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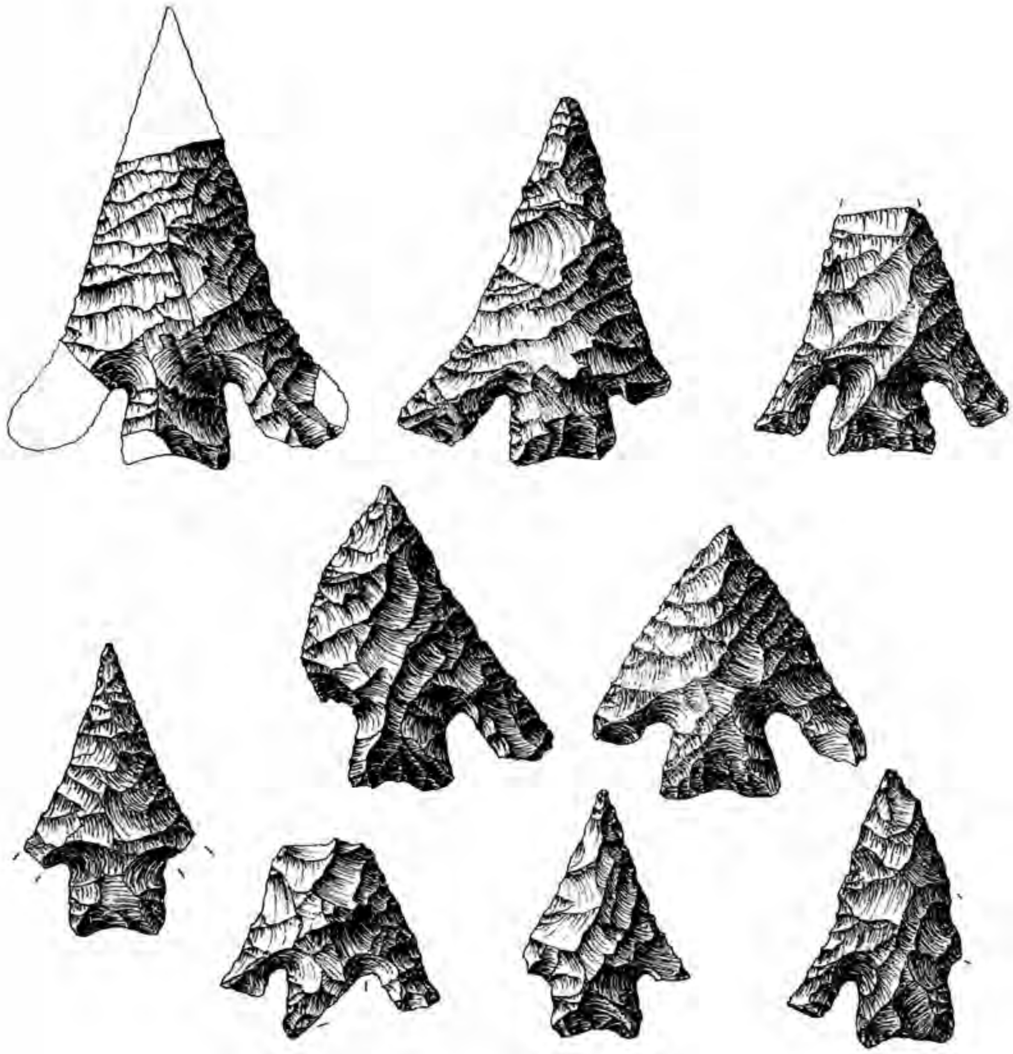

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The Southern Texas Archaeological Association

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 journal (*La Tierra*), newsletters, and special publications to meet the needs of the membership; and to assist those desiring to learn proper archaeological field and laboratory techniques for southern Texas.

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About the cover: Laguna points drawn by Richard McReynolds.

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Contents

Hidalgo: A Dart Point Type of the Lower Rio Grande

Don Kumpe and Richard McReynolds

ABSTRACT

The Hidalgo dart point type is defined in this paper. Thought to date to the Early Archaic, the known distribution includes three counties along the lower Rio Grande River in deep South Texas. It is also found in parts of northern Tamaulipas and northeastern Nuevo Leon, Mexico. Data on the physical characteristics of the Hidalgo type, examples of its variations in form, and preliminary information on its distribution are provided.

INTRODUCTION

A certain sturdy dart point type with an expanding stem and more-or-less bulbous base has been found along the lower Rio Grande River in Hidalgo, Starr, and Zapata counties for many years (Figures 1, 2). Known locally as "bulb-base," it is also found in northern Tamaulipas and northeastern Nuevo Leon, Mexico. Although scarce, specimens are surprisingly unpopular with some local collectors, "because they're thick (over 10 mm thick on average) and because they're not in the book," referring through the years to Suhm, Krieger, and Jelks (1954), Suhm and Jelks (1962), or Turner and Hester (1985; 1999).

Named for the county at the northeastern limit of its distribution, the Hidalgo type is characteristically thick (specimens in this paper are 8 to 14 mm thick), appears to have a unique technology, to be morphologically distinct from other dart point types in Texas and Mexico, and to have a somewhat widespread yet distinct distribution. In Texas, it is apparently unique to the lower Rio Grande. Hidalgo points are uncommon, but occur consistently; the senior author recovered 19 Hidalgo points in 48 years, while examining well over a hundred in local collections. The 41 specimens in this paper were found by 10 individuals while surface collecting in sites that were often deeply eroded; 27 of the 41 are illustrated. Although it is unusual to find more than one Hidalgo point in a site, two areas, Los Olmos Creek in Starr County and the southwestern corner of Hidalgo County, apparently yield comparatively large numbers of Hidalgo points.

Perhaps because they are uncommon, very few Hidalgo points have appeared in print. Newton (1963: 6) employs line drawings to illustrate unidentified projectile points from Arroyo Los Olmos in Starr County; two of his specimens (IV and XV) appear to be Hidalgo points. Utberg (1969: Part II, 3, 5) illustrates 3 Hidalgo points; the 3 were among 5 Hidalgo points that were later borrowed from Dick Clardy of McAllen and photographed by C.K. Chandler. In 1976, Joel Shiner (1983) of Southern Methodist University directed a summer field school from Pan American University in Edinburg (now UTPA, the University of Texas-Pan American) that excavated the Sheldon site in southwestern Hidalgo County. Gerald Whitaker, Pan American University photographer, took a photo of 11 stone artifacts recovered during the excavations (Davis 1976). Two of the artifacts (first vertical row, 2nd and 3rd from top or bottom) in Whitaker's photo are apparently Hidalgo points. Shiner (1983) mentions a large, unidentified stem point that was found in a deep gully, probably referring to one of the Hidalgo points in Whitaker's photo.

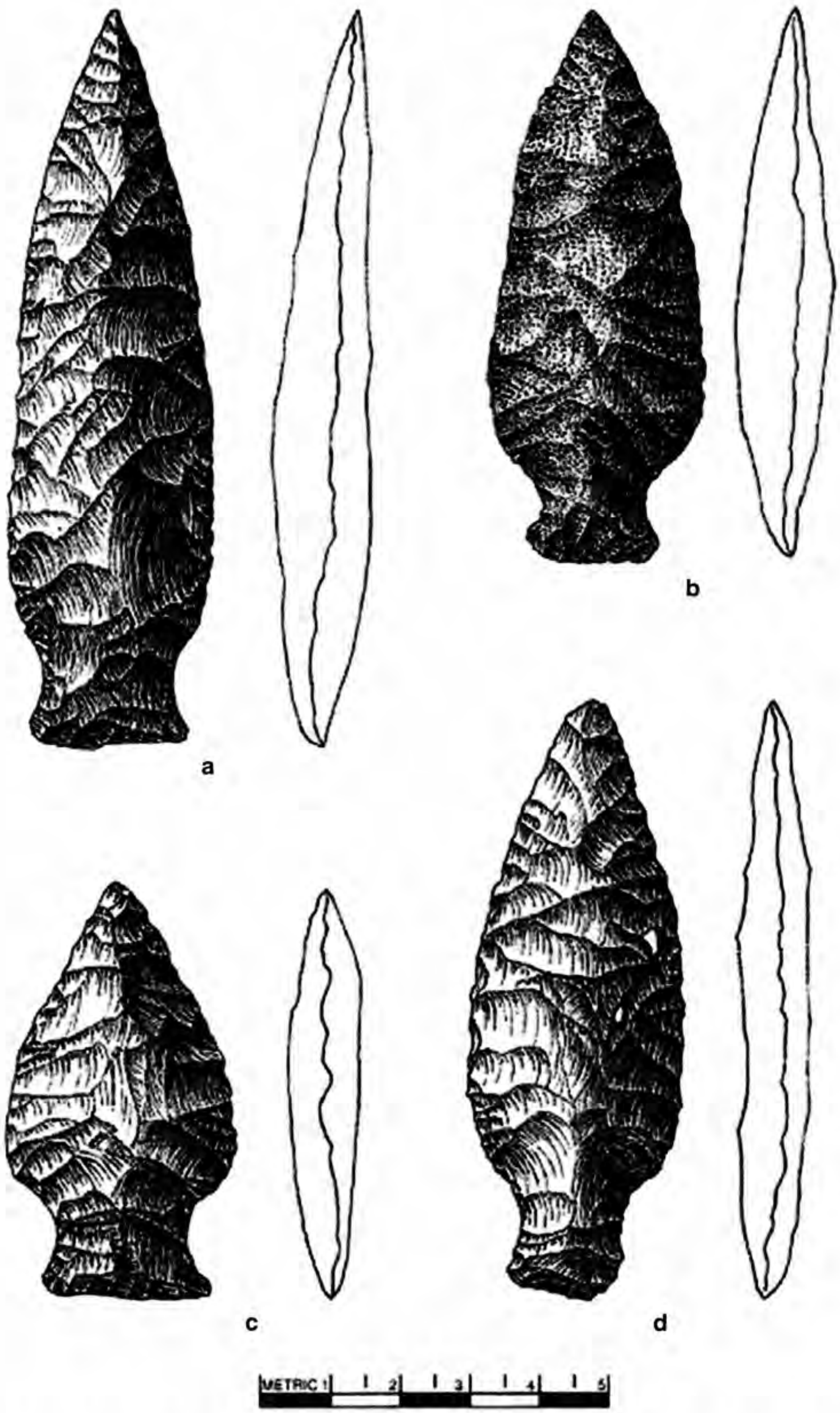

Figure 1. Hidalgo points from the lower Rio Grande; d is made of El Suez chert (see text) and perforated by 2 vugs. a, c, Tamaulipas; b, Zapata County; d, Starr County. Drawings by Richard McReynolds.

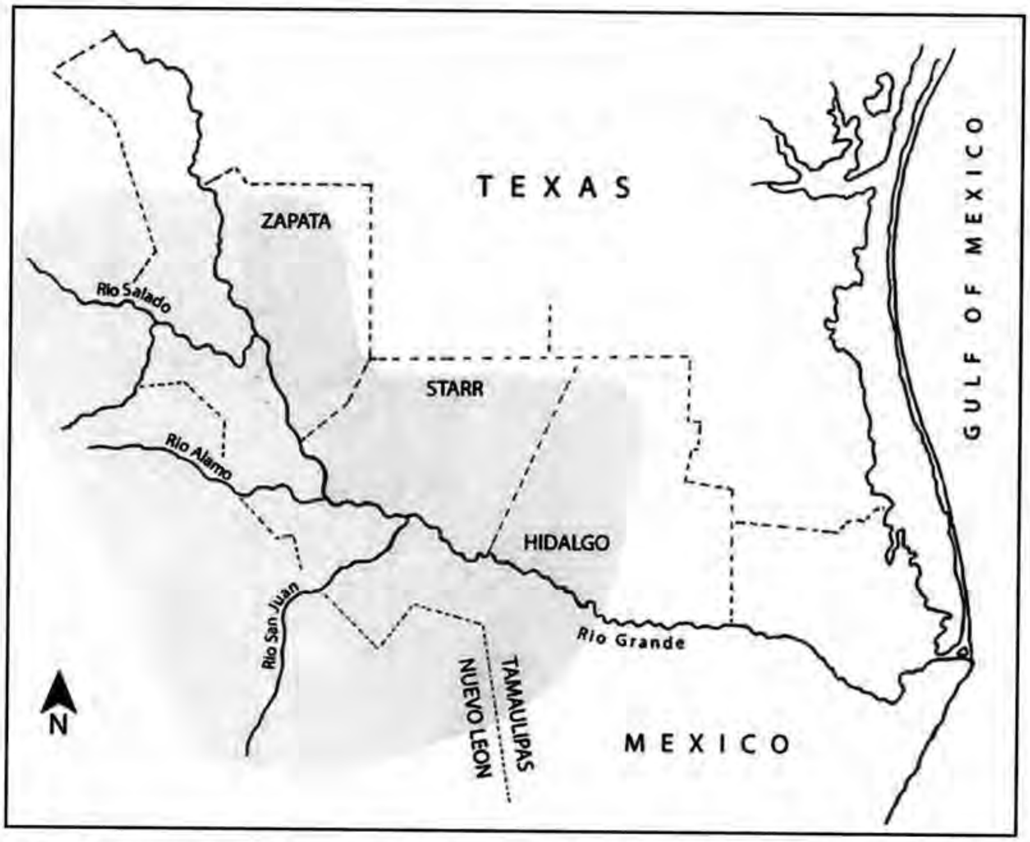

Figure 2. The Lower Rio Grande River and its Mexican tributaries, the Rio Salado, Rio Alamo, and San Juan. Shaded area is the presently known distribution of the Hidalgo dart point type.

