clay with a few clear quartz sand grains. The light tan surface color continues throughout the interior paste. There is no evidence of a tempering agent. The entire body surface has an elaborate incised design that was applied while the clay was still relatively soft. The protruding breasts are highlighted by concentric circles. There is a vertical row of short horizontal lines centered on the front and extending to the top of the breasts. There are two vertical panels of bordered crosshatched lines. One panel is on the left side and extends about two-thirds the length of the specimen, terminating above the left breast. The other panel is located below the right breast and extends from the breast to the broken portion of the lower body. There are vertical rows of connected diamonds on the back that extend full length. On the front just above the breasts there is a horizontal row of connected diamonds. There are two single zigzag lines above and parallel to the diamonds that corner and become parallel extending to the top of the specimen. About midway of the vertical lines there are three horizontal diamonds on a short row on each side. These diamond shapes are formed by the crossing of zigzag lines.

This figurine is 32 mm long, 11 mm in diameter and weighs 4.9 grams. Because of its small size and intricate decoration it is illustrated (Figure 3) at twice its natural size.

This figurine is from an open occupation site (41NU164) located on cultivated farmland near the confluence of Oso and La Volla Creeks in east central Nueces County and was found by Ed Mokry in May, 1984.

There is considerable evidence of a long-term occupation at this site in the form of land snail shells, marine shell, baked clay nodules, bone fragments, lithic debris and lithic artifacts, bone and shell artifacts, potsherds and the small clay figurine reported here.

DISCUSSION

In broad terms, human clay figurines are quite widespread. They appear very early in Mexico and are fairly common in the American Southwest and eastern United States as early as 1 A.D. However they are comparatively scarce in Texas. The Huastecan area of the eastern coast of Mexico is fairly rich in figurines and the Huastecan influence does extend up the Gulf Coast to at least the Rio Grande Delta, and possibly as far north as Baffin Bay.

Three fired clay figurines have been previously reported from South Texas (Chandler 1978, 1990) but they, and the figurines reported here, do not closely match the Huastecan figurines personally examined or seen illustrated. The latter are, in general, more elaborate in anatomical detail and dress. Also, later Huastecan figurines are mold-made. While the specimens reported here are unlike the Huastecan figurines, the idea for making them may have derived from that region.

George C. Martin (1929) was probably the first to report the presence of clay figurines in South Texas when he reported two specimens from a site on Copano Bay, and a third specimen from Baffin Bay. The specimen from San Patricio County and the one from Live Oak County (Chandler 1978) increased the known number of these artifacts in the south and coastal areas of Texas. The Live Oak County specimen had a head and limbs that were missing when found, as does the McMullen County specimen reported here. These are the only specimens known from South Texas that have these features. Hudgins (1986) reports a ceramic figurine from a historic Indian site in Wharton County. It has a head but no limbs. The Wharton County and San Patricio County specimens are the only ones previously reported as having body decoration. The Wharton County specimen is assumed to have been fired, but this is not stated in the report. The specimen from Nueces County (Figure 3) has extensive decoration and is unusually small.

Unfired specimens are known from the Lower Pecos (Schuetz 1960; Shafer 1975) and from the Big Bend (Hilton 1986). All of these are unlike the known fired clay figurines. The Lower Pecos specimens are basically cigar shaped with pointed ends (Shafer 1975). There are a number of fragments of fired clay objects known from several South Texas locations that are round and cigar shaped with appearances similar to the unfired specimens from the Lower Pecos. One specimen from 41SP68 is round and tapered with a truncated end. It is completely smooth and without decoration. It is hard, compact and well fired and has the appearance of a figurine. There is a smaller one from 41JW8 with decoration. Five specimens from 41MC296 are all cylindrical in form. One has a blunt pointed end, one has a pinched rounded end, one has a pinched truncated end, and two have decoration. All of these are considered to be fragments of figurines or appendages.

SUMMARY

The large number of potsherds from 41NU164 are mostly of Rockport ware, including Rockport Plain, Rockport Incised and Rockport Black-on-Gray. However, several sherds that appear to be Leon Plain have distinctive inclusions of bone tempering. Some of these are coated with black asphaltum. Bone temper does occasionally occur in Rockport Plain (Suhm and Jelks 1962). The total assemblage of cultural materials from this site does establish it as a Rockport Focus site with a probable time period within the Late Prehistoric. While the surface and interior paste color and texture of this figurine does not closely identify with the other ceramics from this site, it is believed to be within the same cultural identity and time frame.

The well-defined body proportions and shape of the McMullen County figurine have not been observed in other known figurines from South Texas, and this alone may indicate it is of more recent origin. Its color and paste characteristics are more like Leon Plain ceramics, but it does not have bone temper that is so common in Leon Plain wares.

The one sherd from this site does have bone inclusions and the surfaces have a light slip coating. This sherd fits well within the Leon Plain description (as defined by Suhm and Jelks 1962) but it can not be definitely stated that it has any association with the figurine.

The beginning date for both Rockport and Leon Plain ceramics is not well established but is considered to be prehistoric. Rockport ceramics continued well into the 18th Century but Leon Plain ware is not known to have been manufactured in historic times.

There is insufficient evidence to assign a time period or cultural identity to the McMullen figurine but it is believed to be within the Late Prehistoric or Early Historic time frame.

ACKNOWLEDGEMENT

The authors wish to thank Richard McReynolds for his excellent drawings of the artifacts shown in Figures 2 and 3.

References Cited

Chandler, C. K.

1978 Two Clay Figurines from the Central Coastal Region of Texas. *Bulletin of the Texas Archeological Society* 49:341-348.

1990 A Fired Clay Figurine from Bexar County, South Central Texas. *La Tierra* 17(4).

Hilton, Evelyn Gill

1986 Survey of Texas Big Bend's Prehistoric Indians: Circa A.D. 100-1500. *The Artifact* 24(4). El Paso Archeological Society.

Hudgins, Joe D.

1986 A Historic Indian Site in Wharton County, Texas. *Bulletin of the Texas Archeological Society* 55:29-51. (Vol. 55 for 1984)

Martin, George C.

1929 Preliminary Archeological Survey of a Portion of the Texas Coast. Made by George C. Martin and Wendell H. Potter in 1927, 1928, 1929. Privately printed.

Schuetz, Mardith K.

1961 An Analysis of Val Verde County Cave Material: Part II. *Bulletin of the Texas Archeological Society* 31:203. (Vol. 31 for 1960)

Shafer, Harry J.

1975 Clay Figurines from the Lower Pecos Region, Texas. *American Antiquity* 40(2):148-158.

Suhm, D. A. and E. B. Jelks

1962 Handbook of Texas Archeology: Type Descriptions. *Texas Archeological Society Special Publication No. 2* and *Texas Memorial Museum Bulletin No. 4*.

MODIFIED BONE AND ANTLER FROM THE ALABONSON ROAD SITE (41HR273) HARRIS COUNTY, TEXAS

Barry W. Baker and Brian S. Shaffer

ABSTRACT

The bone tool assemblage recovered during 1987 and 1988 excavations at the Alabonson Road site (41HR273) includes seventeen worked elements and one additional possible bone tool. Artifacts include seven perforated turtle shell fragments, two incised bones, a spatulate bone tool, the proximal stock remnant of a bone fishhook, an awl tip, four unidentified worked bones, and a modified antler tine. Cultural activities reflected by the artifacts include ornamentation use, fishing, and possible hunting and skinning.

INTRODUCTION

Excavations in 1987 and 1988 at the Alabonson Road Site (41HR273), located on the east bank of White Oak Bayou in northwest Houston (Figure 1), yielded over 128,000 complete and fragmented vertebrate specimens (Ensor and Carlson 1989). Seventeen of the elements have been worked (Table 1). A preliminary analysis of these artifacts was reported by Baker et al. (1989), with a more detailed discussion being provided here.

The Alabonson Road Site represents an Early Ceramic occupation with an associated Late Ceramic component (Ensor and Carlson 1989). Sixteen of the bone artifacts were recovered from Zone 3, the Early Ceramic midden zone of the site. In addition, one specimen was found in the largely culturally sterile matrix (Zone 4) that was located below the site midden. Radiocarbon samples from wood/charcoal recovered from Zone 3 produced dates of 1280±70 B.P. (radiocarbon years) (Beta 27535); 1330±70 B.P. (Beta 27535); 1400±90 B.P. (Beta 27536); and 1401±90 B.P. (Beta 27536). Thus, dates for the bone artifacts from Zone 3 range from 1491-1210 B.P.

The worked bone from Zone 4 probably originated in Zone 3, having been removed from primary context by turbation processes (H. Blaine Ensor, personal communication 1990). This is based on the identification of possible roasting pits of cultural origin that had apparently intruded into lower levels of Zone 3. It appears then that prehistoric cultural disturbance may have been responsible for this movement. The bone artifact from Zone 4 probably dates to 1491-1210 B.P. as well.

The majority of the tools were from arbitrary elevations between 99.25 m and 99.55 m. The highest concentration of vertebrate faunal remains from the Zone 3 midden was also noted from this elevation range. The types of worked elements recovered include seven specimens that are drilled or perforated, two that are incised, a spatulate bone tool, the proximal stock remnant of a bone fishhook, an awl tip, four unidentified worked bones, and a modified antler tine. An additional bone that may have been worked and used as a tool is also described.

ARTIFACT DESCRIPTIONS

Drilled / Perforated Bone

All of the perforated bones from the site are turtle shell elements (Figure 2) and were recovered from Block II, Zone 3 (Table 1). Six of the elements contain one hole each, with the seventh (Figure 2,A) containing two. Such holes

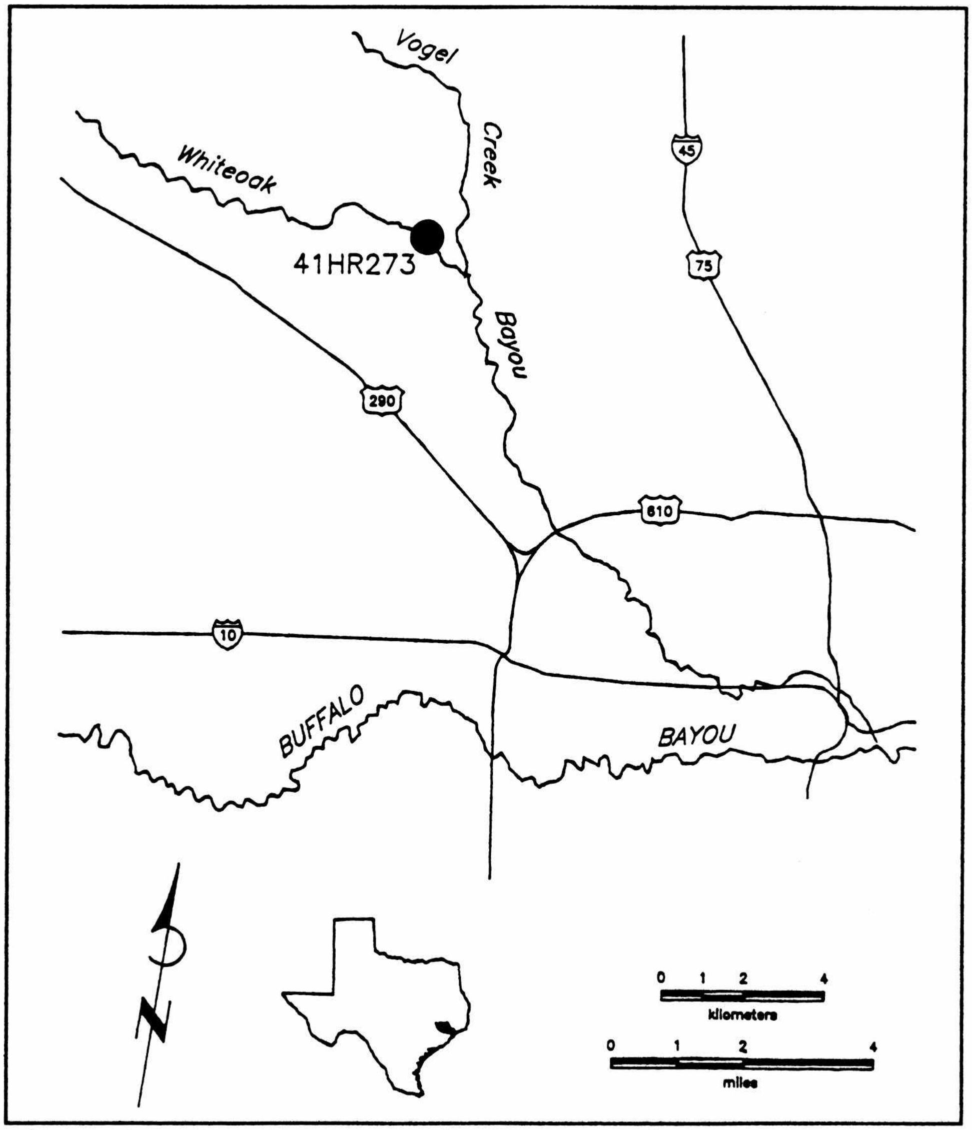


Figure 1. Alabonson Road Site map, Harris County, Texas.