DESCRIPTION

Hidalgo points, whether large or small, are thick, over 10 mm thick on average (10.4 mm/n=41) and have a wide range of variation. Blades often have strongly convex lateral edges, but range from narrow lanceolate (Figure 1, a) to broadly ovate (Figure 1, c). Some specimens are flat on one side, while oval and thick on the opposite side (Figure 3, a-b); these appear to have been made on large, unusually thick percussion flakes. Cross sections range from plano-convex to biconvex. Shoulders are generally rounded (Figure 1, a-b), but some specimens have slightly squared off shoulders, sometimes on only one side (Figure 3, G); others are more strongly shouldered, verging on barbed (Figure 4, a-f; Figure 5, b, d). Stems usually are strongly expanding, but may expand only slightly (Figure 4, g-i). None of the stem edges are dulled. Basal edges are usually convex, but may be straight (Figure 3, b; Figure 5, a-b, f), slightly concave (Figure 3, e, g), or rounded (Figure 4, e, g-i). Many Hidalgo points have impact fractures and may be reworked so that one or both of the lateral edges angle abruptly to a newly placed tip (Figure 3, c, g; Figure 4, d). Flaking is random, there is no beveling, and none are serrated. Many have a heavy patina. Some variations in form may originate with reworking of blades and stems.

DISTRIBUTION

The geographic distributional center of the Hidalgo type appears to be the lower reaches of the 3 Mexican river systems tributary to the lower Rio Grande, the Rio Salado, the Rio Alamo, and the Rio San Juan, and a length of the lower Rio Grande centered on the 3 Mexican rivers (Figure 2). Bordering the lower Rio Grande, Hidalgo, Starr, and Zapata counties collectively appear to be the northern limit of its distribution, and

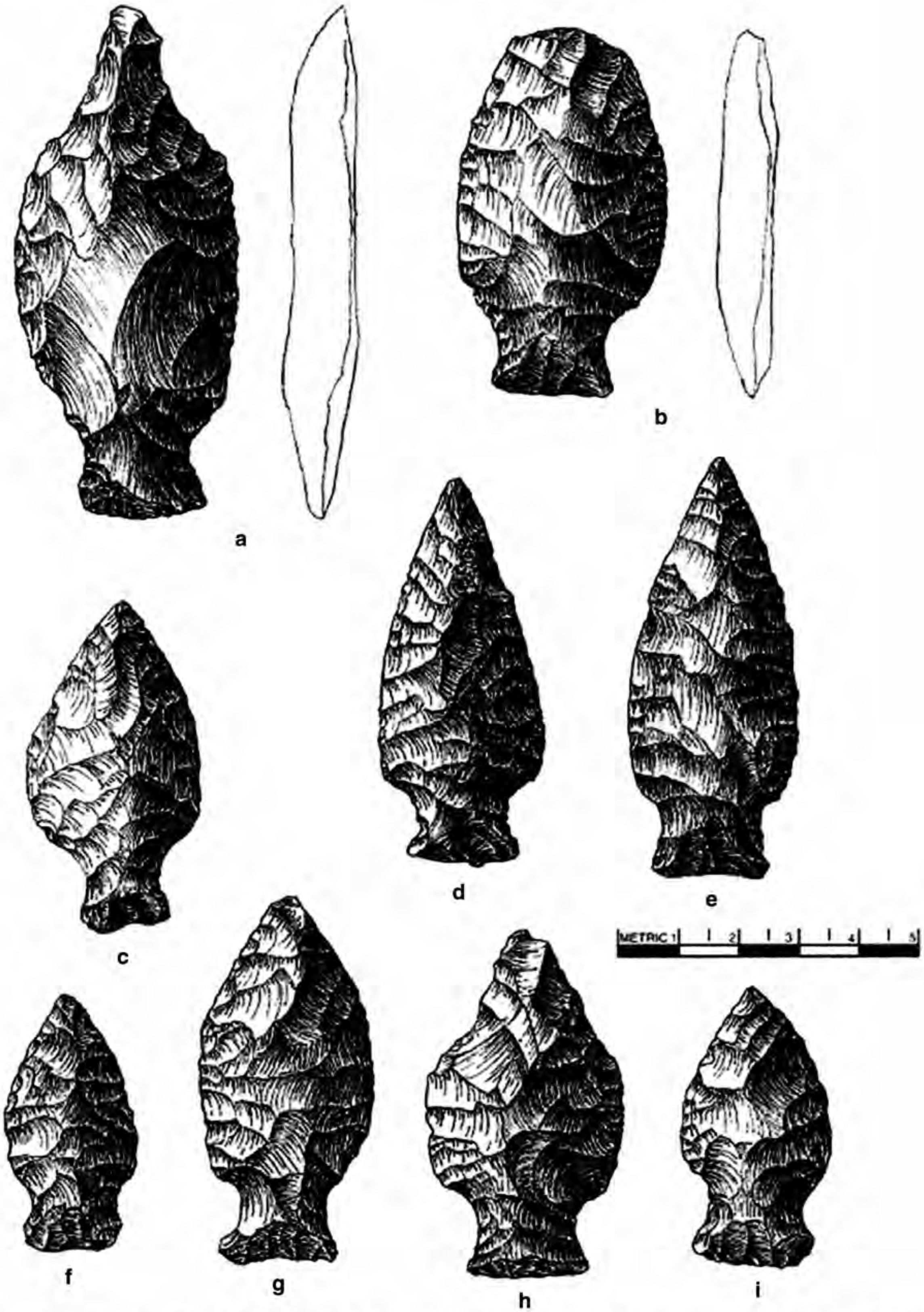

Figure 3. Hidalgo points, a (from 41ZP154) and b (from 41HG142) are notably plano-convex, a, c, i, Zapata County; b, d-f, h, Hidalgo County; g, Starr County.

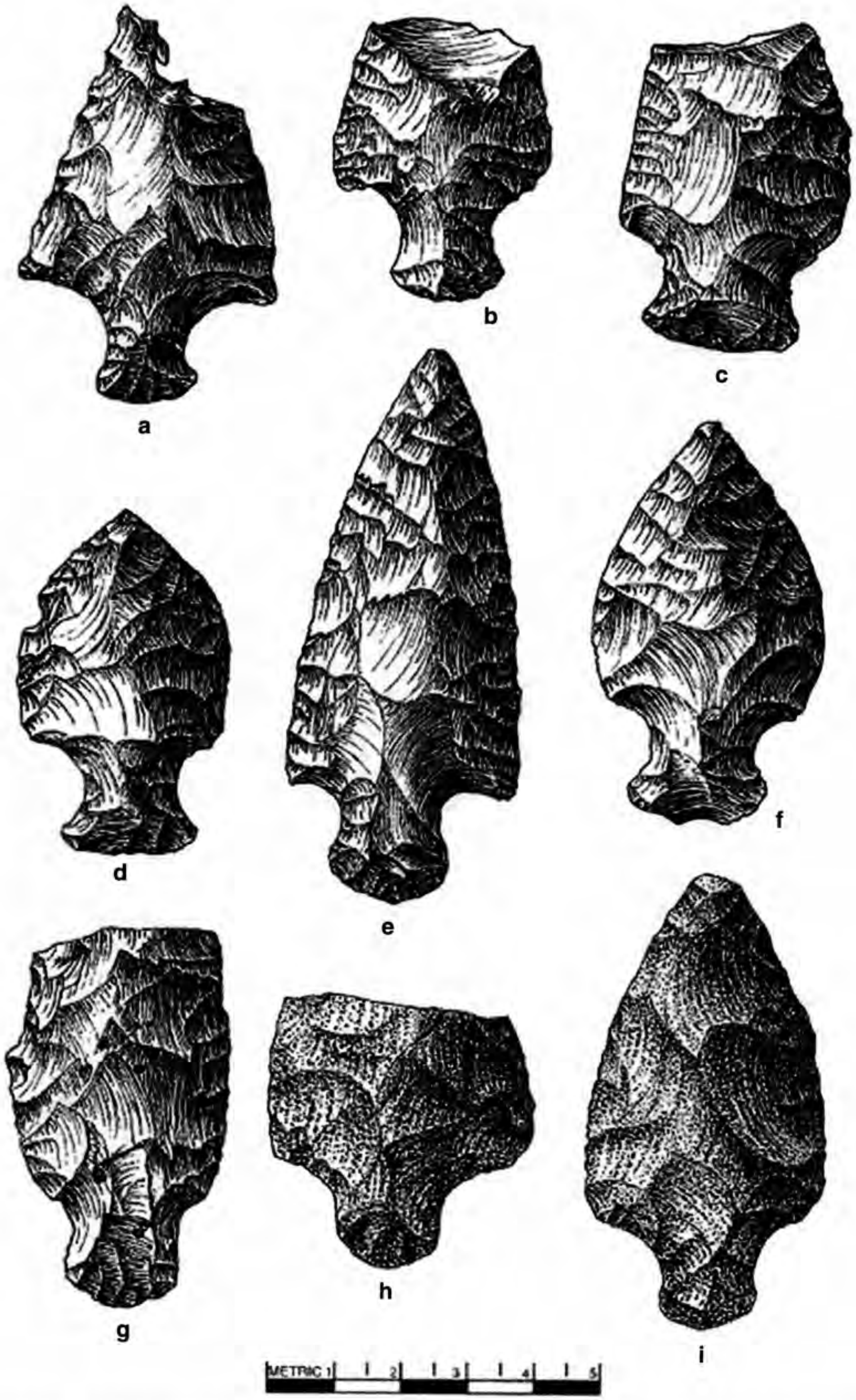

Figure 4. Hidalgo points; a-f are more strongly shouldered specimens; e is from 41SR137; a-b, e, i, Starr County; c, Hidalgo County; d, f, h, Zapata County; g, Nuevo Leon.

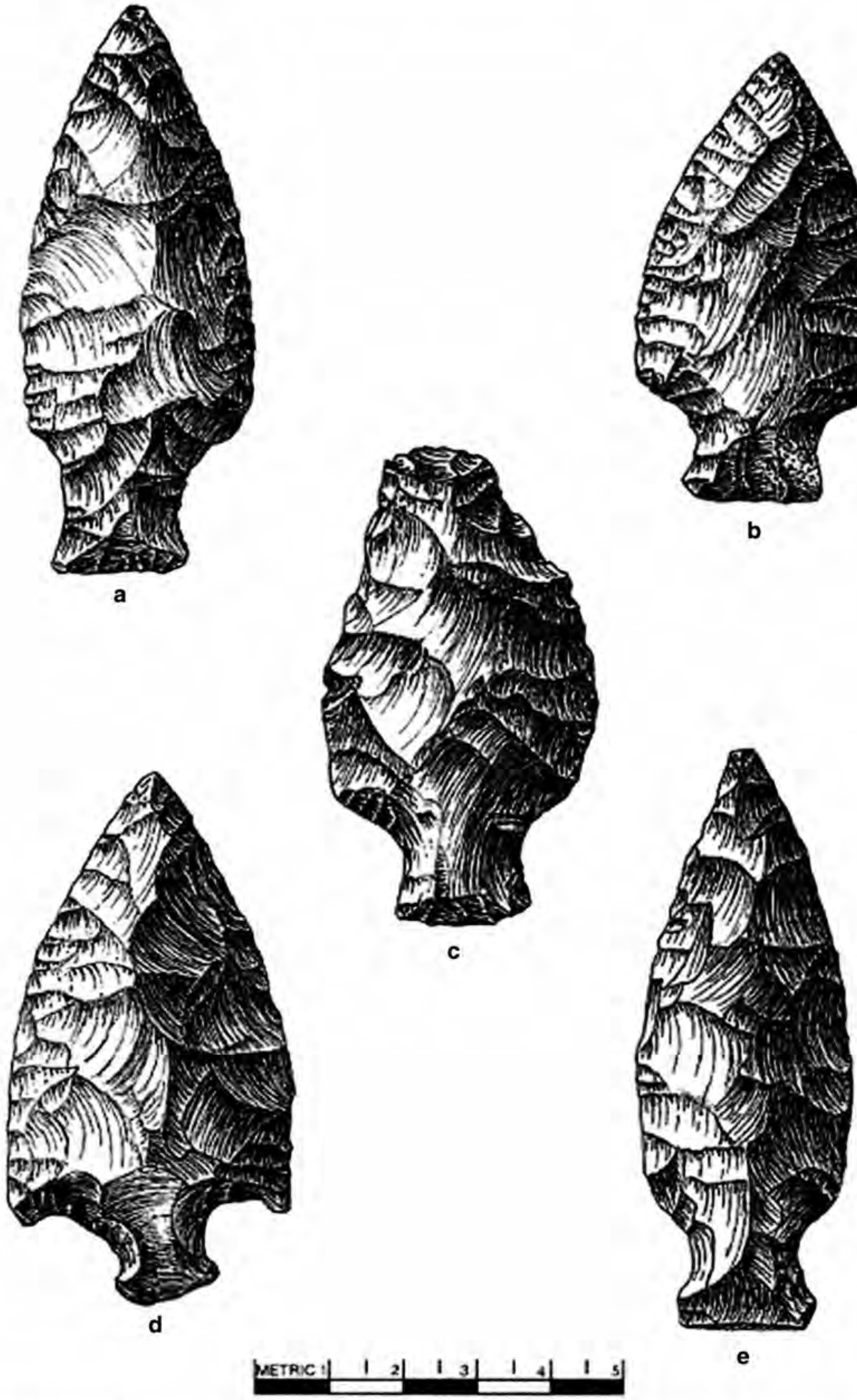

Figure 5. Hidalgo points. Some specimens (a-b, e) have stright basal edges; d is believed to be reworked on a broken distal end; a, d, e, Tamaulipas; b, Zapata County; Starr County.

Hidalgo points are apparently found in only the western portions of Hidalgo County (none have been reported east of Edinburg). In Mexico, specimens have been found in northern Tamaulipas and northeastern Nuevo Leon to approximately 30 miles south of the Rio Grande. This paper includes only 2 Hidalgo points from Nuevo Leon, but previously examined collections that contained specimens from the northeastern part of that Mexican state are no longer available to the authors; 11 of the 41 specimens are from Starr County, 9 from Zapata County, 10 from Hidalgo County, and 9 are from Tamaulipas.

DISCUSSION

Eleven of the 41 Hidalgo points are manufactured of a distinctive pale grey but sometimes colorful chert (identified as opalized tuffaceous bentonitic clay) outcropping north of Rio Grande City in Starr County (Mallouf and Tunnell 1979). The material in Starr County was named El Sauz chert by Bob Mallouf (Banks 1990: 50-51), but there are apparently undiscovered outcrops of this stone in northern Tamaulipas and/or northeastern Nuevo Leon, Mexico (senior author's personal experience). Two of the 30 remaining Hidalgo points are made of sugar quartzite (Figure 4, h-i), one is made of gold moss agate (Figure 4, f), and the majority of the materials used to manufacture the remaining 27 points are believed to have been taken from local outcrops of Rio Grande gravels.

David Calame (personal communication to Richard McReynolds 2009) remarked that an asymmetrical specimen (Figure 5, d) appears to have been reworked from a broken distal end; it was once a much larger point. There are also larger Hidalgo points that were not available for this paper. During the 1960s, the senior author met a collector who had a frame of Hidalgo points, including a specimen nearly 6 inches in length from the Rio Salado, Tamaulipas.

The heavy patina seen on many Hidalgo points, including those made of sugar quartzite, suggests a degree of antiquity and specimens have been found in sites with one or more Paleoindian components. In Zapata County, one Hidalgo point with a heavy patina (Figure 3, a) was found in the same site (41ZP154) as multiple specimens of Golondrina, but the site also contained points from Archaic periods (Turner and Hester 1999). Shiner (1983) apparently recovered Archaic dart points, one Scottsbluff, and two Hidalgo points at the Sheldon site in Hidalgo County.

Regardless of size, Hidalgo points are characteristically thick and sturdy; they appear to have a unique technology, a specific distribution, and to be morphologically distinct from other dart point types in Texas and Mexico.

ACKNOWLEDGMENTS

The authors thank Tom Hester for his comments and help with references, Sue Turner, Harry Shafer, and David Calame for their comments, and John Boland and Bill Yoder for the timely and helpful loan of artifacts. Richard Brady, Doug Bryan, Tracy Keys, Mike Krzywonski, Terry Kumpe, Eugene Pilarczyk, and Tim Savage were also helpful to the completion of this paper.

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Faunal Assemblages from the Batot-Hooker Site (41ME34), Medina County, Texas

Robert R. Rector

EDITOR'S INTRODUCTION

Thomas R. Hester

In 1993, the late Robert R. Rector wrote this paper as part of course requirements for a zooarchaeology seminar at The University of Texas at San Antonio (UTSA), taught by Dr. Marilyn Masson. Dr. Masson knew that I had directed UTSA summer field school at 41ME34 in 1987, and since the faunal remains were derived from 41ME34 collected housed at the Center for Archaeological Research at UTSA, she very kindly provided me with a copy of Mr. Rector's paper. In the late 1990s, Mr. Rector and I discussed some of the results from his analysis, and about 5 years ago, I suggested that the paper be edited and then published in *La Tierra*. An untimely and unexpected death prevented this from being done by the author.

In the version of Rector's study, as published here, some extensive revision has been done to include and update data on the site itself, along with additional research and publication. Giving the time restrictions inherent in a one-semester seminar, he sampled about 50% of the available 41ME34 fauna. This was a laudable effort that produced a good bit of important information. Unfortunately, Mr. Rector did no analysis of faunal remains found at the block excavation—Units G and I, 2 x 2 meter squares, and J and K, 1 x 1 meter units adjacent to G and I [see Figure 3]. This was a very interesting Late Prehistoric locale, with Perdiz, end scrapers, beveled knives, bone-tempered pottery and fragments of bison and doubtless other species. It thus sounds like a typical Toyah Horizon campsite, although mixed among these materials (exposed and piece-plotted) were Edwards, Scallorn, and Frio points (cf. Brownlow 1998) I really hope that faunal analysts at UTSA or at other academic or research settings, will take on the important block excavation fauna.

While I have worked hard to preserve Mr. Rector's style and format, I have added quite a number of facts and observations within the text. He never visited the site and had not seen the earlier publications in *La Tierra* at the time this was written in 1993.

INTRODUCTION

In summer. 1987, The University of Texas at San Antonio conducted an archaeological field school at the Batot-Hooker Ranch in Medina County, Texas, under the direction of Dr. Thomas R. Hester. To date, Hester (1987, 1990, 2010) and Brownlow (1998) constitute the main reports from the excavations. The focus of the present paper will be to attempt to assess the faunal remains recovered at the site and identify the types and quantities recovered, and possibly consumed or utilized at the site during its period of occupation, and any anomalies that might be present to suggest any correlation to subsistence activities.

THE NATURAL SETTING

The Batot-Hooker Site (41ME34) is located five miles south of the present day city of Hondo, Texas, in southern Medina County (Figure 1). Medina County is located on the southern edge of the Edwards Plateau, however, the Batot-Hooker Site is located in a transitional region that could be closely associated

Figure 1. Location of Medina County in the State of Texas.

with the region of Texas known as the South Texas Plains (Biessart 1985) by today's vegetational patterning. It is entirely possible that before European encroachment and over-grazing of the area, the countryside much more resembled an Oak Savannah with open parklands that would have attracted large herds of grazing animals (Weniger 1984).

The site is located at 900' MSL and currently is surrounded by mesquite, oaks, various species of cacti and grasses. The terrain can be considered as a gently rolling plain integrated with numerous creek bearing valleys extending to open flatlands.

DESCRIPTION OF THE SITE

The site is located on the north and south sides of a of a ranch road, running parallel to, and on the north side of a spring-fed tributary. A well-preserved historic structure is just to the west, doubtless placed there because of the spring. A few historic artifacts were recovered in the upper deposits of the site probably related to that structure.

The creek which is associated with the site is a small tributary of Live Oak Creek, which feeds into East Branch Creek to its north. According to the USGS topographical map (Hondo 7.5), nearby hilltops reach 924' MSL sloping to the creekbed at 850' MSL (Figure 2).

Eleven units were investigated at the site (Figures 3-8) in addition to two test pits.The majority of the excavations took place on the north side of the creek. Known as the "Mesquite Area," there were two excavation locales, one that revealed a Transitional Archaic occupation (Figure 7) and the block excavation just to the north (Figure 2). One unit (Unit H) was excavated to a depth of 130 cm on the north side of the creek (Figure 8).

Certainly the spring (or springs) at the head of the small creek was a primary attraction for both Native American hunter-gatherers and historic Angloeuropean settlers. It is unfortunate that the springs and deposits around there were dug, to excess, by a backhoe in a reckless search for reputed Spanish "silver."

FAUNAL ANALYSIS

Sampling Methodology and Approach

Initially a sampling method was selected intended to evaluate 100% of all faunal remains recovered at the site. The site data records were inspected and a map was made of the unit blocks investigated by the 1987 field school participants (Figure 3). Nine two meter by two meter units were laid out and designated units A,B,C,D,E,F,G,H and I, while 2 one meter by one meter units were designated J and K. The two meter by two meter units were then subdivided into quadrants (NE, NW, SE and SW) and excavated accordingly. Records of each 1 x 1 unit were maintained separately from its adjoining unit within same 2 x 2 main unit.

Since the initial research model was intended to count and identify all faunal remains recovered, steps were taken to retrieve all level bags from the site collection which contained faunal remains. Faunal remains were then removed from their respective bags and labeled accordingly for return after the faunal analysis was completed. Not all level bags contained faunal remains, and those that did (N=79) were sorted by unit designation and excavation level to determine an inventory assessment of the entire faunal collection.

Upon completing this task, it was determined that the quantity of faunal remains recovered might be too extensive for an adequate assessment in the time allotted for this project. An alternate strategy was adapted which was intended to address multiple goals.

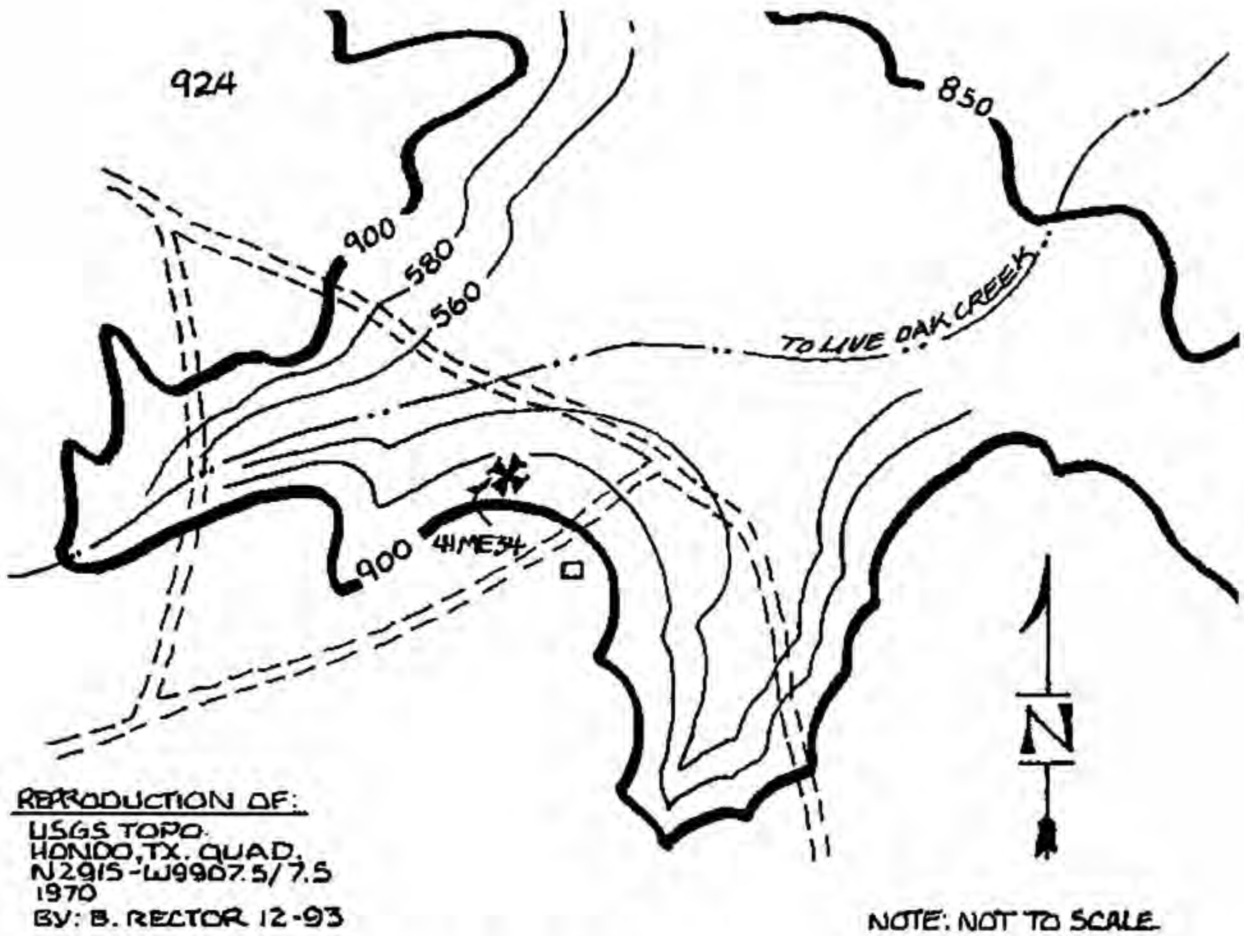

Figure 2. Location of Site 41ME34 in Relationship to the Surrounding Terrain.

Of primary concern was the evaluation of the types of taxa used at the site, with special emphasis on the percentages of species with available usable and non-usable parts and biomass calculations. Considerations should also made as to the subsurface deposits and any anomalies such as changes in species usage, distribution in remains, and cultural markers associated with the remains recovered. Attention should also be paid to any indicators of specialized activity areas such as cooking, processing or disposal locations, however, this may be difficult to determine due to the limited number of samples that could be evaluated in the time allotted.

A random sample was considered for selection of level bags to evaluate. However this type of sample may not provide a database which would address issues of site patterning or spatial composition within the site, nor address issues about the site's history with any form of organization. It was ultimately decided that (A) since the arrangement of the excavated units at the site were basically in four clusters throughout the general area of the entire site, a representative sample from each cluster would be appropriate for that area of the site, and (B) the units selected in the cluster should extend to levels equal to units in other clusters, and (C) artifacts found within those different levels would aid in an attempt at associated dating of the faunal remains found at those levels.

Units A/SE and SW, B/NE and SE, D/SE and NE, and H/NE and NW all extended to 40 cm in depth, so these were chosen for our selected sample group (Figures 3, 4). My sample group consisted of 33 level bags (42%) with 46 (58%) unsampled level bags remaining for further investigation in the future. I feel that this percentage (42%) will represent an adequate sample for faunal evaluation at the 41ME34 site.