do not occur naturally on turtle shells, nor do they appear to have resulted from organismic boring or root action. Three of these shell fragments (Figures 2,A, 2,B, 2,C) are carapace peripherals of unidentified species of turtle. A carapace pleural (Figure 2,D) was also perforated. The three remaining drilled specimens (Figures 2,E, 2,F, 2,G) are of unidentified turtle shell fragments.

Interpreting the function of the perforated elements is problematic, though Parmalee et al. (1972:30) suggested that similar drilled turtle shell elements from a Woodland site in Illinois may have served as pendants or ornaments, or were strung together to make a rattle. It is interesting to note that three of the seven specimens were recovered from the same elevation (99.35 m) and recording unit (N108/W016), suggesting they may have been associated with one another. This lends further support to the idea that they may have served one of the functions mentioned by Parmalee et al. (ibid.:30).

Incised Bone

Two of the specimens from the bone artifact assemblage are incised. Both are medium to large mammal long bone fragments. One of the bones (Figure 2,H)

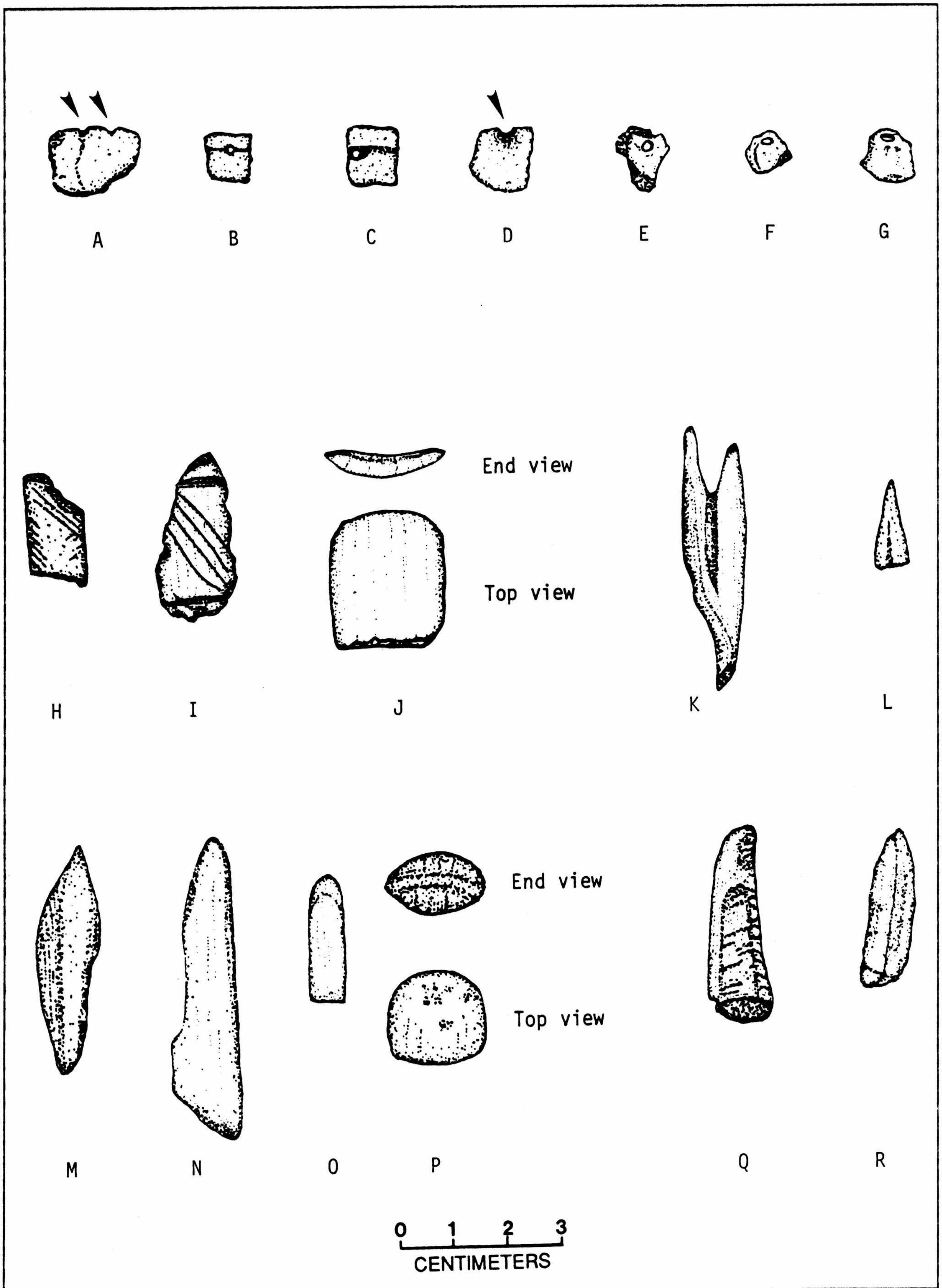


Figure 2. Bone and Antler Artifacts (drawn to scale).

Table 1. Bone and Antler Artifacts from the Alabonson Road Site (41HR273).

Fig	Blk	Z	Unit	Qd	Lvl	Elev	Taxon	Element	Description
2a	II	3	N106W104	SE	7	99.35	Testudinata	Peripheral	Drilled
2b	II	3	N108W106	NE	8	99.35	Testudinata	Peripheral	Drilled
2c	II	3	N108W106	NW	10	99.25	Testudinata	Peripheral	Drilled
2d	II	3	N108W106	SE	8	99.35	Testudinata	Pleural	Drilled
2e	II	3	N108W106	SE	8	99.35	Testudinata	Shell fragment	Drilled
2f	II	3	N110W104	SW	8	99.40	Testudinata	Shell fragment	Drilled
2g	II	3	N104W104	NW	7	99.35	Testudinata	Shell fragment	Drilled
2h	II	3	N110W106	SE	8	99.35	Mammalia	Long bone	Incised
2i	II	3	N108W106	NE	4	99.55	Mammalia	Long bone	Incised
2j	II	4	N108W104	SW	1	99.15	Mammalia	Long bone	Spatulate tool
2k	II	3	N108W106	NE	9	99.30	Mammalia	Long bone	Fish hook
2l	I	3	N106W102	SW	1	99.65	Mammalia	Bone	Bone awl tip
2m	II	3	N108W106	SW	8	99.40	Mammalia	Bone	Bone point?
2n	II	3	N108W106	NE	9	99.30	Mammalia	Bone	Worked bone
2o	II	3	N108W104	NW	4	99.55	Vertebrata	Bone	Worked bone
2p	II	3	N110W104	SW	8	99.40	Mammalia	Bone	Ground bone
2q	II	3	N104W104	NE	6	99.40	Vertebrata	Bone	Worked bone?
2r	II	3	N106W104	NW	6	99.40	*Odocoileus*	Antler tip	Cut and polish

Fig=Figure, Blk=Block, Z=Zone, Qd=Quad, Lvl=Level, Elev=Elevation exhibits nine diagonal incisions on its exterior surface, while the second specimen (Figure 2,I) possesses four exterior diagonal cuts bordered within two transverse incisions. The artifacts are too small and fragmented to identify the elements they represent, or to interpret their function. Similar patterns have been documented on bone awls from Allens Creek (Hall 1981).

Spatulate Bone Tool

Illustrated in Figure 2,J is a modified large mammal long bone fragment. If complete, this tool probably would have been rectangular. The bone exhibits signs of wear on three edges, with the fourth edge having broken in a dry fracture. The shape of the tool is concavo-convex. The end opposite the breakage broadens slightly. This tool measures 2.1 cm at its widest point and 2.0 cm at its most narrow. It has a thickness of 0.5 cm. Wear is evident on both the concave and convex sides, with fine striations having their highest concentration on the margins of the convex surface and the concave end opposite the end of breakage. Polish is most evident on the distal convex surface.

This tool compares favorably with specimens from 41VT66 in Victoria County, and 41LK201 in Live Oak County, Texas (Huebner 1987). Huebner has interpreted such specimens as skinning or fleshing tools, and has proposed that the term "spatulate bone tool" be used in their description. Additional references for similar tools not reviewed by Huebner include Aten (1983:258-263) and Hall (1981:66, 225).

Fishhook Proximal Stock Remnant

While no fishhooks were identified from the site, the refuse from the manufacture of one hook was found (Figure 2,K). The specimen is a mammal long bone fragment that is spirally fractured on one end, with two worked prongs at the other end. Cut marks are present on one of these prongs, being the point where the hook would have been removed. A deep groove exists just above the juncture of the two prongs. An almost identical specimen from Horn Shelter 2 in Bosque County, with the hook retained, is illustrated by Redder (1985:57, Figure 8,f, Figure 11). The term "proximal stock remnant" is taken from Redder (ibid.:55) to describe this artifact. See Redder (ibid.:55-61) for a detailed discussion of the nomenclature and manufacturing technique associated with fishhooks of this type.

In his discussion of the fishhooks from Horn Shelter 2, Redder (1985:55; 56 Figure 7) identified a lithic assemblage from the site that he felt was used to make these bone artifacts. His description of these flakes is provided below.

> "After much discussion with Watt and analysis of used flakes, a pattern began to emerge. Certain flakes that were triangular in form, with a used edge generally along one side, had on this edge near the small end a notch. This notch varied from 1/8 in. across to slightly larger and from shallow to as deep as the width. Theoretically, these tools would work admirably, rounding out the inside portion of the hook as well as shaping up the outside and freeing the point.... Utilized flake material from other sites having a fishhook component need to be analyzed to see if this type of tool is present, and the assemblage checked against sites not having fishhooks."

Analysis of the lithics from the Alabonson Road Site produced no evidence of flakes similar to those described by Redder. Redder's description is provided here to reiterate the potential importance of these flakes to researchers who may be analyzing similar assemblages.

Identifiable fish from Alabonson Road include three catfish elements (Order *Siluriformes*), and 27 gar (Family *Lepisosteidae*) scales and vertebrae. Fish of this size could have been caught with hooks. Of the 459 osteichthyean vertebral centra from the site, 434 (94.6%) are minnow-sized elements that were recovered through fine screening. These fish would have been too small to have been caught with hooks, suggesting that they may have been captured with nets, or represent the stomach remains from larger fish or other predators. Their presence may suggest a second method of fish exploitation used by the inhabitants of the site, though no archaeological evidence of nets or additional fishing tackle was found at Alabonson Road.