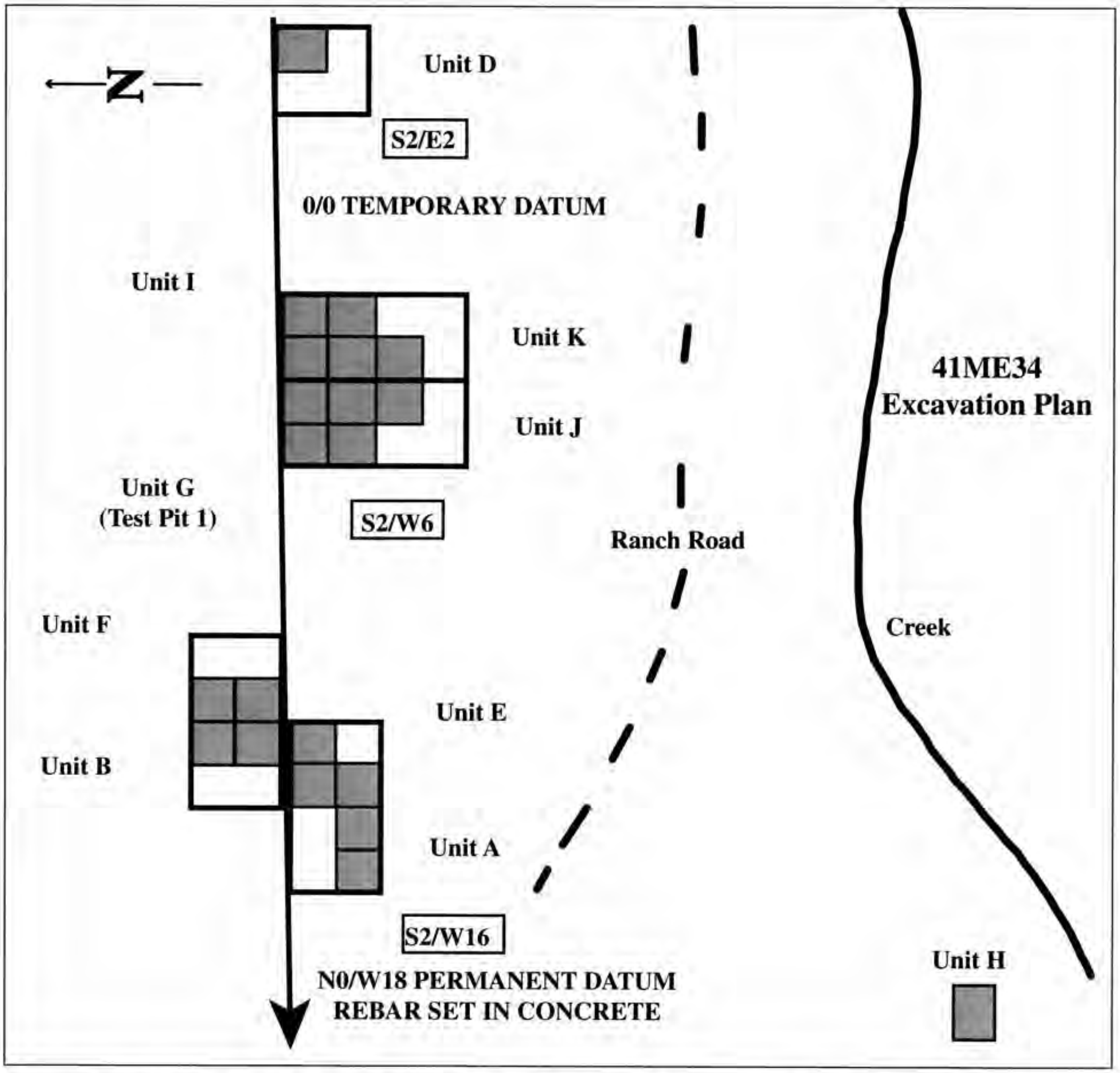

Figure 3. Plan of Excavations at 41ME34. Areas in gray are units from which the faunal samples were obtained.

The evaluation to examine assemblages by 10 cm levels is an attempt to assess issues concerning the history of the site, and it is recognized that the 10 cm depths do not necessarily reflect specific occupational zones, and that erosional and other natural forces may be a factor in deposits at those levels. However, a comparison of deposits at different depths in different units may prove useful in site formation observations or changes in faunal usage throughout the site's history, especially if artifactual assemblages reflect different occupational periods.

Procedures

When each level bag was inspected in the laboratory, individual elements were identified by cross comparison with the faunal collection at the CAR lab or by identification with mammalian osteology text (Gilbert 1990) and by fish, amphibian and reptilian text (Olsen 1968), or by other reference material available. When positive identification could not be assessed, a consultation with Dr. Marilyn Masson (our zooarchaeology instructor) would aid in identification. Those

Table 1. Laboratory Raw Data Sheet for Initial bone count analysis.

Area	Unit	Level	Bag #	Species	Ct.	Element	Side	Portion	Size	Wt. (g)	Breaks	Cuts	Burned?	Juv.?	Comments

faunal remains which were too badly decomposed or damaged to be identified by element were inventoried and recorded according to species (i.e. lg. mammal, sm. mammal, testudines, etc.) and type of fracture and type of bone. Once the contents of each level bag was sorted and identified, all information was entered on a raw data sheet (Table 1) which included all relevant criteria for each faunal sample. This information was then transferred to a computer program (Lotus 1-2-3) where formulas could be used in calculations to assess percentages of counts, weights and biomass of faunal remains within the sample groups.

For my evaluation of the four sample groups at 41ME34, I divided my entered data into 3 categories. Category 1 was a total inventory of all taxa, elements, counts, weights, and biomass with percentages of all faunal samples from each unit, along with descriptions and comments as were recorded on the raw data sheet in the lab. This provided a detailed account of all items inventoried from the 33 sample bags by unit and cm level. Category 2 summarized and simplified Category 1 by listing unit group designations by total counts of taxa, thus eliminating the categories of broken elements. By this method, diagnostic elements can be identified and non-diagnostic elements listed, but not handled as an individual item as in Category 1. Percentages and biomass calculations can still be made according to total count and weight, but by species instead of by element (Table 2).

Category 3 sorts the taxa by count and weight per unit and level designation. By separating the species in this manner, frequencies of increased taxa usage can be charted to measure below surface deposits of species per unit throughout the history of the site. The data in these three categories can be cross-compared manually to formulate an assessment of faunal remains present by unit designation as well as by intrasite location (Table 3; note that this table lists only the large mammal categories, since smaller mammals and other taxa composed a small percentage (25%) of the total

Table 2. Total Taxa Recovered.

Taxa:	Count	%	W	%	Biomass	Pounds	%	Comments:
Bison- (Bison bison)	110	16.8971	262.92	43.06563	3961.33	15.6204	42.0624	
Antelope- (Antilocapra)	33	5.06912	27.02	4.425808	511.113	2.01543	5.42712	Poss. Deer Except For Pos Ids.
Deer- (Odocoileus Virginianus	320	49.1551	295.53	48.40707	4400.9	17.3537	46.7298	Poss. Antelope Except For Pos. Ids.
Red Fox- Vulpes vulpes)	1	0.15361	0.01	0.001638	0.41687	0.00164	0.00443	Juvenile-Pos. Ids,
Raccoon- (Procyon lotor)	2	0.30722	0.02	0.003276	0.77791	0.00307	0.00826	
Coyote- (Canis latrans)	2	0.30722	0.31	0.050777	9.16696	0.03615	0.09734	Poss. Other Canine Sp.
Badger- (Taxidea Taxus)	1	0.15361	2	0.327595	49.0825	0.19354	0.52117	
Human- (Homo Sapiens)	1	0.15361	0.7	0.114658	19.0804	0.07524	0.2026	Biomass?
Jackrabbit- (Lepus californicus)	3	0.46083	0.12	0.019656	3.90178	0.01539	0.04143	
Cottontail- (Sylvilagus floridanus)	3	0,46083	0.22	0.036035	6.73256	0.02655	0.07149	
Cottonrat- (Sigmodon hispidus)	8	1.22888	0.09	0.014742	3.01175	0.01188	0.03198	
Turkey- (Melagridae gallopavo)	3	0.46083	0.52	0.085175	38.3652	0.1S128	0.40737	
Rattlesnake- Crotalus atrox)	3	0.46083	0.03	0.004914	0.39985	0.00158	0.00425	
Turtle- (Testudines)	4	0.61444	0.04	0.006552	3.65915	0.01443	0.03885	
Mammals	21	3.22581	0.21	0.034397	6.4565	0.02546	0.06856	
Sm. Mammals	136	20.8909	20.77	3.402074	403.36	1.59054	4.28297	
Totals:	651	100	610.51	100	9417.76	37.1363	100	

faunal assemblages. The complete Table 3 listing is available on the attached computer printout.)

Results of the Faunal Evaluation

In the sampled units that were excavated to a depth of 40 cm and which comprised our sample groups, 651 bone samples were recovered weighing 610.51 grams and representing 14 different taxa. The majority of the bone recovered was in the form of splinters, flakes and other fragments of an unidentifiable nature other than that they were from large or small mammals. The highest bone count percentages appear to come from Artiodactyla species (71.06%) such as White-tailed Deer (Odocoileus virginianus), Pronghorn Antelope (Antilocapra americana) and Bison (Bison). The next largest percentage of mammal remains (20.89%) were those of smaller mammals and other species such as rabbits, rats, turtles, snakes and birds (4.69%). Percentages of bone counts, bone weights and biomass calculations from all taxa recovered can be seen in Figure 4.

Aside from identified Bison, Antelope and Deer elements, smaller mammals present at the site included Red Fox (Vulpes vulpes), Coyote (Canis latrans), Raccoon (Procyon lotor), Badger (Taxidea taxus) and one possible Human element (left second thumb phalange). Other small species present included Jackrabbit (Lepus californicus), Cottontail Rabbit (Sylvilagus floridanus) and Cotton Rat (Sigmodon hispidus). Four Turtle (Testudines) fragments, three Wild Turkey (Melagridae gallopavo) fragments, an unidentifiable bird (Aves) phalange (i.e. Hawk or similar sized bird) and three Diamondback Rattlesnake (Crotalus atrox) vertebrae concluded the balance of the identifiable taxa from the sample groups (Table 2).

When bone weights are compared (Figure 4), Bison and smaller Artiodactyla (Deer and Antelope) represent the largest percentage (95.4%). Biomass calculations also show that the largest percentage of usable meat (94.37%) came from Bison, Antelope and Deer, while smaller mammals and other taxa represented only 5.63% of the biomass present.

NISP, MNE & MNI CALCULATIONS

Of the 610 NISP counted (Number of Identifiable Specimens), only a few (N=42) were reliable enough to formulate a MNE (Minimum Number of Elements) count (Table 4), since most remains had been broken apart, apparently to retrieve marrow or other edible portions for consumption, boiling to retrieve the fat or were destroyed during the butchering process. Thirty-two bone fragments out of the 610 (5.25%) had burn marks, and only 3 Bison and 4 Deer bones (N=7) had obivious cut marks (1.15%), however it was apparent that the fragmentation of most bones was by human means, since numerous long bones showed signs of impact scars. One worked bone fragment appeared to have been polished and may have been utilized as a pin or an awl (level bag BSE2). No evidence was seen to suggest bone boiling for fat recovery was done, however this does not mean it was not practiced.

There were enough identifiable elements to attempt an estimate of MNI (Minimum Number of Individuals) present at the site (Table 5). Of the 42 MNE recovered, a calculation of Maximum Animal Unit (MAU) ratios suggested that one Bison, one Antelope (aged 2-3 years by tooth eruption), three Deer aging 61/2 and 71/2 years and one fetal (Davis 1990), in addition, a juvenile fox, and one each of raccoon, badger, coyote, jackrabbit, cottontail, cotton rat, turkey, turtle and one rattlesnake was present at the site. All total, there were 17 identifiable animals that either were killed or consumed at the site, or were there by natural circumstances, and are not related to human activity. The presence of one human phalange does not necessarily infer that human meat consumption was practiced at the site.

It must be taken into consideration that these MNI calculations are based only upon the four sample units dug to a depth of 40 cm, and the probability that these elements used to calculate the MNI total are from multiple animals deposited through time. A calculation of elements recovered at similar levels would yield a more precise estimate of actual animals in camp at an occupational episode within a shorter time span.

FAUNAL REMAINS BY UNIT LEVELS

One of the reasons for attempting this particular sampling method, was to observe bone deposition through time during the site's formation processes.

Table 3. Faunal Deposits by Unit Level Designations

Unit	Bison	Wt.	Biomass	Antelope	Wt	Biomass	Deer	Wt.	Biomass
Surface to 10 cm									
A-SE,SW	7	44.51	900.962	0	0	0	13	17A	338.607
B-NE,SE				0	0	0	17	&S	338.607
D-NE,SE				0	0	0	5	1.91	47.0901
H-NE,NW	3	4,9	109.945	0	0	0	7	1.61	40.3779
Totals:	10	49.41	910.907	0	0	0	42	27.42	76 4.6B.5
10-20 cm									
A- SE,SW	37	86	1448.93	0	0	0	45	27.97	527.258
6- NE,SE	35	55.7	980.098	0	0	0	55	42-3	765.079
0- NE,SE	5	9.1	191,928	0	0	0	21	21	407.378
H-NE,NW	12	46,31	830.0515	0	0	0	44	40.8	740.618
Totals	89	197.11	3451.02	0	0	0	165	132.07	244.033
20-30 cm									
A- SE,SW	0	0	0	0	0	0	18	9.62	182.792
E.- NE,SE	0	0	0	10	2.42	58.2585	8	11.8	242.49
D-NE,SE	4	5	111.963	0	0	0	18	24.6	469.723
H- NE,NW	1	3.6	83.3052	23	24.6	469.7228	11	10.3	214,562
Totals	5	8.6	195.268	33	610.011	527.9913	55	55.32	1109.57
30-40 cm									
A- SE,SW	0	0	0	0	0	0	1	0.6	16.6087
S-NE,SE	0	0	0	0	0	0	5	2,11	51.2858
0-NE,SE	5	7.8	167.065	0	0	0	29	67.9	1171.34
H- NE,NW	0	0	0	0	0	0	5	1.61	40.3779
Totals:	5	7.8	167.065	0	0	0	40	72.21	1279,61

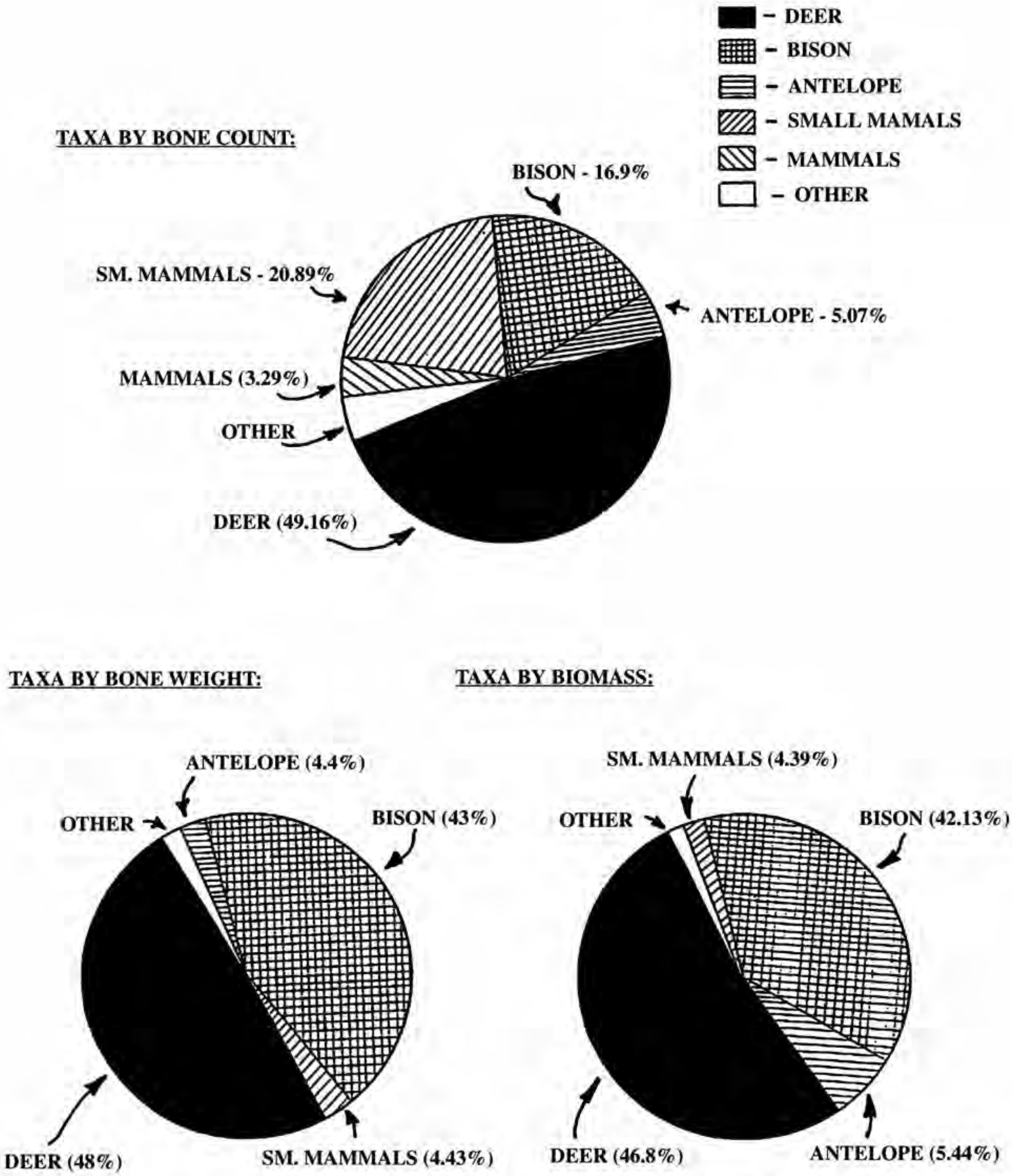

Figure 4. Total Percentages of Faunal Remains from the Four Sample Groups from 41ME34, Level 4, by Bone Count, Bone Weight, and Biomass. Partial units A, B, D and H were source of the samples.

Since large and small mammals appear to be the largest faunal resource used, a series of graphs were prepared to compare their frequencies through the sub-surface strata.

Since units A and B (Figures 5, 6) were within a one meter proximity of each other, they shall be compared first. In both units, the greatest number of deposits occurred within level 2 (10-20 cm) and

Table 4. MNI Counts from 41ME34.

Diagnostic Elements for MNI Count:

Taxa	Unit	Count	Element
Bison	BNE2	1	Tibia
BNE2	1	R.Metatarsal	
BNE2	1	Second Phalange	
BNE2	1	Vertebrae	
BSE2	1	Humerus	
ASE1	1	Metatarsal Frag.	
DSE3	1	Ulna	
HNE2	1	Second Phalange	
Total:	8		
Antelope	BSE3	1	Tooth- Incisor
HNE3	1	Tooth- R. 1st Molar	
HNE3	1	Second Phalange	
HNE3	1	Metatarsal	
Total:	4		
Taxa	Unit	Count	Element
Deer	BSE2	1	Tooth- 3rd Mandibular M
DSE2	1	Tooth- R. Second Molar	
DSE2	1	Tooth- 6th Mandibular M	
BNE3	1	Humerus	
DNE2	1	R. Calcaeneous	
DNE3	1	L.Carpal	
DNE3	1	Femur	
DNE4	1	Astragulus	
DNE4	1	Metapodial-Fetal	
HNW2	1	R. Metacarpal	
HNW3	1	Metatarsal Frag.	
HNW3	1	Tibia Frag.	
Total	12		
Taxa	Unit	Count	Element
Red Fox	ASW2	1	R. Mandible-Juvenile
Raccoon	HNE2	1	Tooth- R. Canine
Coyote	DNE2	1	2nd Phalange
HNW3	1	Calcaneus	
Badger	DNE2	1	Radius
Human	HNE3	1	2nd Phalange- Thumb
Jackrabbit	DNE4	1	Mandible
Cottontail	ASW2	1	R. Mandible-Juvenile
Cottonrat	ASE2	1	Tooth- Incisor
HNE3	1	L. Tibia	
Turkey	HNW3	1	Femur or tibia
Rattlesnake	DNE2	1	Vertebrae
DNE4	1	Vertebrae	
HNE4	1	Vertebrae	
Turtle	HNE3	1	Carapace Frag.
Avis	HNE3	1	2nd Phalange- Poss. Hawk

Table 5. MNI Counts from 41ME34.

Minimum Number of Individuals Estimated by Identifiable Elements

Taxa	NISP	MNI Description:
Bison	8	1
Antelope	4	1 2-3 Yrs.
Deer	12	3 71/2 Yrs.R 61/2 Yrs.) 1 Fetal
Red Fox	1	1 Juvenile
Raccoon	1	1
Coyote or Canine	2	1
Badger	1	1
Human	1	1
Jackrabbit	1	1
Cottontail	1	1 Juvenile
Cottonrat	2	1
Turkey	3	1
Rattlesnake	3	1
Turtle	1	1
Avis	1	1
Totals	42	17

dropped off drastically by level 4. Higher levels of small mammal remains occurred in unit B within the first three levels than in any other unit in the sample groups. The reason for the abnormally high counts in three levels is unclear, since the small mammal counts in unit A (one meter to the south) is relatively low. The reason for the high accumulations of these small mammal remains in 3 levels might be due to high numbers of bone in the lower part of level one and high numbers in the upper part of level 3 or that a large number of small mammals were utilized at one spot, and through animal burrowing or other natural forces, these remains were dispersed throughout this unit.

Antelope remains occurred within level 3 of unit B; as they did in unit H, which is located across the ravine and 16 meters to the south. These were the only two units in which Antelope remains were positively identified. Bison remains only occurred in the top two levels of units A and B.

Unit D (Figure 7), 15 meters to the to the east, showed small quantities of Bison remains in levels 2, 3 and 4; however, Deer tended to remain relatively constant after level 2. Small mammal remains increased as the level depth increased, while Bison remains were low, but nearly equal in frequency. Once again, level 2 showed a higher quantity of faunal remains, however level 4 appears to be high in small mammal faunal assemblages. When considerations are made of the biomass available from small mammals, it is apparent that level 2 would have contained a much higher usable meat ratio than level 4.

Unit H (Figure 8), located 16 meters to the south, had a similar pattern of assemblage types and ratios as units A and D in the top two levels. Level 3 contained Antelope remains, which might correlate with the Antelope remains in level 3 of unit B. Deer counts are low in all 30 cm levels of the four sample groups, and since the similarities between non-diagnostic elements of Deer and Antelope are so great, the possibility exist of misidentification of Antelope bone as deer. Since the Antelope remains were all found at the 30 cm levels, this might be an indicator of a resource shift, or of an influx of that species at that point during the site's formation. Level 4 of unit H was the last level to contain faunal remains even though the unit was excavated to a depth of 130 cm.

When all quantities of faunal remains are totaled together by taxa and unit level (Figure 9) a trend can be seen in frequencies of increased deposits. If we look at the bone frequencies from the bottom of the levels (40 cm) and work up to the surface level (0 cm), different taxa appeared to have been utilized differently. Bison bone counts are relatively low until around the time when the 20 cm deposits were made when they shot up dramatically and slowed down in level 1. Antelope remains are absent until level 3, when they occur simultaneously in two units 18 meters apart. Antelope remains also occur before the increase in Bison remains, suggesting more Antelope in the region than Bison. Deer remained relatively constant, however more Deer remains were present in level 2 indicating high resource presence of all taxa (except Antelope) during that period when the site was occupied. Small mammals showed a similar pattern as did Deer. The mammal bar graph includes all the unidentifiable bone splinters, flakes and fragments of large mammals, suggesting more intense bone breakage to retrieve marrow was occurring at level 4 and level 2.

This paradigm is based upon four factors for this proposed model to work. First, it assumes that equal populations visited the site. Secondly, it assumes that the frequency of visits would be the same throughout the year, and third, groups would have had to rely upon the most available species in the region at that point in time. Finally, all unit levels must experience the same rate of depositional accumulations to insure that the levels are intact by occupational zone. It is recognized that we cannot expect occurrences such as those mentioned above to have remained a fixed constant in the real world. Increased populations, visitations by multiple groups to the same location, and many other factors could be the possible reasons for increases in any particular resource used. However, the possibility exist that annual or climatically stimulated migratory patterns might be responsible for increases in faunal remains at archaeological sites.

In the Transitional Archaic period, Bison migratory patterns were in decline (but still present) in south Texas during the use of Frio dart points (Figure 10), suggesting high frequencies of Bison remains may be a result of hunting activities during the end of Dillehay's Bison Presence II period. Lack of Austin Phase diagnostics may be an indicator of lack of use of the site by hunters during the Bison Absence II period, while Toyah Phase diagnostics (i.e. Perdiz arrow points) may be an indicator of their return during Dillehay's Bison presence III theory.

Although the concentration of this examination has been upon the first four excavated levels of units A, B, D and H, comments need to be made in regards to further excavation of unit H. Below 40 cm, no faunal remains were recovered. However, cultural remains were recovered in level 6 with the discovery of a Clear Fork uniface (level 6), a Tortugas dart point (4670+/-60 B.P.; Hester 1990) in level 9, and a Guadalupe Tool (5730+/-80; Hester 1990) in level 10, and cultural deposits without diagnostics continued to level 13, indicating that the site had been used for centuries before the faunal deposits we evaluated were deposited at the site. The reasons for no faunal remains at the 40–130 cm levels may be due to various reasons—the rate of decomposition due to soil composition, animal foraging activities, length of time on the surface, different subsistence patterns and activity locations may all be factors.

SUMMARY

By NISP inventory and MNE and MNI evaluation, a proposal can be made suggesting that there were 17 individual animals present at the site representing 14 different taxa. Different deposits at different levels below the surface may indicate that many more individuals were present but are still buried beneath the surface or are included in the yet unsampled level bags at the CAR lab. Faunal utilization seems to be mainly of large mammals such as Artiodactyla and Bison, however smaller mammals were being utilized to a limited degree. No fish remains were recovered.