Long Bone Implement Tip

The tip of a probable bone awl is shown in Figure 2,L. It was recovered from the heavy flotation fraction of 1/16" screening, emphasizing the role that fine screening can play in the recovery of bone artifacts. The artifact is highly polished and shows numerous parallel wear striations on both sides of the tool.

Unidentified Worked Bone

Four of the bone tools are of unidentified type and function. The artifact illustrated in Figure 2,M is made from a medium to large mammal bone fragment. The specimen tapers on both ends, with a fair amount of polish being present on the pointed tip. Polish is also evident on one of the tapering edges, suggesting that its shape was not simply the result of recent breakage. The length and width of the tool are 4.1 cm and 1.2 cm, respectively. It is possible that the tool served as a bone projectile point. The double tapering of the tool compares favorably with specimens from the southeastern United States identified by Fundaburk and Foreman (1957:Plate 152) as projectile points. In addition, Aten (1983:258, Figure 13.3,f) illustrated a double tapering bone tool from the upper Texas coast that he identified as a bone projectile point. The degraded nature of the Alabonson Road specimen makes a positive identification impossible.

Additional unidentified tools are shown in Figures 2,N and 2,O. The first, from a medium to large mammal bone fragment, is spirally fractured and has been worked to a rounded tip on one end. Polish and wear striations are present on the tip. The second tool (Figure 2,O) has a moderately worn tip and exhibits numerous parallel wear striations around the margins of the tool. The function of these tools is unclear.

A final unidentified specimen is a ground fragmented portion of medium to large mammal bone (Figure 2,P). The bone is degraded and burned, thus masking any wear or polish that may have been present. The tool is relatively thick compared to other bone artifacts from the site, measuring 1.1 cm at its thickest point.

Antler Tips

Twenty-six deer (*Odocoileus* sp.) antler tips (not pictured) were recovered from Block II, Zone 3. All specimens were from elevations between 99.25 m and 99.55 m. Each antler tip was examined with a 10X hand lens to determine if evidence suggestive of pressure flaking could be identified. No positive wear of this nature was observed. The majority of the antler tips was heavily weathered.

Some antlers did exhibit signs of degradation on the tip of the tines, though this could have been the result of rutting behavior and does not necessarily represent human modification. One antler tip (Figure 2,Q) was identified as having been cut or scraped to form two relatively flat surfaces on the specimen. This modification does not appear to us to have resulted from rodent gnawing. Slight polish and a small wear facet are present on the tip of the element, though as noted above, this could be the result of non-cultural modification. Similarly, Aten (1983:263) has suggested that blunt antler tines from 41CH46 may have been used as flaking tools, though no positive identification could be made.

Olsen (1984:28, 1989) has indicated that scanning electron microscopy may be employed in distinguishing between antlers that have been modified through rutting behavior, and those modified by human activity. This technique was not applied to the assemblage from Alabonson Road, but does represent a potential line for future inquiry.

Possible Bone Tool

The symmetrical shape and possible polish on the tip of the unidentified bone specimen shown in Figure 2,R suggests that this may be a tool. The bone is highly degraded, however, and could simply represent a naturally worn spirally fractured element that retained collagen. The specimen is broken in a dry fracture on one end, pointed on the other, and is relatively flat. No wear striations are evident. The bone is 2.9 cm long, 0.8 cm wide, and 0.4 cm thick.

CONCLUSIONS

The bone artifacts from the Alabonson Road Site reflect a range of cultural activities including fishing (fishhook stock remnant), ornamentation use (perforated turtle shell), hunting (bone point?), and possible skinning (spatulate bone tool). The majority of the specimens described here as tools were recognized only after careful cleaning and analysis in the laboratory. This emphasizes that care in excavation, cleaning, and analysis is needed to recover and report the complete bone tool assemblage at sites in the area.

ACKNOWLEDGEMENTS

This research was funded by the Harris County Flood Control District, Houston, Texas. We would like to thank H. Blaine Ensor, Helen M. Danseizer, and D. Gentry Steele for commenting on earlier versions of the manuscript. Elizabeth Ham produced the illustrations of the artifacts. Figure 1 was provided by the Archeological Research Laboratory, Texas A&M University. The specimens described here are curated by the Archeological Research Laboratory, Department of Anthropology, Texas A&M University, College Station.

References Cited

Aten, Lawrence E.
1983 *Indians of the Upper Texas Coast*. Academic Press, San Francisco.

Baker, Barry W., Brian S. Shaffer, Kristin D. Sobolik, and D. Gentry Steele
1989 Chapter 7, Faunal Analysis. Part I: Analysis of the Vertebrate Faunal Remains. In: Alabonson Road: Early Ceramic Adaptation to the Inland Coastal Prairie Zone, Harris County, Southeast Texas (H. Blaine Ensor and David L. Carlson, editors). *Archeological Research Laboratory, Texas A&M University, Reports of Investigation No. 8*, pp. 201-239. Draft.

Ensor, H. Blaine, and David L. Carlson, editors
1989 Alabonson Road: Early Ceramic Adaptation to the Inland Coastal Prairie Zone, Harris County, Southeast Texas. *Archeological Research Laboratory, Texas A&M University, Reports of Investigation* No. 8. Draft.

Fundaburk, Emma Lila, and Mary Douglass Fundaburk Foreman, editors
1957 *Sun Circles and Human Hands: The Southeastern Indians Art and Industries*. Published by Emma Lila Fundaburk, Luverne, Alabama.

Hall, Grant D.
1981 Allens Creek: A Study in the Cultural Prehistory of the Lower Brazos River Valley, Texas. *The University of Texas at Austin, Texas Archeological Survey Research Report* No. 61.

Huebner, Jeffery A.
1987 A Toyah Horizon Bone Tool From Victoria County. *La Tierra* 14(4):6-15.

Olsen, Sandra L.
1984 On Distinguishing Natural Damage from Use Wear on Prehistoric Antler. *First International Conference on Bone Modification Abstracts*. Center for the Study of Early Man, Orono, Maine.

Parmalee, Paul W., Andreas A. Paloumpis, and Nancy Wilson
1972 Animals Utilized by Woodland Peoples Occupying the Apple Creek Site, Illinois. *Illinois State Museum Reports of Investigations* No. 23, Springfield.

Redder, Albert J.
1985 Horn Shelter Number 2: The South End, a Preliminary Report. *Central Texas Archeologist* 10:37-65.

§ § § § § § § § § § § § § § § §

ANDICE/BELL PROJECTILE POINT NOTCHING FAILURES

Carey D.Weber

ABSTRACT

Attributes of seven types of notching failures experienced during Andice/ Bell replication experiments are presented. Fracture mechanics and causes are discussed. Four of the failures can be distinguished from utilization fractures for analysis of notching success rates experienced by prehistoric craftsmen.

INTRODUCTION

During 100 plus experiments to replicate Andice/Bell projectile points, crushed notching platforms were demonstrated to be the most common cause of premature notching termination. Six other types of notching failure, including removal of the barb by notching flake expansion, split fracture, vertical snap, transverse blade snap, transverse barb snap and lateral barb snap were demonstrated to be the causes of most aborted preforms. The latter five types of failures are usually the result of continued flaking attempts after a notching platform has been crushed. Notching failures which abort the preform may result from either spot-loaded fractures or snap fractures. Spot-loaded fractures, including split fractures and removal of barbs by notching flake expansion, as well as vertical snap fractures originating from the notching platform, have unique qualitative attributes that distinguish them from utilization fractures. Other types of snap fractures cannot be distinguished from utilization fractures.

DESCRIPTIONS

Crushed Notching Platforms

Loss of a notching platform occurs when the flaking edge inside the notch is crushed and becomes rounded, preventing removal of subsequent notching flakes. A crushed edge at the notch termination may have a thick, steep or rounded appearance, and small, multiple flake snap terminations may be directed into the mass as shown in Figure 1,a. The edge will not be thin and sharp, and in cross

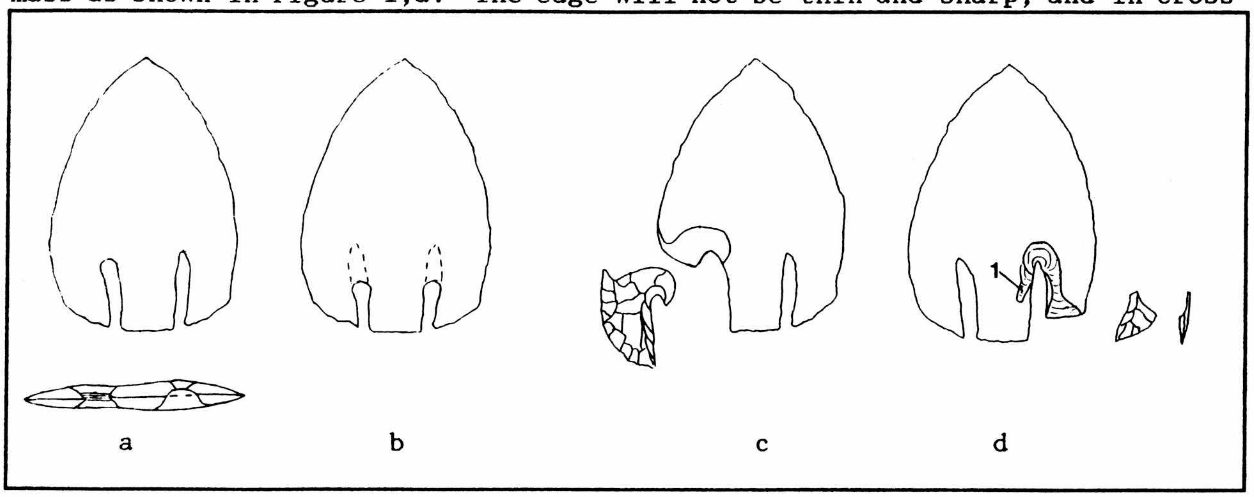


Figure 1. a, loss of one (wider) notching platform; b, premature loss of both notching platforms; c, notching flake removal of barb; d, notching flake removal of barb by overshot; 1, reversal of notching flake expansion toward base.

section the edge will usually be near the centerline of the preform rather than off center toward one face. When a crushed, rounded edge develops, the notch may be widened somewhat in an attempt to regain the notching platform. In the replication experiments lost notching platforms were conspicuous when metal flaking tools were used, but they were harder to identify when bone or antler tools were used (see Figures 2, 3 and 4 pp. 25, 26, 27).

The presence of any characteristic, whether through the raw material or the notching technique, that contributes to edge crushing will increase the frequency of platform loss. For example, maintaining a notching platform in a raw material with low tensile strength is much more difficult than with stronger materials. Failure to sufficiently strengthen the notching platform and excessive preform thickness in advance of the notching platform also result in many lost platforms.

Removal of Barb by Notching Flake

The most common cause of failure with narrow preforms is removal of the barb by notching flake expansion (see Figure 5, p. 28). The fracture plane of the notching flake carries through the barb centerline to the opposing face, removing the barb. The fracture may be the result of a preform that is too narrow or has irregular facial contours. Platforms that are too strong or above centerline may cause removal of the barb by the resulting flake. Barb removal may be caused by a reverse expanding fracture front that becomes an overshot. The replication experiments demonstrated that this type of fracture is frequently associated with flaking tool angles that are near perpendicular to the preform face. Most of these failures can be prevented by maintaining sufficient width on the proximal half of the preform during percussion thinning, by creating even barb facial contours during lateral and basal contouring, and by using more acute flaking angles to remove notching flakes.