Degrees to which bones were broken to retrieve usable portions, suggest animal parts were exhausted to extract maximum benefit. However, if this was done as a result of resource stresses, we should expect to see increases in the remains of other animal species such as rabbits or other small animals. Small mammals and other small taxa are only 25% of the total bone count and only 4.63% of the available biomass present in the sample group, suggesting these taxa were not as mandatory as a food resource since larger mammals were available with much higher returns for labor invested. The high percentages of larger mammals in bone count and biomass calculations suggest resource

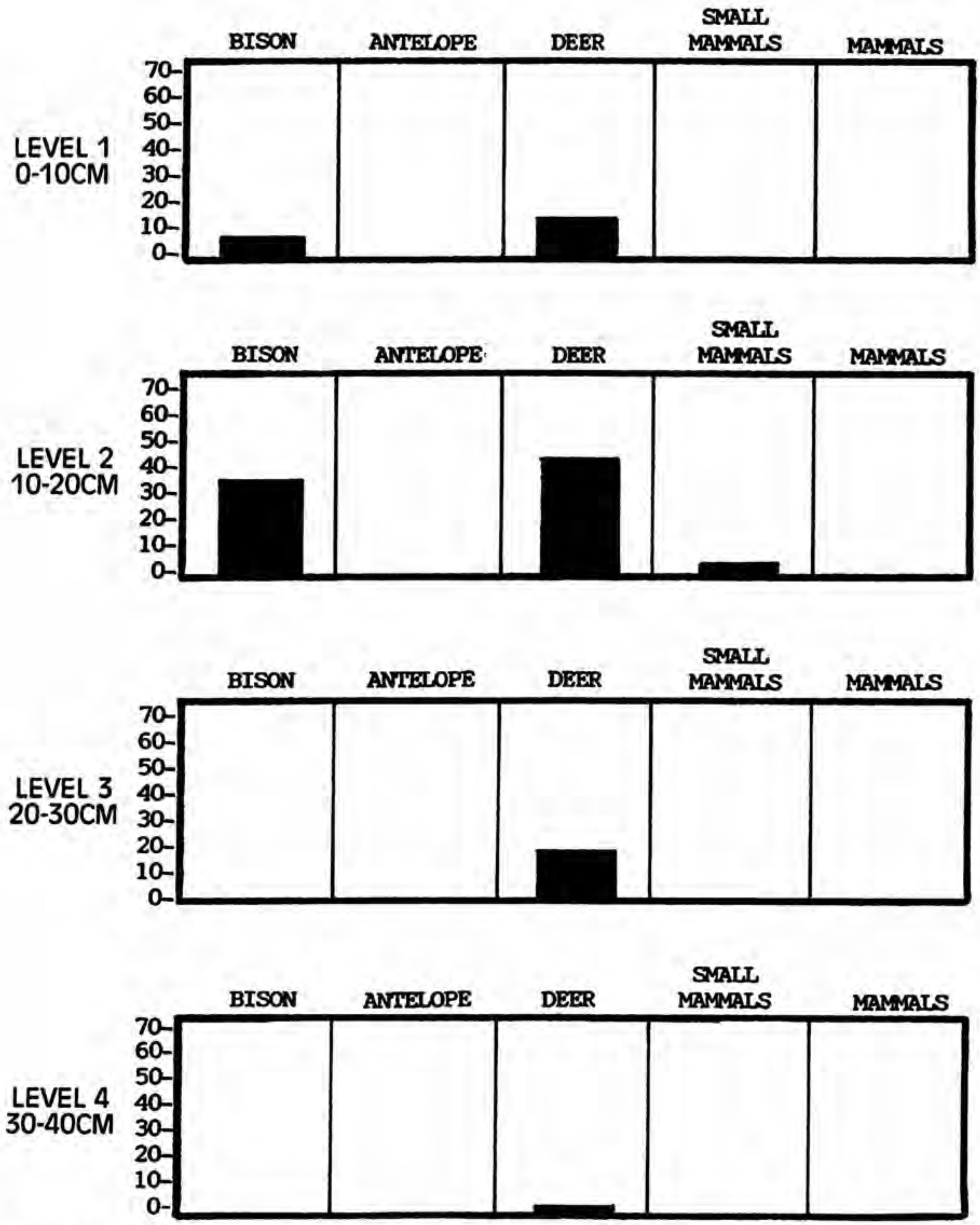

Figure 5. Units A/SE and A/SW bone counts by 10 cm levels.

stress may not have been an issue at the 41ME34 site. Since there were massive quantities of shattered longbones and other elements in the faunal collection from the site, explanations other than resource stress should be considered. Bone marrow is known to have been considered a delicacy in some cultures, and bone can be used for other purposes such as soups, or boiling for fat extraction. All of these uses for bone would

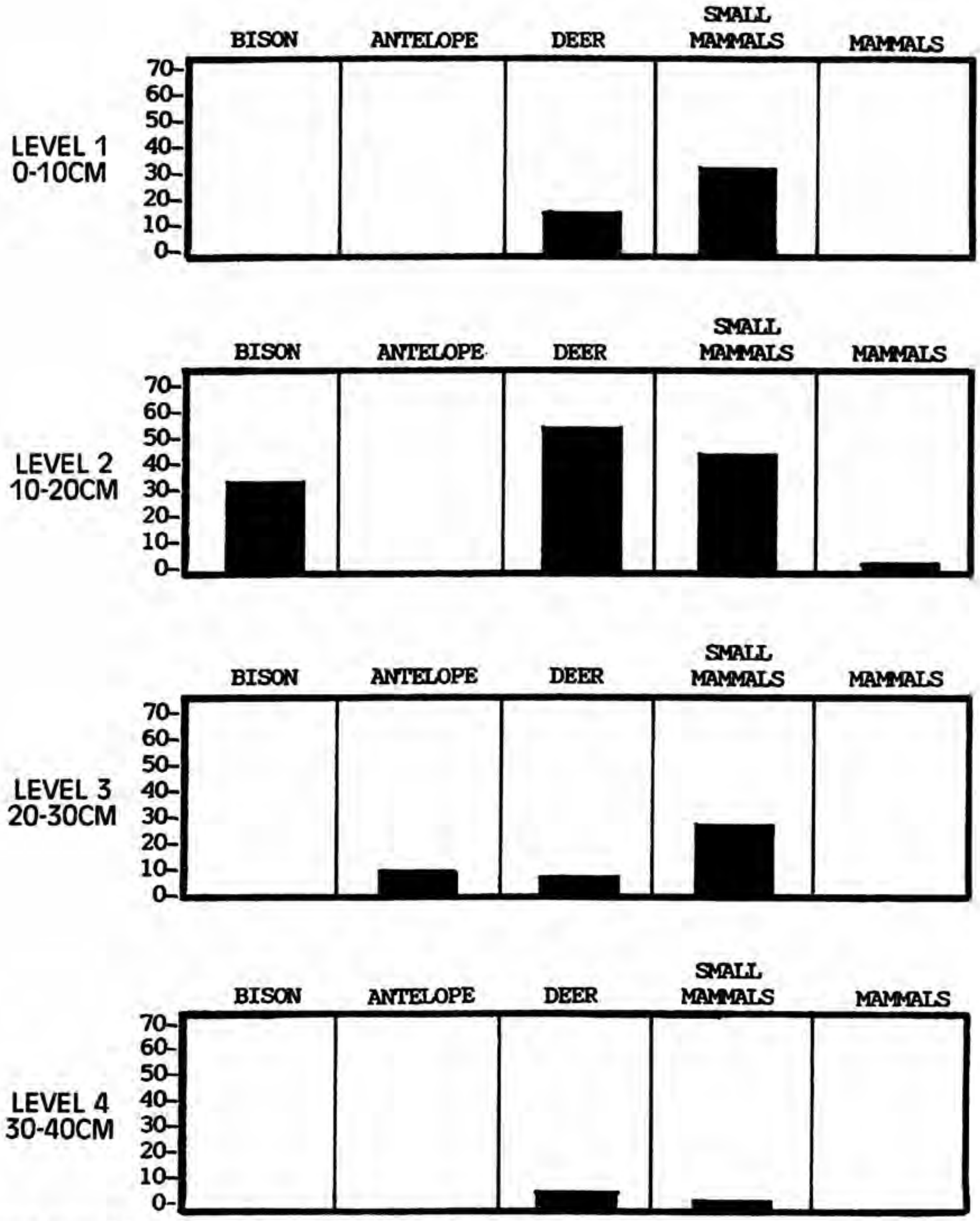

Figure 6. Units B/NE and B/SE bone counts by 10 cm levels.

require breaking the bone for maximum efficiency.

Quantities of long bones were high in the faunal samples suggesting that some animals were killed and butchered elsewhere and transported to camp. Skull fragments, mandible fragments and teeth (i.e. Bison) may suggest that the head portion of the animal was still attached to some of the remains which were transported into camp. Rib and vertebrata fragments present at the site may indicate that those portions might have been favored as a transportable part of the animal, since they are both high in meat and marrow content. Larger mammals such as a 2500 pound Bison would

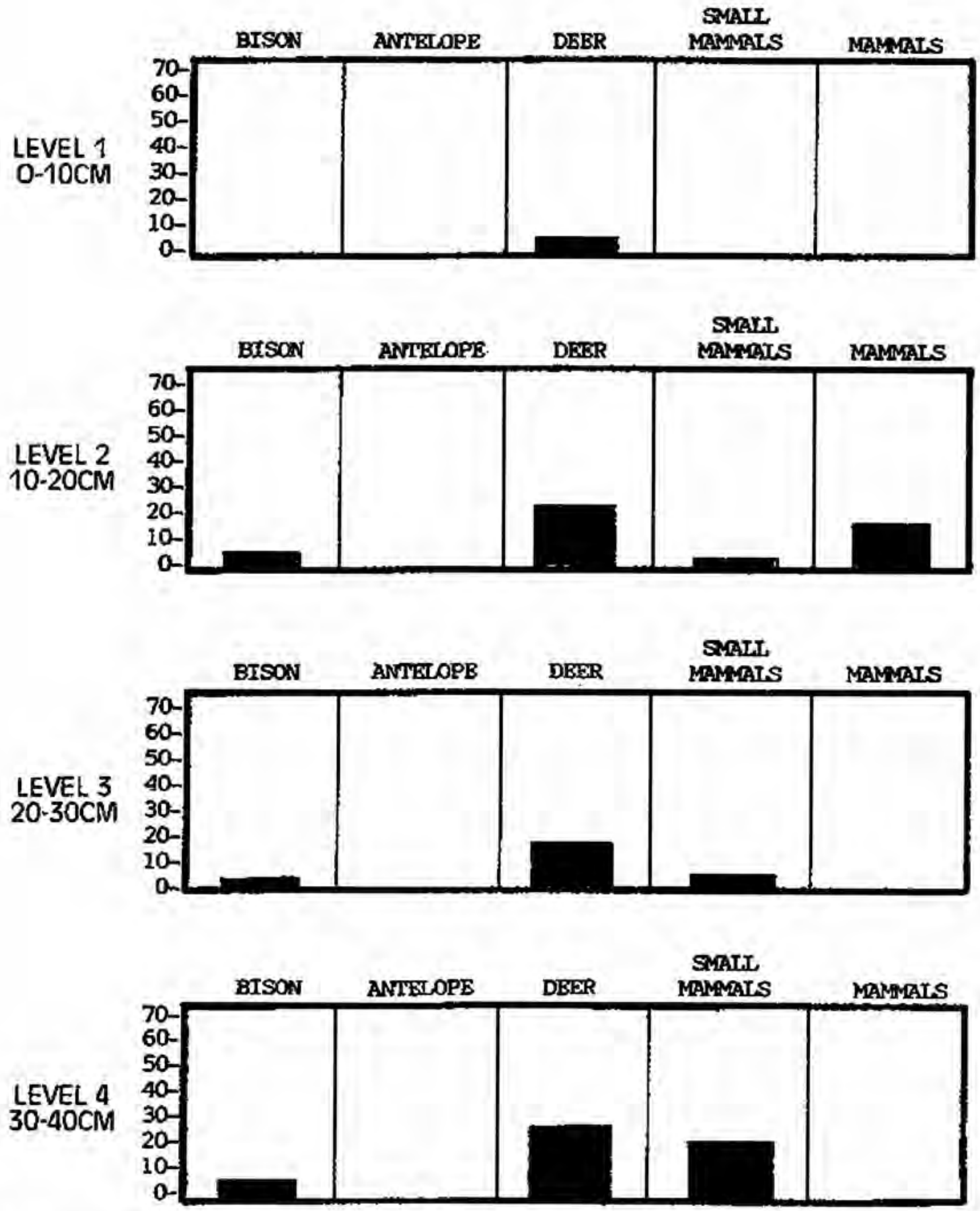

Figure 7. Units D/SE and D/NE bone counts by 10 cm levels.

require butchering on site unless the kill site was close to camp, however Deer or Antelope could easily have been transported without too much effort.

Observations by level deposits seem to suggest that in the early history of the site from level 4 up, Deer and small mammals were utilized, followed by an influx of Antelope, followed by an increase in Bison utilization, which tapered off during Level 1 the in units that were sampled. Bison is also present in the block excavation materials dating to Late Prehistoric times; however, no units/levels were sampled for faunal analysis from that excavation locale.

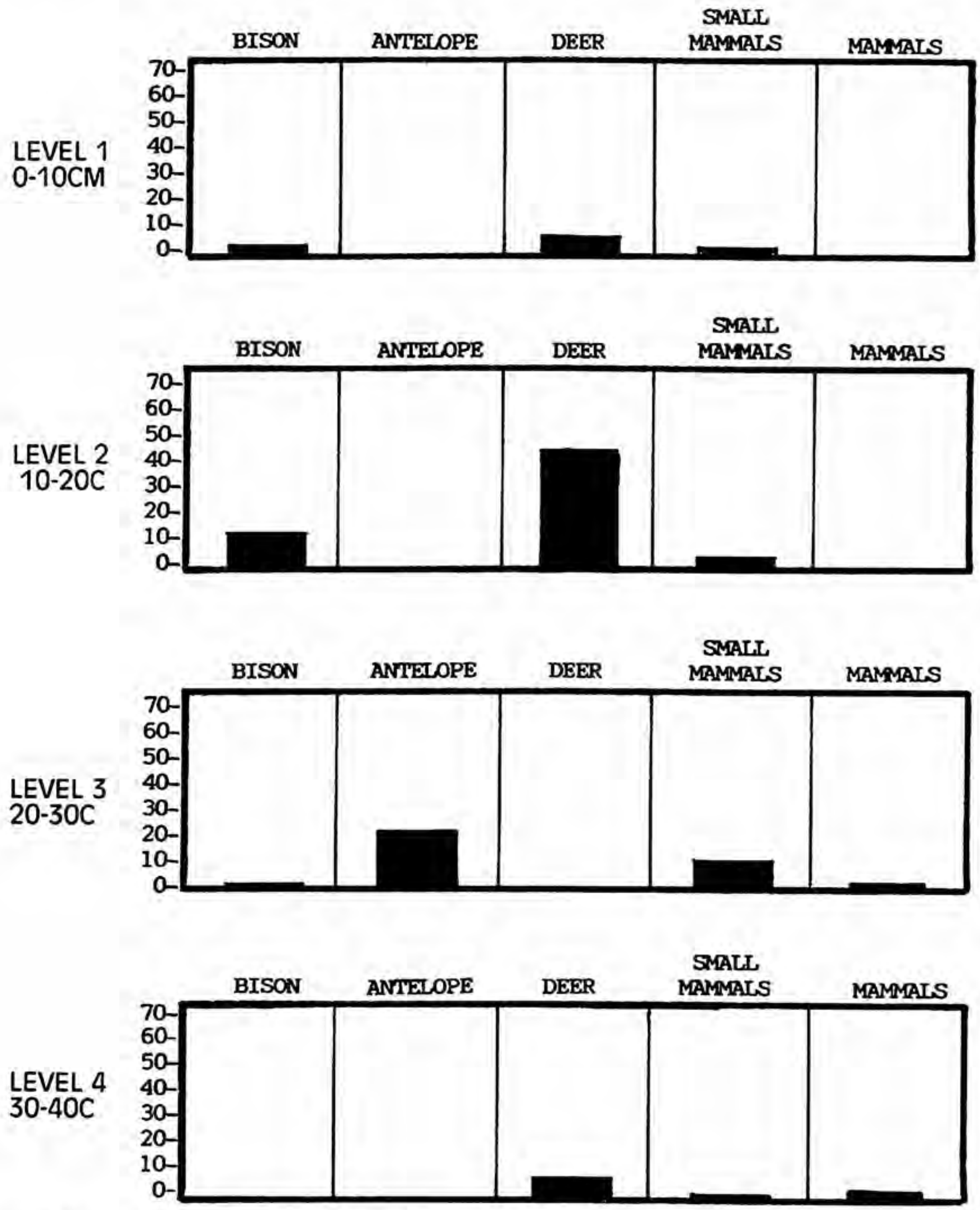

Figure 8. Units H/NE and H/NW bone counts by 10 cm levels.

CONCLUSIONS

The faunal analysis of 41ME34 has shown that a much higher percentage of large mammals was used at the site than were smaller mammals or other taxa. In addition to listing the taxa by bone count, bone weight and available biomass, an attempt was made to investigate the conditions present at the time the remains were deposited to explain why these percentages are at the levels that they appear to be.

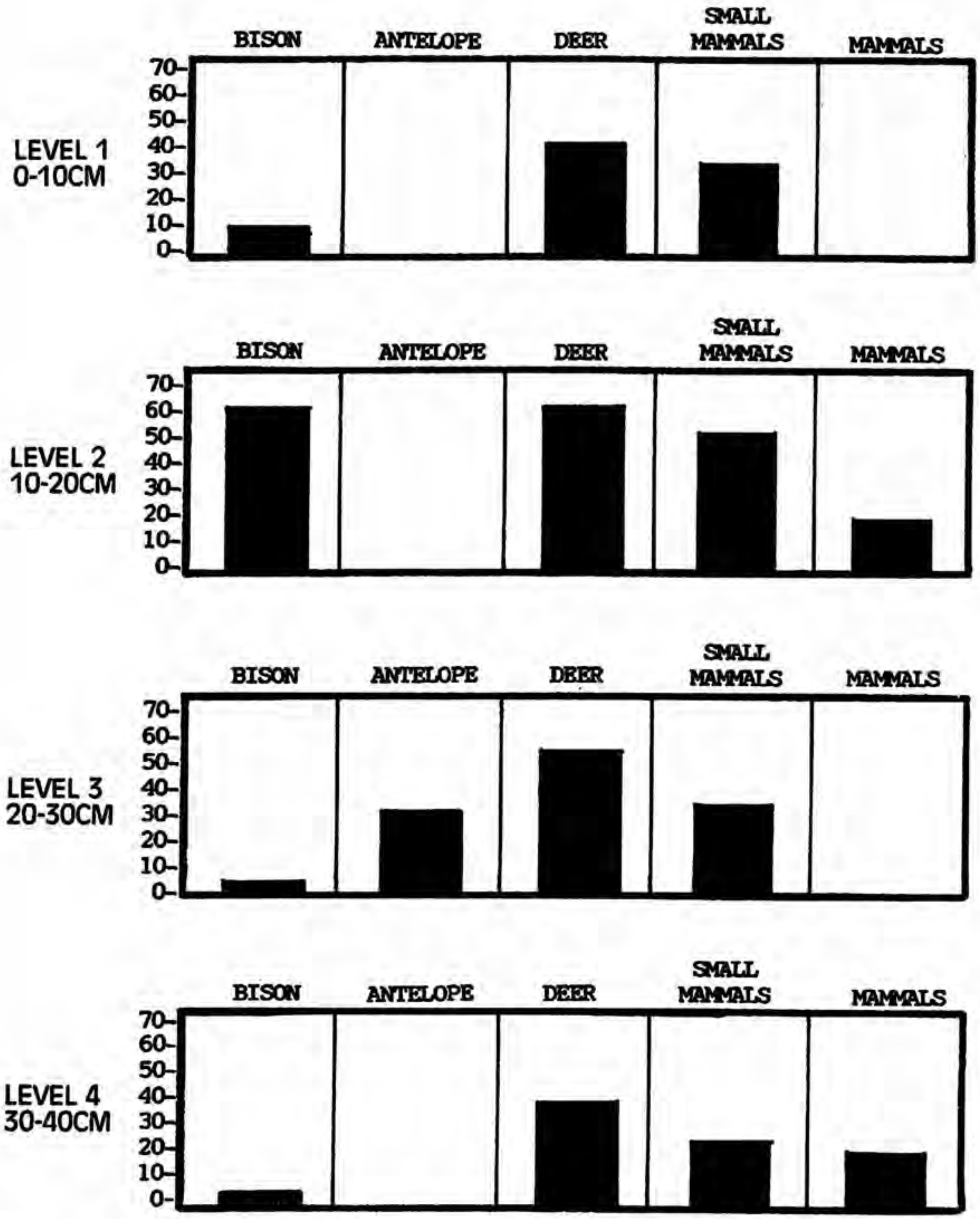

Figure 9. Total bone counts by 10 cm levels from all four sample units.

By associating the faunal assemblages with the chronological period of occupation at the site, a possible explanation was explored to relate bone frequencies with available faunal resources at the time the site was occupied. Since artifact assemblages showed that the top four levels of the site areas sampled for faunal remained date largely to the Transitional Archaic (200 BC-AD 600), and that Bison migratory patterns may have still extended into south Texas, the explanation of high quantities

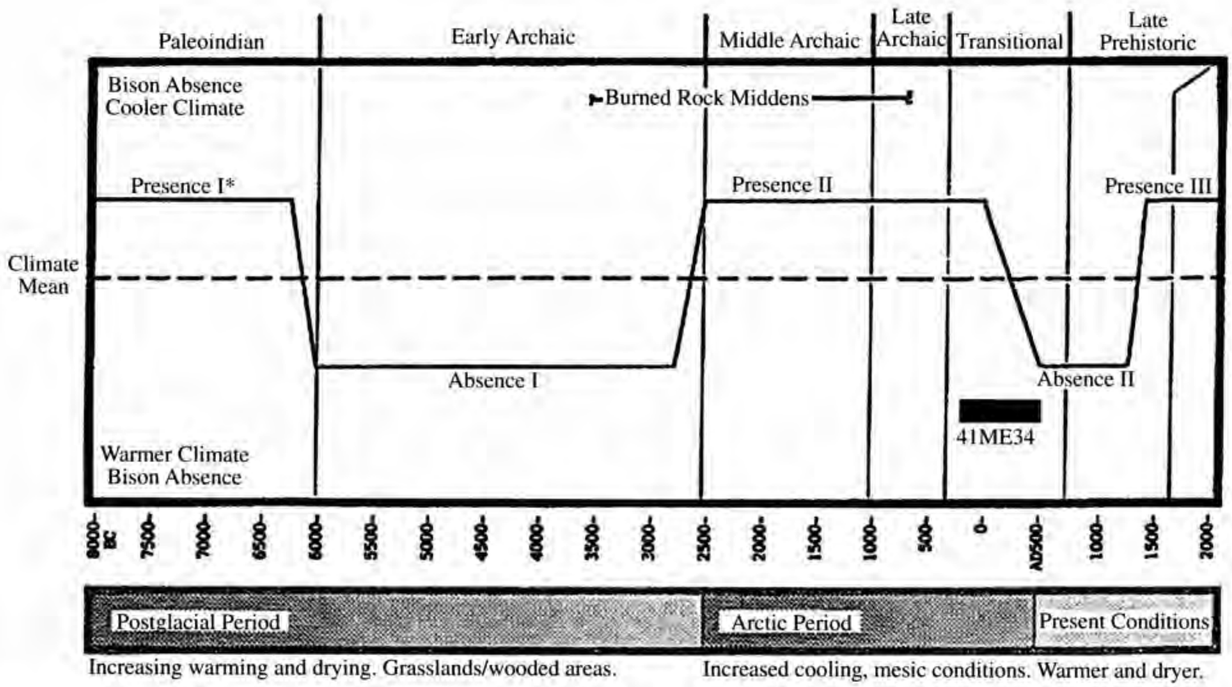

Figure 10. Dillehay's Bison Presence and Absence Periods (Adapted from Dillehay (1974).

of bison remains in level 2 throughout the site seems plausible, and may suggest that during the occupational period of level 2 there was a time of resource abundance. However, there may be a reason to reconsider this assumption.

Dillehay's (1974) Bison Presence II period may explain the high levels of Bison remains, however, low levels of Bison remains in levels 3 and 4 leaves questions as to why more Bison were not utilized in those levels when Bison should have been even more available. A possible answer might be, based on the speculation of some researchers, that the Middle Archaic and Late Archaic showed a gradual increase in populations which peaked in the Late Archaic. If this was indeed the case, population densities at the 41ME34 location would be responsible for the increased faunal deposits rather than an over abundance of faunal resources.

I feel that the 42% sample that I have conducted is a proper representation of the faunal remains that were present at the site; however, it seems appropriate that more analysis should be done on the remaining 52% collected to reinforce my calculations. The hopes I had for locations of possible activity areas was not possible due to the limited sample groups, however a more extensive analysis may have results that may answer these questions.

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APPENDIX

To help the reader better visualize the 41ME34 site area and the excavation areas described by Mr. Rector, the following four figures are appended:

Figure 11. View of excavations in the Mesquite Area, including Units A and B, used for faunal analysis.

Figure 12. Excavations in the block including Units G, I, J, K.

Figure 13. Excavations in Unit H near the creek.

Figure 14. Water screening in the creek led to the recovery of much of the faunal material from Units A and B.

El Sauz Chert:
A Distinctive Lithic Resource on the Lower Rio Grande

Don Kumpe and Mike Kryzwonski

ABSTRACT

El Sauz chert is a distinctive high quality lithic resource that outcrops as bedrock strata or as irregular shaped chunks within a small area of the Catahoula Formation in Starr County, Texas. The geologic sources of El Sauz chert were heavily quarried by local Indians and the stone appears to have been widely transported. This paper describes the known geologic sources of El Sauz chert in Starr County and provides the general location of the outcrops. Artifacts made of El Sauz chert are illustrated; they range in age from Early Archaic (Hidalgo points) to Late Prehistoric (Caracara points).

INTRODUCTION

During the 1960s the senior author found artifacts made of a distinctive light gray but sometimes colorful material along Los Olmos Creek in Starr County, Texas. Richard (Dick) Clardy and other local collectors called the stone "opalite" and Clardy, although quiet about locations, was familiar with the stone and its geologic sources.

In 1979 the senior author showed a heavily quarried outcrop of opalite (41SR137) to Curtis Tunnell and Bob Mallouf. Mallouf and Tunnell (1979) showed the opalite material to Cader Shelby and Leon Byrd, geologists with the Texas Department of Water Resources, who remarked that the stone is a silicified (bentonitic) clay that probably originated in the Catahoula Formation and was likely silicified through the breakdown of volcanic ash by the movement of ground water; they also remarked that the coloration is due to iron oxide staining.

Opalite was identified as opalized tuffaceous bentonitic clay and 41SR137 as a "high quality lithic resource area," where the stone occurs in irregular shaped very glossy chunks with rounded and battered edges (to perhaps 20 x 20 x 30 cm in size). Possibly several tons of stone were visible in the area examined; most of the stone showed signs of aboriginal fracturing and there were a large number of eroded hearths (ibid.).

Banks (1990: 50-51) remarks that Robert Mallouf refers to the dense, aphanic, and opaque chert (opalite) collected by Mallouf and Tunnell in Starr County (at 41SR137 in 1979) as "El Sauz chert" for its proximity to the town of the same name (see Figure 2).