Split Fractures

Split fractures (see Figure 6) are spot-loaded fractures perpetuated by outward displacement of the barb fragment in contact with the flaking tool. Fracture is initiated at, or just above, the intended notching platform and travels generally toward the distal end of the preform, usually terminating at the near blade edge, but rarely terminating at the opposing blade edge. Instead of being snapped into two pieces, the displaced piece is actually a flake being detached from the stabilized piece. The fracture plane is perpendicular, rather than parallel, to the preform face. Partial split fractures may occur when spot-

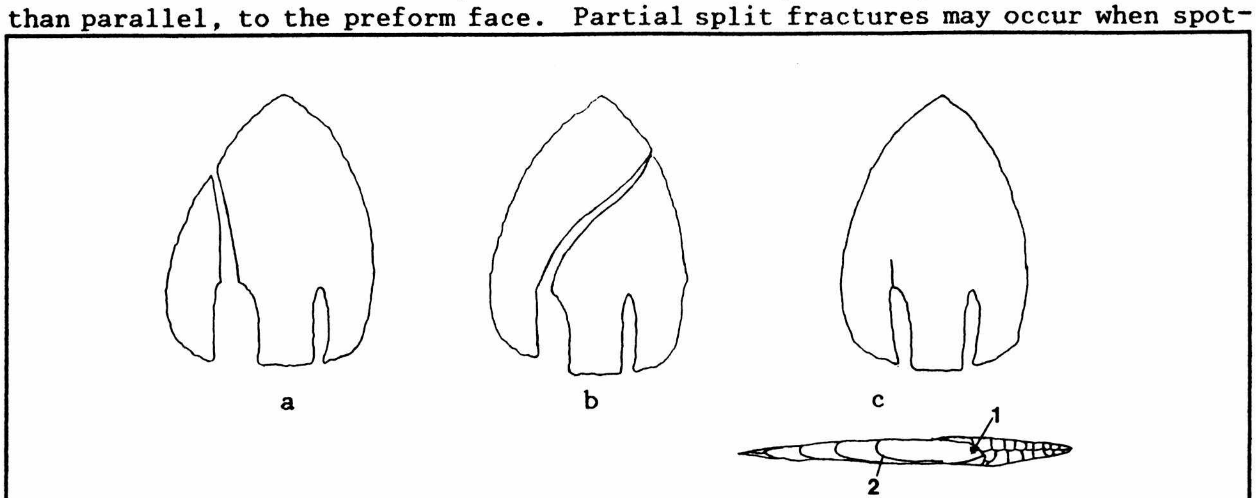


Figure 6. Split fractures. a, near edge; b,far edge; c, partial split; 1, small force bulb; 2, arced undulation showing direction of fracture toward distal end and opposite face.

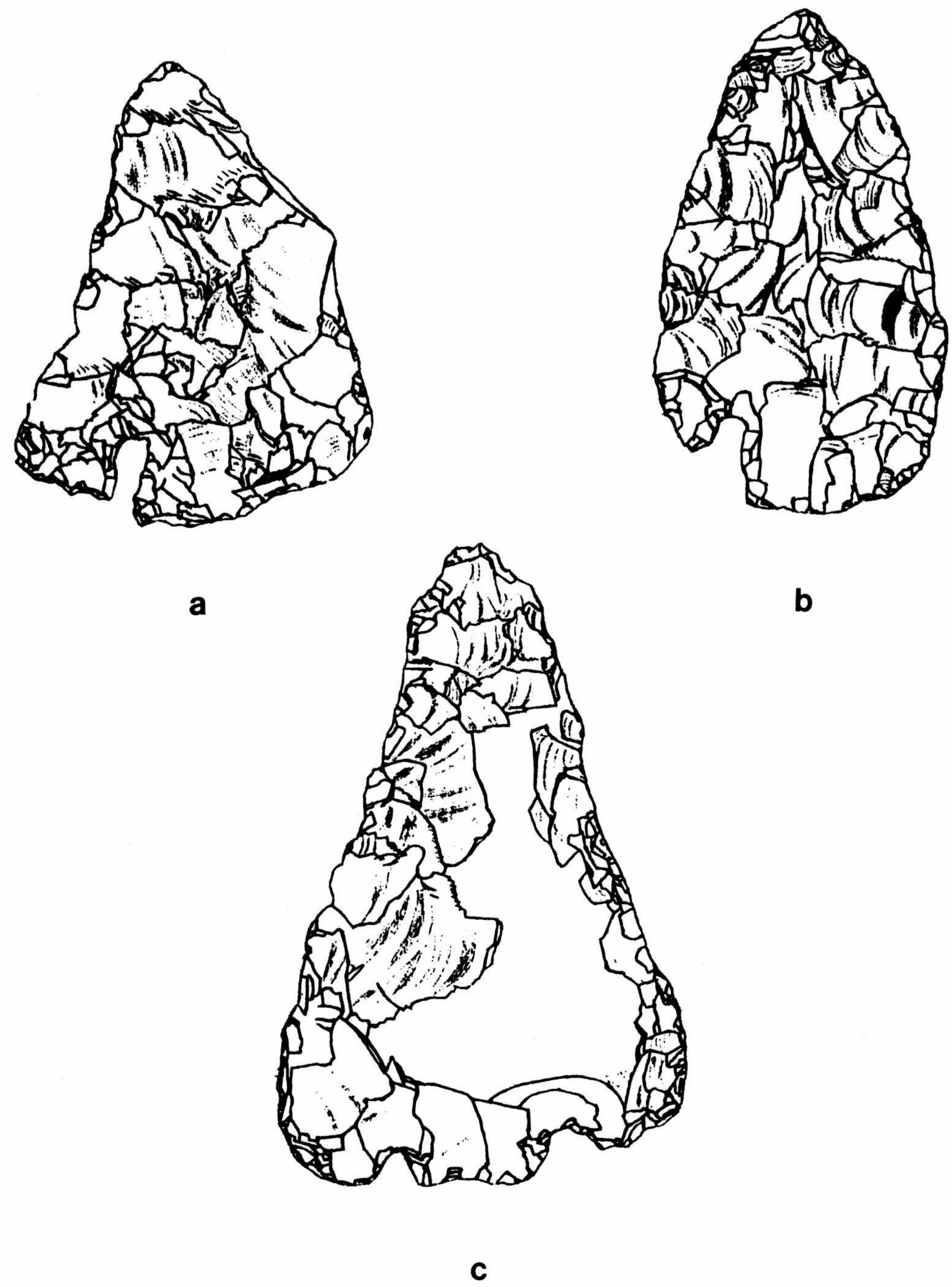


Figure 2. Prehistoric failures from lost notching platforms. a, Brushy Creek, Williamson County; b, c, Lindsey-Gault Site (41BL323).

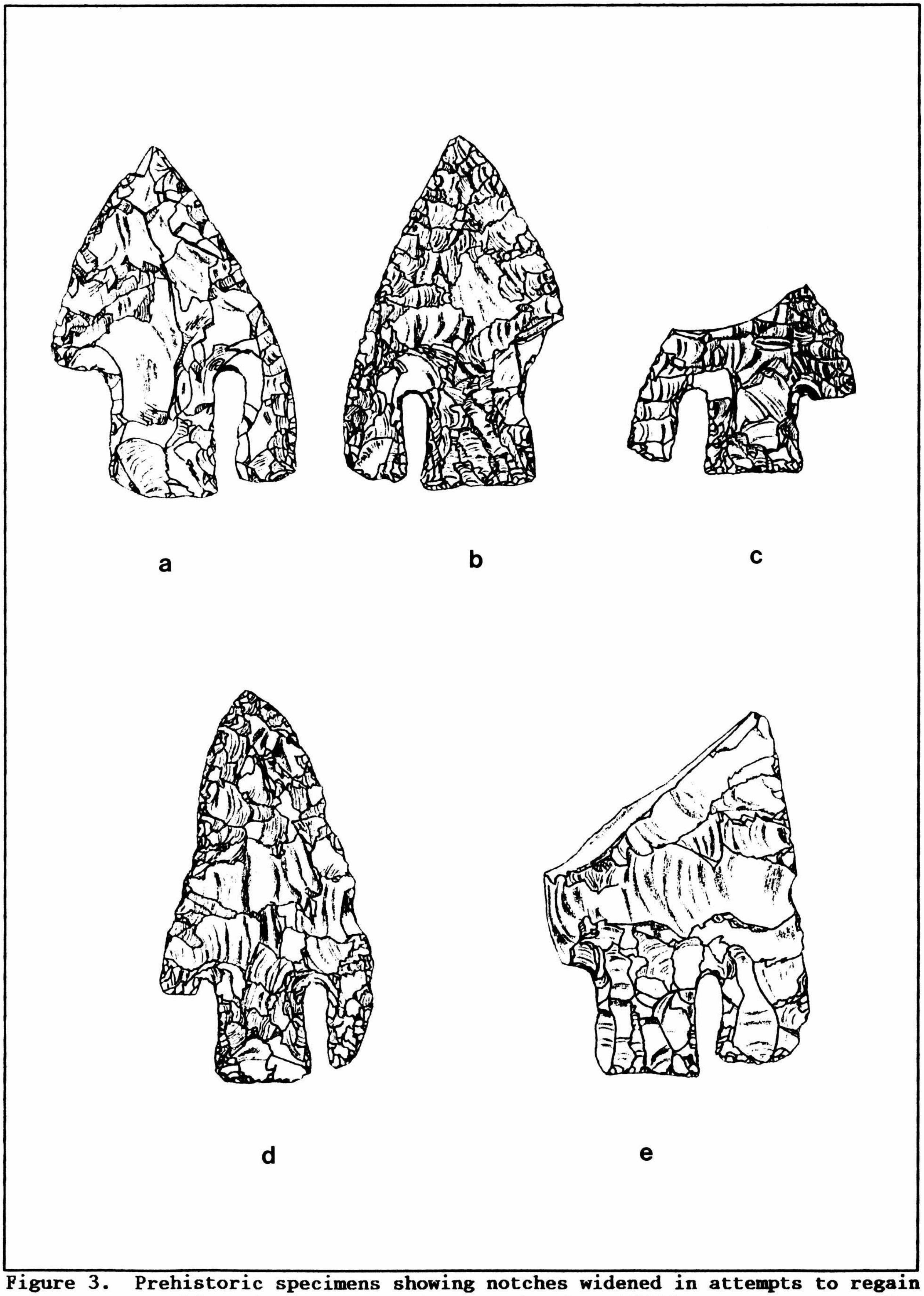


Figure 3. Prehistoric specimens showing notches widened in attempts to regain notching platforms. a, b, Kennedy Site, Williamson County; c, McGregor Park Site, Bell County; d, private collection, no provenience; e, manufacturing failure, Winnins Creek, Bandera County.

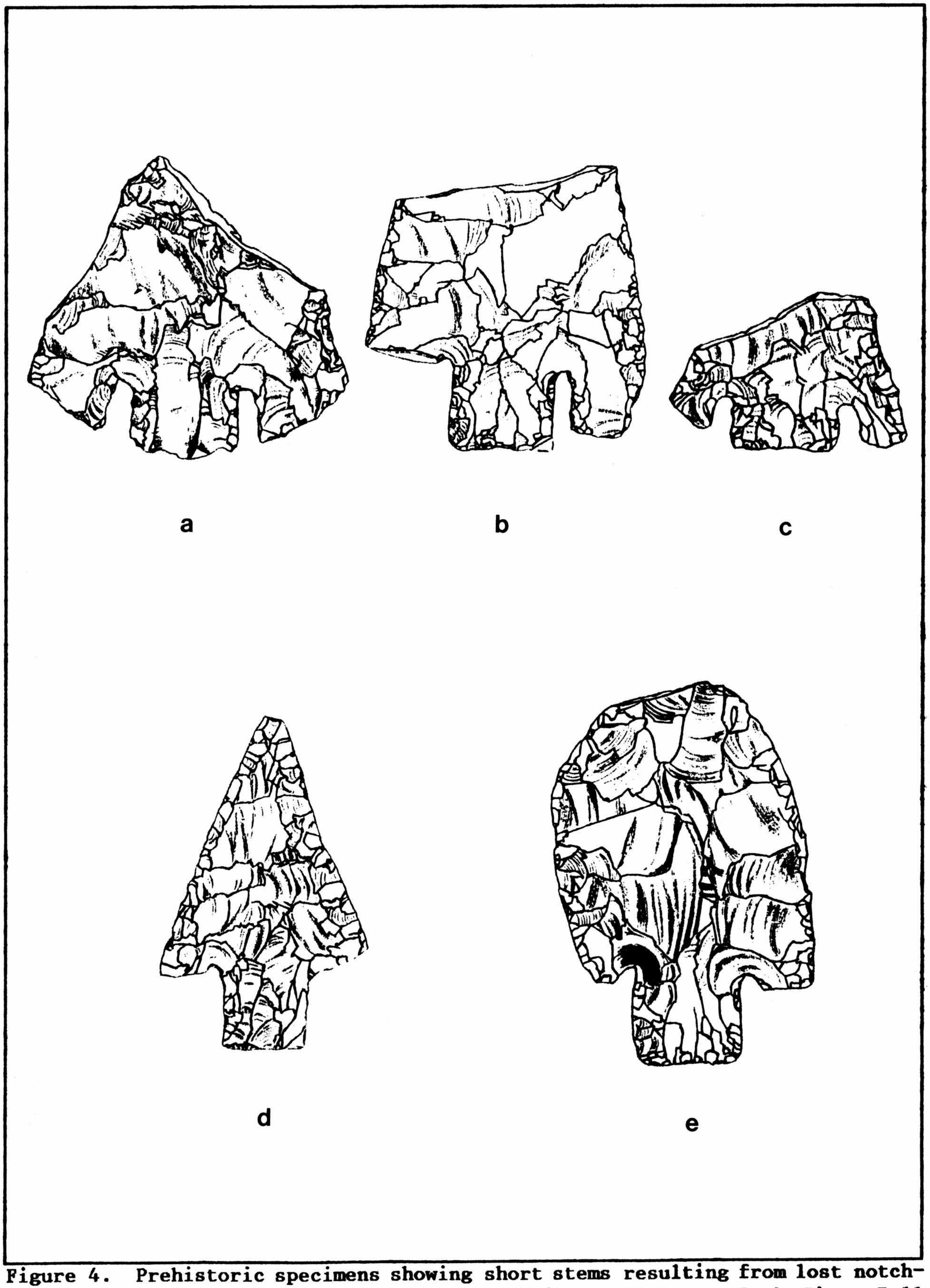


Figure 4. Prehistoric specimens showing short stems resulting from lost notching platforms. a, manufacture failure, McGregor Park Site, Bell County; b, Bell County; c, Tonn Site, Williamson County; d, private collection, no provenience; e, manufacture failure, Lindsey-Gault Site (41BL323).

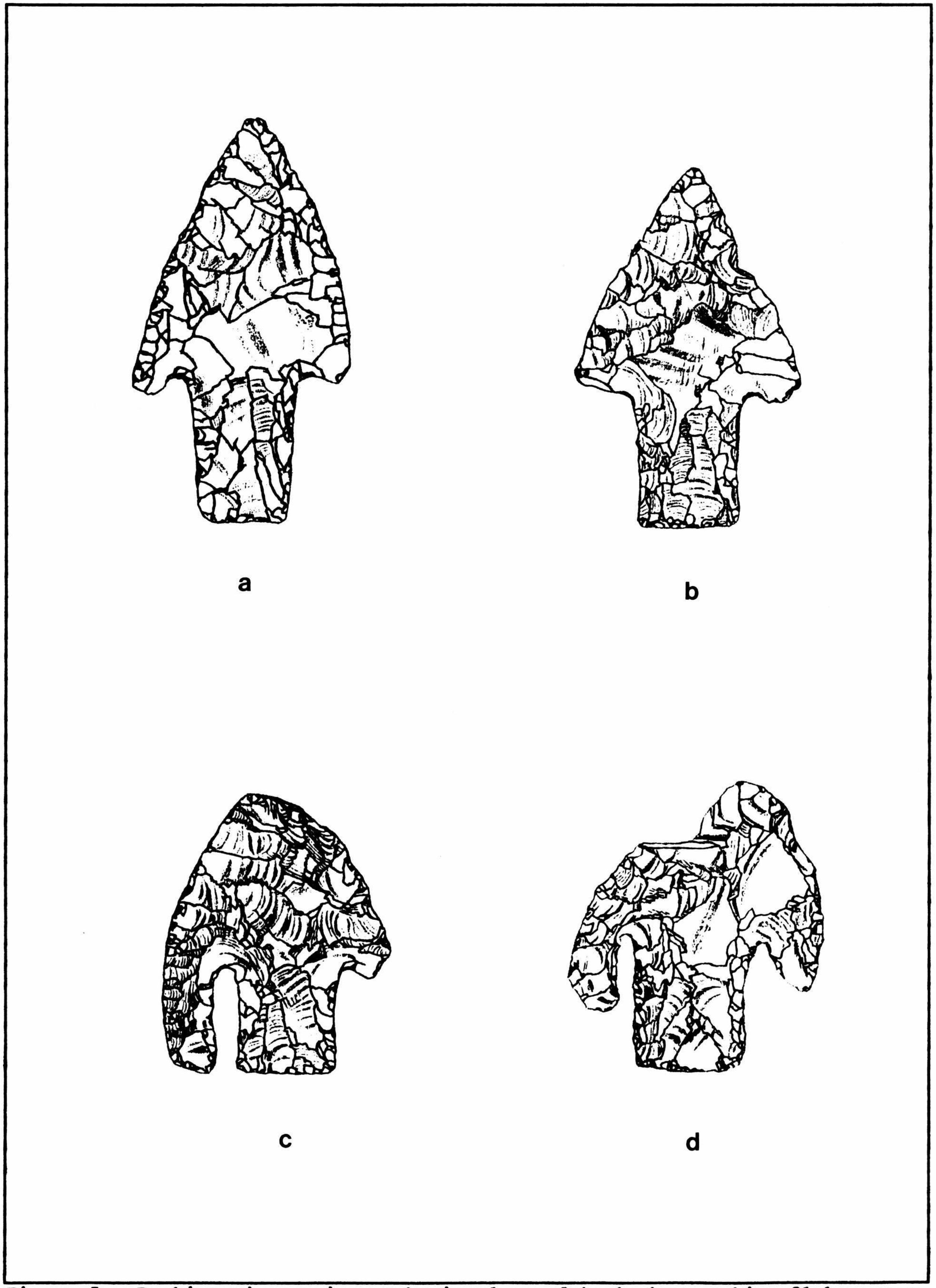


Figure 5. Prehistoric specimens showing loss of barbs by notching flake expansion. a, Tonn Site, Williamson County; b, c, d, private collection, no provenience.

loaded force is insufficient to carry the fracture to termination at the blade edge.

Attributes of this type of fracture include a small negative bulb of force on the stabilized part of the preform, a small diffuse bulb of force on the detached part of the preform and curved undulations showing the shape of the fracture front perpetuated by displacement.

Split fractures occur when the notching tool is improperly positioned or misdirected. Split fractures are a usual result of continued attempts to remove notching flakes from oversteepened or lost notching platforms using increasing levels of force (see Figure 7, p. 30).

Vertical Snap Fractures

When vertical snap fractures are viewed from the preform face, they very closely resemble split fractures (see Figures 8 below and 9 p. 31). However, the mechanics involved in the production of split fractures are different. While split fractures are spot-loaded fractures, vertical snaps are bending fractures. Vertical snap fractures begin on the face opposite the point of force application, and they travel generally toward the face from which the force is applied.

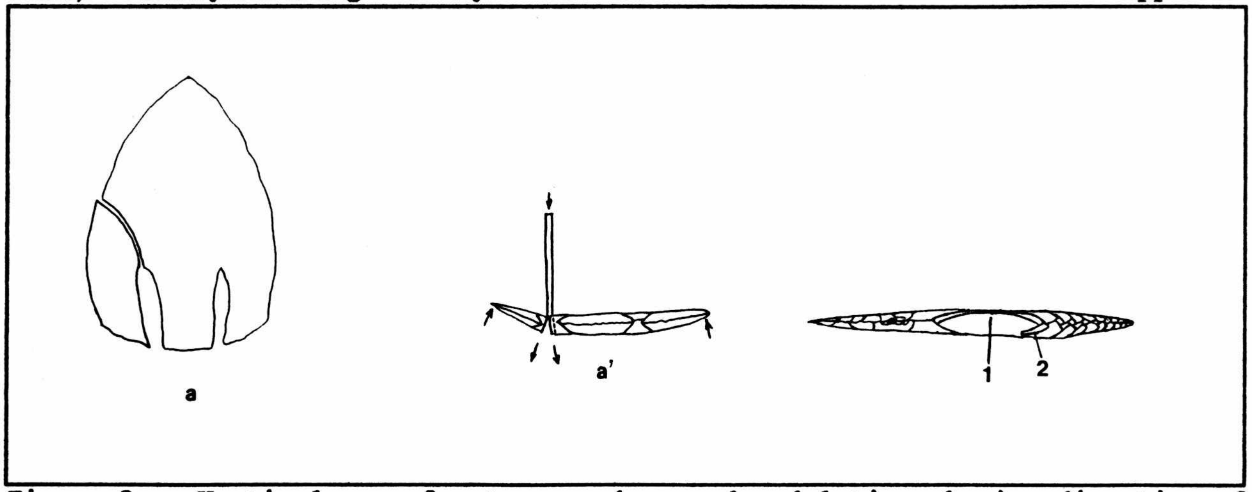


Figure 8. Vertical snap fractures. 1, arced undulation showing direction of fracture directly toward opposite face; 2, flake scar running up snap fracture ridge from divided platform.

Although tension may create the initial void somewhat nearer the notch edge than the lateral blade edge, direction of the fracture is always from the face opposite force application and toward the face of force application. The diagnostic attribute is a curved undulation which arcs toward the face of applied force. Usually there is no more than one undulation because the fracture has little time to develop before it terminates. Often the single curved undulation may merge with the rounded edge where the fracture turned to avoid particles in secondary compression before terminating at the opposite face.

Perhaps the best way to visualize this type of fracture is to place each end of a long piece of plate glass on supports, leaving the center free. Pressing on the unsupported center snaps the glass into two pieces. No force bulb is formed because the fracture causing the failure was not initiated at the point where force was being loaded.

In notching, since displacement of the two pieces created by the fracture begins on the face opposite the point of force application, the flaking tool is seated at or near a line of compressed particles created by the displacement opposite the line of tension. Even after the fracture has terminated, the two complete pieces continue the direction of displacement for a short interval. During this interval no void has been created into which the punch can slip

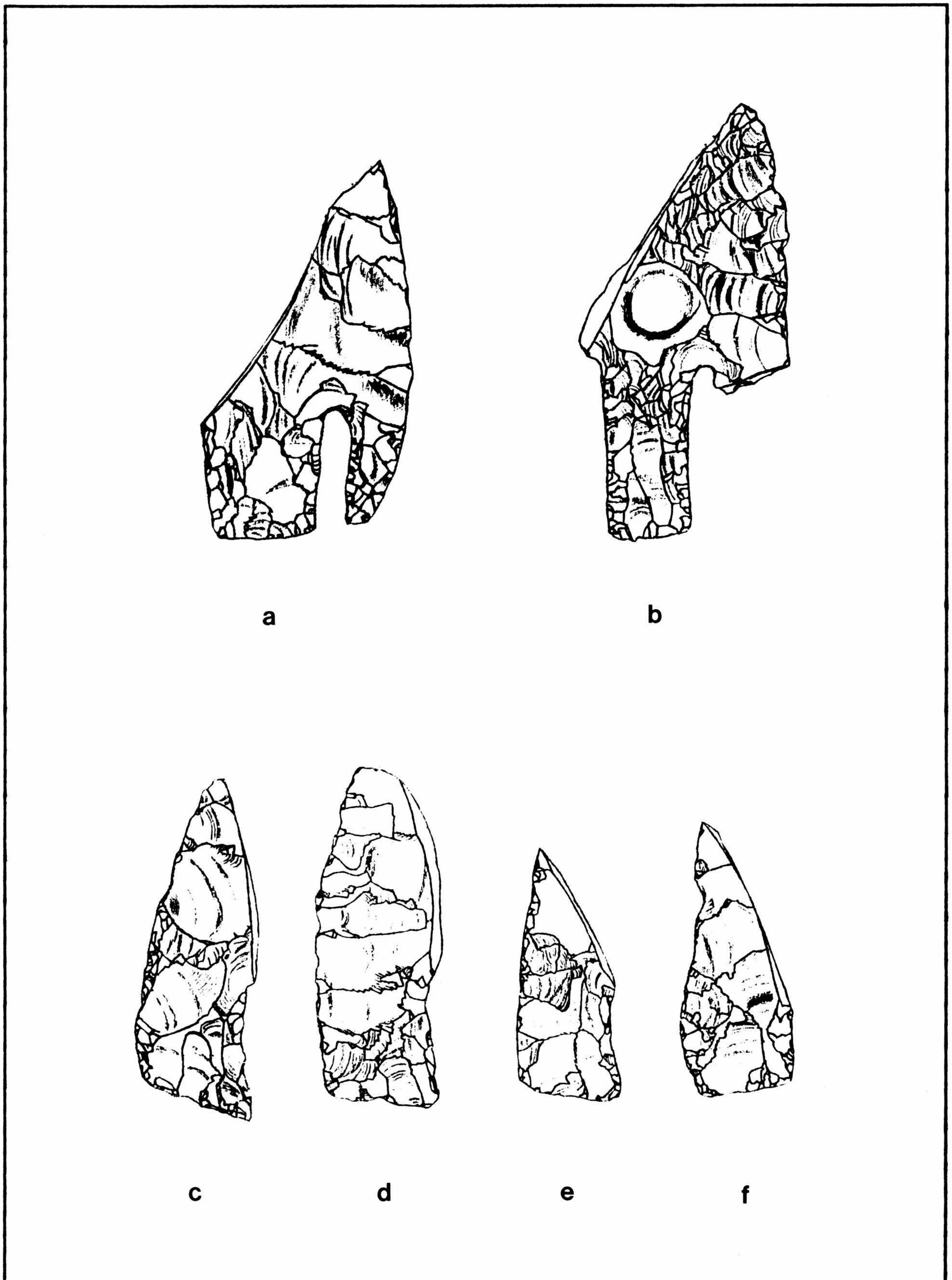


Figure 7. Prehistoric specimens showing split fractures. a, Comanche County; b, Lindsey-Gault Site (41BL323); c, d, e, f, private collection, no provenience.

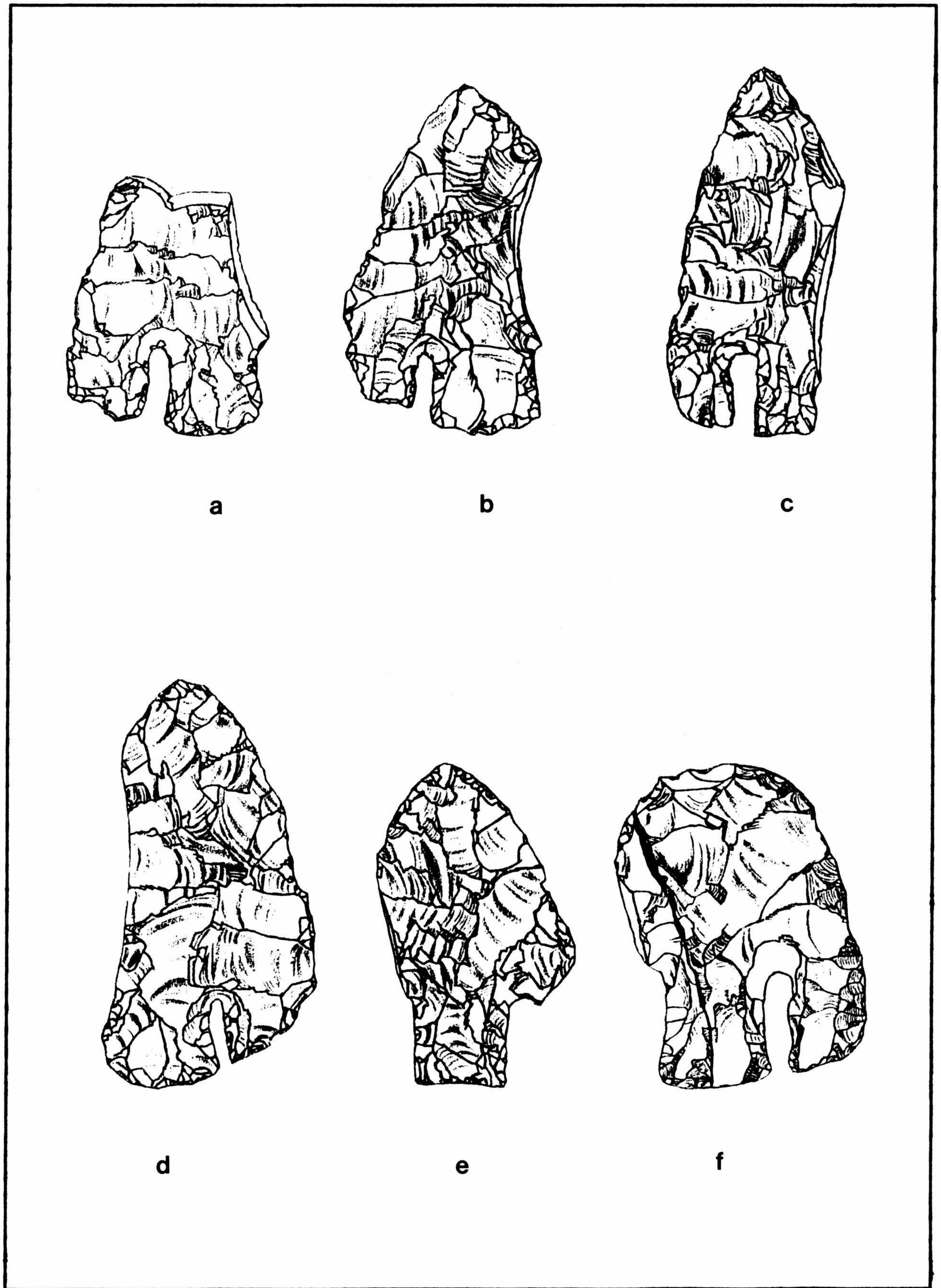


Figure 9. Prehistoric specimens showing failure by vertical snap. a, Tonn Site, Williamson County; b, c, Lindsey-Gault Site (41BL323); d, Bell County; e, private collection, no provenience; f, Pine Creek, Lamar County.

cleanly from the platform; however, the fracture has weakened the original platform by dividing it. The creation of a free face by the first fracture allows a small spot-loaded fracture to initiate from the newly formed corner of the platform on which the flaking tool is positioned. These small flakes are removed after the snap fracture causing the failure is complete, and they commonly run up the ridge formed by the juncture of the original preform face with the snap fracture scar.

Vertical snaps are most common on relatively thin, wide preforms, especially when support underneath the preform allows compression beneath the point of force application by the flaking tool. In other words, excessive cushioning between the preform and the rigid surface providing resistance may contribute to vertical snap failure. Platform strength and flaking tool placement are the real keys to avoiding failure due to vertical snap. When the force required to remove a notching flake exceeds the force required to snap the preform, vertical snap occurs. This is possible only if the platform is too strong (or has been lost) and if the flaking tool is seated too far behind the flaking edge.

Transverse Blade Snap Fractures

Transverse blade snaps are a relatively uncommon form of notching failure. Unlike vertical snaps, transverse blade snaps occur completely away from the point of force application, and it is difficult to determine how the snaps were caused by observing the fracture scars. Transverse blade snaps that occur during notching or other manufacturing stages cannot be distinguished from transverse snaps that result from utilization or after discard because the bending forces that cause the fractures are very similar.

Transverse blade snaps that occur during notching are usually a problem only with thin preforms. The distal half of the preform is stabilized by the craftsman, and the padding under the preform may be too thick, or situated mostly under the stabilized distal half. Excessive force is applied with the notching tool at the notching platform because the platform has been lost or the tool is improperly positioned above the platform. This force bends the proximal half of the preform downward, and a snap fracture occurs when the bending force exceeds the strength of the surface particles in tension. As shown in Figure 10, the scar of the completed fracture may extend across the blade from edge to edge, or from one edge to the notch termination opposite the one at which force was applied.

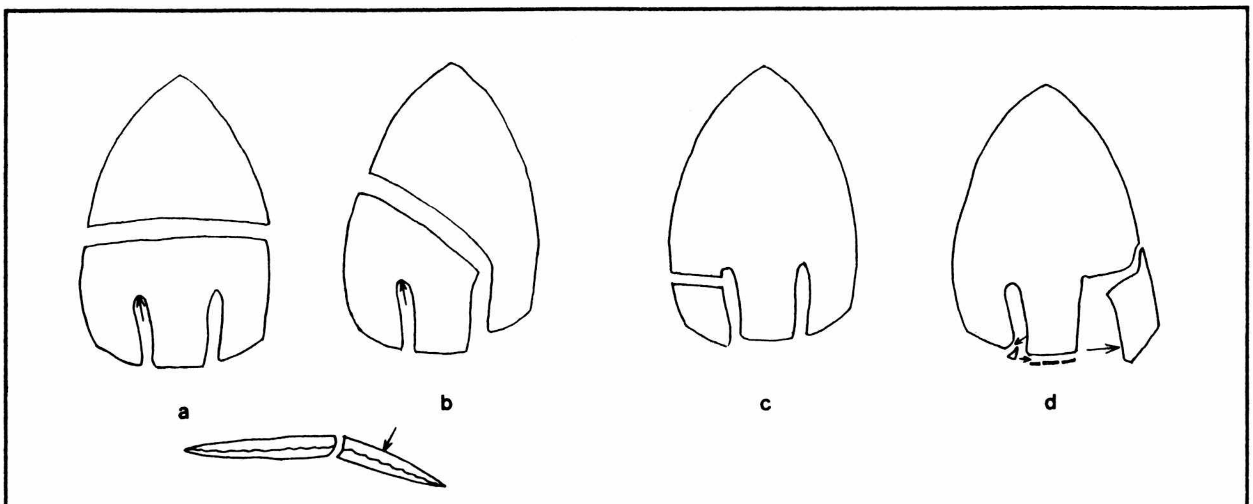


Figure 10. Transverse snap failures. a, b, transverse blade snap; c, transverse barb snap; d, lateral-out barb snap and removal of barb and stem basal edges.

Transverse Barb Snap Fractures

Transverse barb snap fractures usually occur on the barb nearest the notch of applied force, but they may also occur on the opposite barb. Like transverse blade snaps, transverse barb snaps that occur during notching or other manufacturing stages cannot be distinguished from transverse snaps that result from utilization or after discard because the bending forces that cause the fractures are very similar. Regardless of how the force is applied, transverse barb snap is the single most common barb loss scar on prehistoric Andice/Bell specimens. (See Figure 11.)

As noted in early experiments by William B. Carroll (personal communication), transverse barb snaps that occur during notching result primarily when an improperly stabilized preform is struck using indirect percussion. Experiments by the writer confirmed this observation. Similar snaps, in which the end opposite the end being struck is removed, occur in biface thinning using direct percussion with antler billets. The improper or insufficient stabilization allows the primary compression force to be dissipated throughout the preform as vibrations, rather than being concentrated into flake removal. The vibrations create bending forces that cause the transverse snaps. Although not a notching technique, excessive pressure from improper holding during removal of post-notching basal or lateral flakes using leg-assisted pressure flaking was also found to be a cause of transverse barb snaps during manufacturing stages.

Lateral Barb Snaps

A rare form of notching failure, snap fractures of barbs that travel toward the outside blade edge cannot be distinguished from similar scars caused by utilization. Lateral barb snaps toward the outside edge that occur during notching are usually a problem only with narrow barbs. Furthermore, the writer has created lateral barb snaps during notching only when using pressure flakers inside the notch. Improper contact of the notching tool with the inside barb edge, usually near the barb base, forces the barb outward. If the force load is sufficient, a lateral barb snap will occur. More often, however, the fragility of stem and barb bases result in small spot-loaded fractures which either widen the notch entry at the base or remove the basal edge to form a scar that resembles a microburin. These types of scars may also represent barb removals by indirect percussion loads that are directed too far toward the outside blade edge, although this type of failure was not replicated by the writer.

DISCUSSION

Crushed notching platforms are the only type of notching failure that does not affect the intended function of the point. Crushed notching platforms are the single most important type of notching failure, not only because they are often a predecessor to other types of notching failure which abort the preform, but also because of their role in artifact variability.

Table 1 shows the rate of notching failures observed in the prehistoric Andice/Bell study sample. The data is categorized by Discriminant Function Value groups and alternatively by variant stem shapes (Weber 1986). Crushed notching platforms are shown to be the most frequent notching failure for each group, occurring in just less than half of all the notches attempted.

While several variables contribute to the occurrence of crushed notching platforms and are not easily controlled, the relationship of the maximum notch width to the blade thickness can be controlled by the craftsman. A technique for measuring blade thickness above the notching platform was described by Weber and Patterson (1985). Data taken from prehistoric Andice/Bell points show that in the best work the blade thickness may be up to 1.7 times the maximum notch width, while in poorer examples the blade thickness may be equaled or exceeded by the

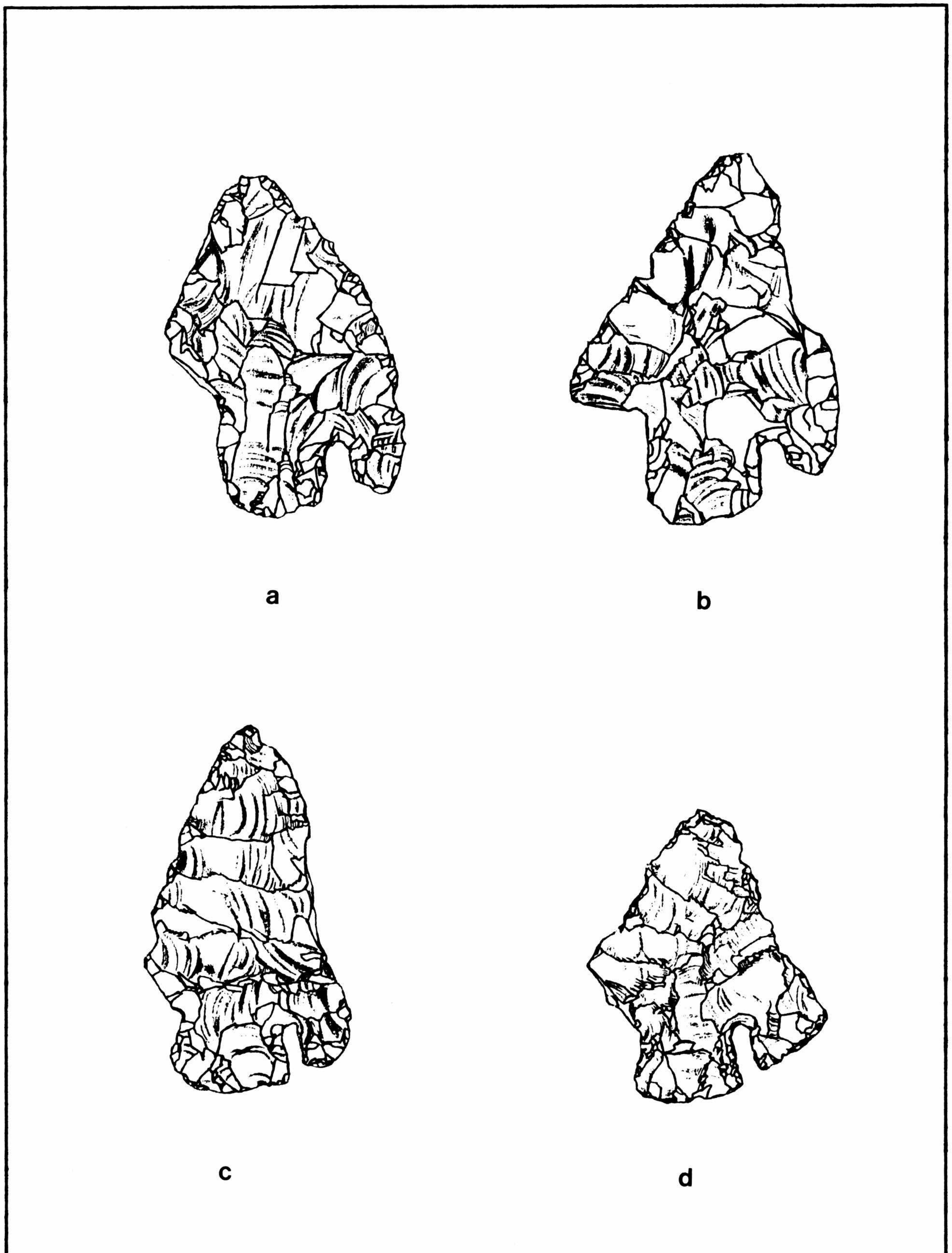


Figure 11. Prehistoric specimens showing failure by transverse barb snap. Identification was made using flake scar sequencing and unfinished edges, not the barb loss scars. a - c, Lindsey-Gault Site (41BL323); d, McGregor Park Site, Bell County.

maximum notch width. Replication experiments demonstrated that 4-6 mm wide notches of significant depth are possible only when blade thickness above the notching platform does not greatly exceed 7.0 mm. Only 7 percent (n=45) of the platforms on prehistoric specimens exceeded this thickness.

To model and test the relationship of blade thickness to maximum notch width, a regression analysis was performed using the General Linear Models Procedure of VMS SAS. This procedure requires identification of an independent variable (blade thickness) and a dependent variable (maximum notch width). The procedure uses the input data for each variable to derive a linear equation, the standard deviation for the dependent variable (also expressed in percent as a Coefficient of Variation), and the predictive accuracy of the model. Eighteen of the original 136 data sets were atypical (maximum notch width at base or greater than blade thickness), and they were omitted to refine the model. Figure 12 shows a graph of the data sets and the linear model produced by the analysis. The equation, $y = .54x + .97$, where y is the maximum notch width and x is the blade thickness, yields 56 percent accuracy for predicting variation of maximum notch width solely by variation of blade thickness. The data sets had a standard deviation of .51 and a coefficient of variation of 12.96 percent.

Predictive models must generally be more accurate; however, the model establishes blade thickness as the most significant independent variable affecting maximum notch width. The model also shows that the range of variability is relatively constant and that the smaller notches are diminutives of the larger notches. This indicates that prehistoric craftsmen intentionally limited notch width. They made notches just wide enough to maintain the notching platform through each blade.

In Table 1 a proportionately low rate of notching failures causing barb loss is revealed, indicating that prehistoric craftsmen recognized crushed notching platforms and accepted shorter stems rather than risking the more serious consequences of continued flaking attempts. A higher barb loss rate occurred in the replicated sample because notch depths exceeding the upper range mean of the prehistoric sample, not function, were the primary objective. Potential barb loss was a minor concern as compared to the possibility that regaining the platform would allow longer notches.

Possible alternative explanations for the low frequency of barb loss notching failures are collector bias and a higher rate of transverse barb snaps in lieu of split fractures and vertical snaps. Collector bias is unlikely because prehistoric Andice/Bell points that were discarded following notching failure tend to be large, essentially whole specimens and, therefore, more desirable to collectors. The latter explanation may be valid; however, it was not demonstrated in the replication experiments and cannot be verified in the artifact sample because of the inability to distinguish transverse barb snaps that result from utilization.

Weber and Patterson (1985) and Weber (1986) have clearly shown that approximately the same variation ranges and only minimal differences in mean data are apparent when basal width and minimum stem width above the base attributes of Andice/Bell specimens are compared. These similarities in stylistic design and the demonstrated occurrence of short stems resulting from notching platform loss emphasize the role of lost notching platforms in artifact variability.

Recent information from the Andice type site, Lindsey-Gault Farm, 41BL323, shows that the full range of stem lengths, preform sizes and variant stem shapes were intermixed throughout a homogeneous occupation zone which was easily distinguished from levels above and below it by a dense concentration of interior thinning flakes and a virtual absence of burned rock. A significant percentage of the points, both utilized and manufacture failures, had short stems and were made on small preforms.

Table 1a. Frequency of Notching Failures on Prehistoric Andice/Bell Points

Notching Failure Type	Discriminant Function Value (Percent)			
	20.54-35.04	35.04-44.04	44.04-60.54	TOTAL
Crushed Platform	46.0 (n=81)	54.7 (n=104)	45.0 (n=77)	48.8 (n=262)
Notching Flake Removal of barb	2.3 (n=4)	1.0 (n=2)	3.5 (n=6)	2.2 (n=12)
Vertical Snap	2.3 (n=4)	2.1 (n=4)	3.5 (n=6)	2.6 (n=14)
Split Fracture	0.0 (n=0)	0.0 (n=0)	2.9 (n=5)	0.9 (n=5)
Partial Split	<1.0 (n=1)	1.6 (n=3)	<1.0 (n=1)	0.9 (n=5)
Good Notching Platform	48.8 (n=86)	40.5 (n=77)	44.4 (n=76)	44.6 (n=239)
TOTAL	(176)	(190)	(171)	(537)

Table 1b. Frequency of Notching Failures on Prehistoric Andice/Bell Points

Notching Failure Type	Variation (Percent)				
	1	2	3	4	TOTAL
Crushed Platform	49.3 (n=37)	44.4 (n=51)	54.6 (n=106)	51.7 (n=45)	50.7 (n=239)
Notching Flake Removal of Barb	0.0 (n=0)	3.5 (n=4)	4.1 (n=8)	0.0 (n=0)	2.5 (n=12)
Vertical Snap	1.3 (n=1)	4.4 (n=5)	1.0 (n=2)	0.0 (n=0)	1.7 (n=8)
Split Fracture	0.0 (n=0)	<1.0 (n=1)	1.6 (n=3)	1.2 (n=1)	1.1 (n=5)
Partial Split	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)	0.0 (n=0)
Good Notching Platform	49.3 (n=37)	47.0 (n=54)	38.7 (n=75)	47.1 (n=41)	44.0 (n=207)
TOTAL	(75)	(115)	(194)	(87)	(471)

NOTE: Insufficient sample for variants other than those listed.

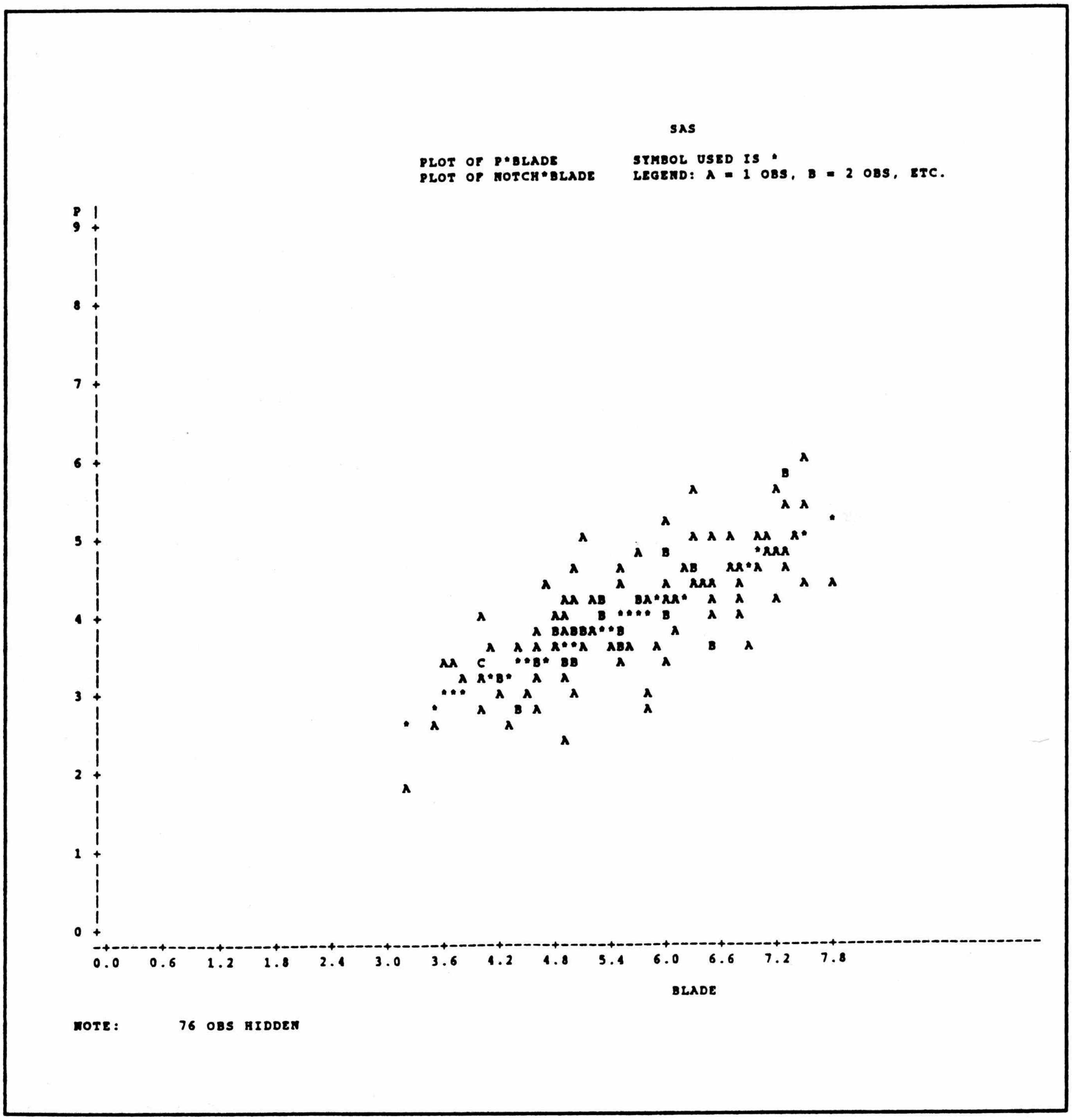


Figure 12. SAS plot (A,B) of the independent variable, blade thickness above the notching platform, and the dependent variable, maximum notch width, for 118 Central Texas Andice/Bell points. Asterisks indicate predicted model. Scale values are in millimeters.

CONCLUSION

Prehistoric man understood the functional requirements of his tools and the limitations of his technology. As students of prehistory, we tend to simplify and idealize relationships of people and objects that were more complex. This limits our appreciation of the variety of ways in which prehistoric man expressed creativity, as well as the limitations and challenges that were overcome to achieve higher levels of accomplishment. For Dalton, Plainview and Clovis points, variation in morphology, manufacturing technique and geographic distribution far exceeds the bounds originally foreseen, and it reveals widespread and complex social phenomena. For Folsom points, a once restrictive idealism has given way to broader acceptance of a technology that is not only innovative and precise, but is also one in which a variety of forms are accepted, 42 percent of which are less-than-perfect edged flakes and unfluted points (Sollberger 1985).

Comparing difficulty of manufacture, there are two chances for failure with Folsom points. With Andice/Bell points there are at least 20. Facing a near 50 percent rate of lost platforms due to crushing, it was imperative that craftsmen practiced and that only the best raw material was selected. There is an insufficient number of notched flakes, multiple notched points and aborted failures to account for skill development, substandard work and small preforms. The size and contouring of the Andice/Bell preform represents considerable value in time and material which would be imprudent to waste because of short stems.

References Cited

Sollberger, J. B.
1985 A Technique for Fluting Folsom. *Lithic Technology* 14(1):41-50.

Weber, C. D.
1986 An Analysis of Discriminant Function Values of Andice and Bell Points. *La Tierra* 13(3):32-38.

Weber, C. D. and L. W. Patterson
1985 A Quantitative Analysis of Andice and Bell Points. *La Tierra* 12(2):21-27.

AUTHORS

BARRY W. BAKER received a B.A. degree in anthropology from Texas A&M University and is currently completing his Master's degree at that institution. He has been employed by the Archeological Research Laboratory at A&M and has participated in field work in New Mexico and Texas. At present, he is a student and project zooarchaeologist at Texas A&M University.

C. K. CHANDLER, current Secretary and also Documentation Chairman of STAA, is a retired railroad management official and engineering consultant with an insatiable interest in Texas archaeology. He is Past President of the Texas Archeological Society and a member of the Coastal Bend Archeological Society. C. K. was the 1985 Robert F. Heizer Award winner for his extensive work in south Texas archaeology (see Vol. 13, No. 1). Also, in 1985, he recorded more archaeological sites with the Texas Archeological Research Laboratory than any other individual. C. K. is a valued contributor of manuscripts to *La Tierra* and the *Bulletin of the Texas Archeological Society*, covering such varied subjects as metal points, rock art, and hearthfield sites in Terrell County. He has been honored by being named a TAS Fellow, and was also appointed as a steward for the Office of the State Archeologist. The Chandlers reside in northern San Antonio.

THOMAS H. GUDERJAN is a senior research associate at the University of Texas Institute of Texan Cultures and the director of the Maya Research Program, an independent non-profit organization in San Antonio. He received his M.A. and Ph.D. from Southern Methodist University and his B.A. from Southern Illinois University. In recent years, his research has focused on Maya trade and political systems as well as his ongoing work with hunter-gatherer adaptations and contemporary Indians.

KAY HINDES has a BA degree in Anthropology from the University of Texas at San Antonio. She has conducted project-specific cultural resource studies from 1984 to the present. Kay served as the research historian for the 1984 Applewhite Reservoir Project and co-authored the report of the survey effort entitled *Chipped Stone and Adobe: A Cultural Resources Assessment of the Proposed Applewhite Reservoir, Bexar County, Texas* (CAR-UTSA, 1987). From 1989 to the present, she has served as the Project Historian for the Applewhite Reservoir Project under contract to Southern Methodist University. Kay serves as the Chairman of the Atascosa County Historical Commission, as a steward for the Office of the State Archeologist, and on the Alamo-La Bahía Historical Corridor Task Force, Alamo Area Council of Governments. She is a member of the Texas Archeological Society, the Council of Texas Archeologists, and the Southern Texas Archaeological Association.

EDWARD R. MOKRY is a longtime active member of the Southern Texas Archaeological Association and the Texas Archeological Society. He has served as a steward with the Office of the State Archeologist. Ed lives in Corpus Christi and works with the U. S. Post Office as well as helping out on the family farm. He has authored a number of articles for *La Tierra* and the TAS *Bulletin*.

AUTHORS (continued)

BRIAN S. SHAFFER received his undergraduate degree from the University of North Texas in 1986 and is currently working on his Ph.D in Anthropology at Texas A&M University. He has participated in fieldwork in North Texas, Oklahoma, and New Mexico. At present, Brian is a project zooarchaeologist for the Zooarchaeology Laboratory, Texas A&M University.

CAREY D. WEBER is a native of Fredericksburg, Texas and a graduate of Texas A&M University. His entire career has been spent with the U. S. Army Corps of Engineers as ranger and, since 1986, manager at Sam Rayburn, Granger, and Georgetown Lakes parks. While on duty he recorded, monitored, and planned for cultural sites on Federal lands. He is currently managing the Granger Lake park on the San Gabriel River in east Williamson County. At a time when there was little professional or Federal interest in archaeological resources Mr. Weber recorded 60 sites while working at Sam Rayburn. He has also recorded 33 sites in Gillespie County's upper Meusebach Creek watershed. Mr. Weber has published articles on experimental replication in the *Louisiana Archeology* journal and the Texas A&M report on the White Oak Bayou Site in Harris County, as well as a previous *La Tierra* report (Vol. 11, No. 4, 1984).

§ § § § § § § § § § § § § § § §

FRIENDS OF ARCHAEOLOGY

Have you renewed your membership to the unique, worthwhile and tax-deductible Friends of Archaeology program? Have you told your friends about this opportunity to take an active part in supporting the various archaeological projects undertaken by students and staff alike? Through your contributions threatened sites can be studied and salvaged before the heavy road machinery moves in, special dating studies (radiocarbon dating, trace element analysis of obsidian, bone identification, soils studies, etc.), publication of important reports, acquisition of special laboratory equipment, student research assistance, and the sponsoring of lectures and educational programs usually open to the public can be considered.

Annual memberships range from $25 for Individual to $500 or $1,000 for Patron and Benefactor. The latter may designate funds to support specific program areas. For more information about the Center for Archaeological Research or Friends of Archaeology, write to:

Center for Archaeological Research
The University of Texas at San Antonio
San Antonio, Texas 78249

or call Jack Eaton, Acting Director, Phone: 512-691-4378.

THE SOUTHERN TEXAS ARCHAEOLOGICAL ASSOCIATION

The Southern Texas Archaeological Association brings together persons interested in the prehistory of south-central and southern Texas. The organization has several major objectives: To further communication among avocational and professional archaeologists working in the region; To develop a coordinated program of site survey and site documentation; To preserve the archaeological record of the region through a concerted effort to reach all persons interested in the prehistory of the region; To initiate problem-oriented research activities which will help us to better understand the prehistoric inhabitants of this area; To conduct emergency surveys or salvage archaeology where it is necessary because of imminent site destruction; To publish a quarterly journal, newsletters, and special publications to meet the needs of the membership; To assist those desiring to learn proper archaeological field and laboratory techniques; and To develop a library for members' use of all the published material dealing with southern Texas.

(See Table of Contents)