In 2000, Benito Trevino arranged for Mike Krzywonski and the senior author to visit two outcropping bedrock strata of El Sauz Chert near 41SR137. Both locations are heavily utilized lithic quarries centered on the tops of hills and littered with lithic debris that appears to be almost entirely from initial reduction activities; the sites were named El Cerrito Villarreal (41SR395) and El Cerrito Garcia (41SR396) for the property owners, J. M. Villarreal and Medardo Garcia of Rio Grande City. This paper provides photos and descriptions of the quarries, the general location of the El Sauz chert resource area, and a color photograph of artifacts made of El Sauz Chert.

THE CATAHOULA FORMATION AND POSTULATIONS ON EL SAUZ CHERT

McBride et al. (1968:47) remark that the Catahoula Formation (Figure 1) was probably deposited during the Oligocene and perhaps early Miocene when

Figure 1. The Catahoula outcrop in south Texas; scale is in miles.

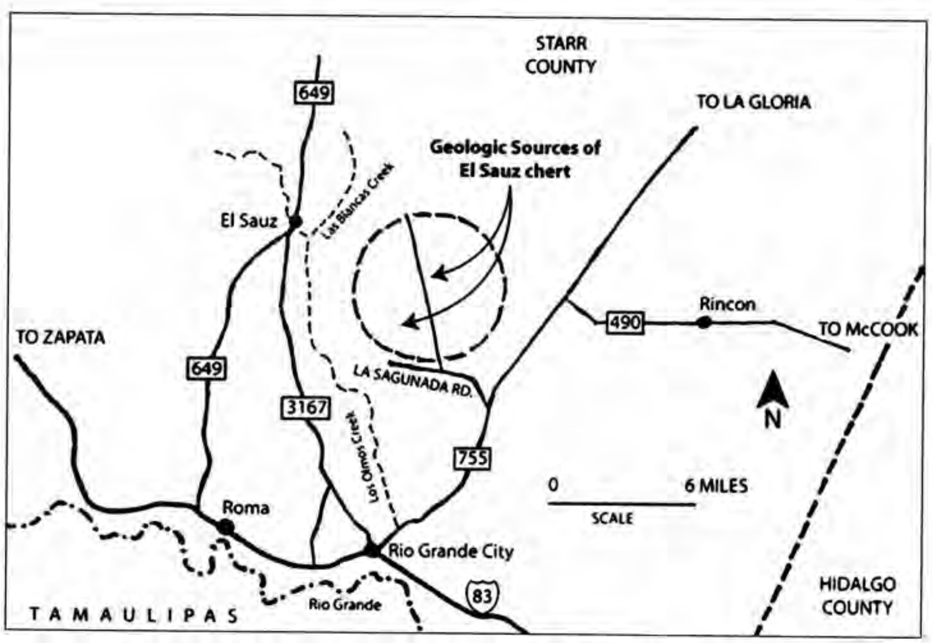

Figure 2. The known geologic sources of El Sauz Chert in Starr County, including El Cerrito Villarreal, El Cerrito Garcia, and 41SR137, are within the circle at center.

pyroclastic material drifted eastward and blanketed a large part of Texas and northeastern Mexico during a period of major volcanism in the Big Bend region and adjacent northern Mexico; the formation is largely "tuffaceous clay with lesser amounts of volcanic sandstone, tuff (indurated volcanic ash), bentonite, volcanic conglamorate, and some ash." Banks (1990: 49) remarks that none of the geological literature on the Catahoula provides adequate information on material of archeological significance.

Mallouf and Tunnell (1979) postulate that the Starr County material (from the Catahoula Formation) was initially an intrusive clay dike from underlying bentonite strata that was replaced with precipitated veins of opal and chalcedony after the silica necessary for opalization of the tuffaceous clay was probably dissolved from surrounding volcanic glass by ground water; they identified the opalite at 41SR137 as opalized tuffaceous bentonitic clay. They also remarked on considerable texture in many of the chunks of stone at 41SR137, including vugs containing botryoidal opal and crystalline calcite. Vugs are cavities that often have a mineral lining of different composition from that of the surrounding stone (Gary et al. 1974) and are often seen in finished artifacts made of El Sauz chert (see Figure 5).

Mallouf later refers to the opalized tuffaceous bentonitic clay (called opalite) at 41SR137 as El Sauz chert (Banks 1990: 50-51).

It appears that there may be additional outcrops of opalized tuffaceous bentonitic clay along the Catahoula Formation's route through south Texas and northeastern Mexico (see Discussion) and, hereafter, in this paper, only the material found in Starr County (or material that is believed to have originated in Starr County) will be referred to as El Sauz chert.

CERRITO VILLARREAL

El Cerrito Villarreal (41SR395) is an outcropping bedrock stratum of El Sauz chert (opalized tuffaceous

Figure 3. El Cerrito Villarreal (41SR395). A boulder of El Sauz chert and 3 hammerstones are in the foreground. A line of bedrock is in the background. Benito Trevino is kneeling on the left. Photo by Mike Krzywonski.

bentonitic clay) centered on the top of a hill or knob north of Rio Grande City in Starr County, Texas (Figure 3). A slope on the south side of the bedrock outcrop is littered with lithic debris from initial reduction activities and similar lithic debris was seen above (or on top of) the bedrock. The slope also contains boulders, including a colorful boulder with a girth of 9 ½ feet near its base, and there appeared to be both talus boulders and boulders that may have been detached by the quarrying activities of local Indians. As at 41SR137, and at El Cerrito Garcia (below), there is considerable texture in much of the stone, including vugs. A large number of hammerstones and fragments of hammerstones were noted and the materials these were made of included green syenite. Among the colors of El Sauz chert at this site are greys, oranges, pinks, reds, purples, golds, yellows, and caramels. Although El Cerrito Villarreal is not the most colorful source for El Sauz chert, the stone here is more colorful than at the nearby quarry, El Cerrito Garcia (see below), which is geologically similar. El Cerrito Villarreal was a high quality lithic resource area for local Indians, a quarry that remains largely pristine.

In Duval and McMullen counties geologic processes precipitated veins of opal and chaldcedony at locations within the Catahoula Formation and differential erosion left these silicified zones as prominent knobs or hills (McBride et al. 1968: 47-48); similar processes appear to have formed El Cerrito Villarreal and El Cerrito Garcia (below) in Starr County.

EL CERRITO GARCIA

El Cerrito Garcia (41SR396) is a second outcropping bedrock stratum of El Sauz chert (opalized tuffaceous bentonitic clay) centered on the top of a hill north of Rio Grande City in Starr County, Texas (Figure 4); it is approximately 1500 yards southeast of El Cerrito Villarreal. A large number of hammerstones and fragments of hammerstones were noted and the large amount of lithic debris at the site appeared to be exclusively from initial reduction activities. There were boulders, one with a circumference of 64 inches, but gradings cross the site and the boulders seen here may have been broken from bedrock by grading activities. The stone at El Cerrito Garcia is almost uniformly grey with only an occasional streak of pink or red in some of the rocks; it is not as colorful as the stone at El Cerrito Villarreal. El Cerrito Garcia was a high quality lithic resource area for local Indians; it has been damaged by grading but remains largely intact.

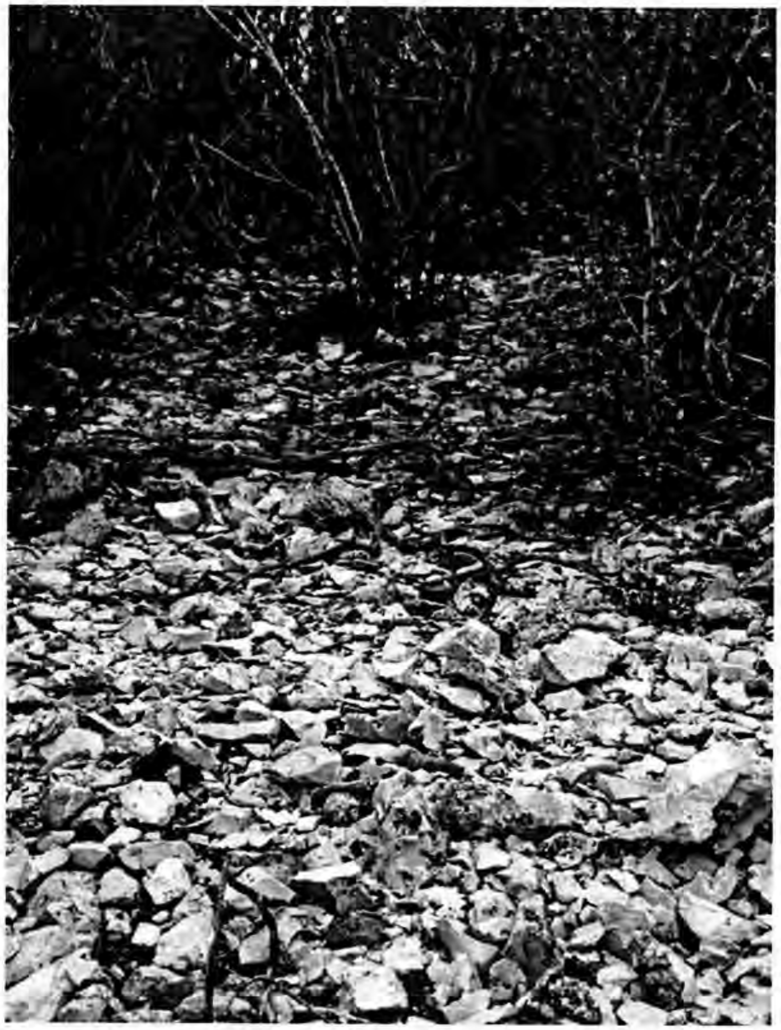

Figure 4. El Cerrito Garcia (41SR396) Initial reduction debris virtually paves the slope below an unseen outcrop of El Sauz chert. Photo by Mike Krzywonski.

THE ARTIFACTS

Figure 5 illustrates 22 artifacts made of opalized tuffaceous bentonitic clay; there are specimens from Hidalgo, Starr, and Zapata counties, northern Tamaulipas, and northeastern Nuevo Leon. Colorful artifacts made of this material were once commonly seen in local collections, but many have been sold and the illustrated specimens scarcely do justice to the stone's sometimes vibrant colors. In Figure 5: A, F, L-M, O-P, T-V are from Hidalgo County; B-C, G-H, R, Starr County; N, Zapata County; D-E, J-K, Q, S, northeastern Nuevo Leon; I, northern Tamaulipas. Eight specimens contain one or more vugs.

Figure 5, A is a waste flake; B, a flake from initial reduction debris at 41SR395; C, a flake tool from Los Olmos Creek; D, a flake from the manufacture of specimen E; E, a knife restored near center (61 x 28.5 x 9 mm); F, the proximal end of a Hidalgo (33.5 x 35 x 9 mm); G, the distal end of a dart point with impact scars along the full lengths of both lateral edges, a vug or cavity perforates this specimen from 41SR395; H, a quarry blank from 41SR395 (80.6 x 59.9 x 18.7 mm); I, Langtry (54 x 35.7 x 6 mm); J, a beveled asymmetrical point (29.4 x 18.5 x 5.5 mm); K, Matamoros (40 x 19 x 7.5 mm); L, beveled triangular point (30.5 x 23.5 x 7.3 mm); M, biface scraper; N, unidentified stemmed point broken along the path of a sizable vug or cavity (59.5 x 39 x 12 mm); O, Matamoros (36 x 21 x 7 mm); P, beveled triangular point with a concave base (25.3 x 18.5 x 6 mm); Q, triangular knife (59.5 x 30 x 10.5 mm); R, blade with one retouched lateral edge (66 x 35 x 10.5 mm); S, uniface scraper; T, small beveled point with a convex base (20 x 16 x 5.3 mm); U, Caracara (31 x 21 x 4 mm); V, uniface scraper (17.5 x 25 x 7 mm). Typology comes from Turner and Hester (1999) and Kumpe and McReynolds (this volume).

DISCUSSION

El Sauz chert (Figure 5) is common in prehistoric sites on Los Olmos Creek in Starr County. It is also frequently noted in sites in the lithic-poor areas of eastern Starr County and western Hidalgo County. The senior author's records contain 100 entries noting artifacts (including waste flakes) made of El Sauz Chert that would found in western Hidalgo County. Mallouf and Tunnell (1979) note the presence of this stone in the Armando Vela collection from eastern-central Hidalgo County. It is rarely seen in collections from Falcon Reservoir. In Cameron County, El Sauz chert is represented by a grey and pink Tortugas (54.8 x 29.4 x 6.4 mm), a grey Tortugas, and 3 Matamoros points in the Mike Krzywonski collection, and by 2 flakes in the senior author's collection. El Sauz chert appears to be scarce in Cameron County, but perhaps that is because the stone becomes difficult to recognize among the generally diminutive lithic artifacts of the Brownsville Complex.

The Catahoula Formation continues south of Starr County into northeastern Mexico (McBride et al. 1969: 7, 47) and opalized tuffaceous bentonitic clay (opalite), indistinguishable from El Sauz chert, is commonly seen in prehistoric sites along the Monterrey Highway southwest of Reynosa, but in such large quantities that it is believed to be from undiscovered outcroppings in Tamaulipas and/or Nuevo Leon, Mexico (senior author's personal experience).

Richard McReynolds (personal communication 2008) remarked that he has artifacts (Matamoros, Catan, Tortugas, Nueces Scrapers, and Abasolo-like) from along Green Branch Creek in southern McMullen and La Salle counties that appear to be made of El Sauz chert, although only one specimen is colorful (pink and grey). The senior author examined McReynolds' artifacts that were made of this material and found that the stone was indeed similar to El Sauz chert, but many of the specimens were subtly different in color and texture. However, two of McReynolds' artifacts were made of stone that is indistinguishable from El Sauz chert and that stone is possibly from Starr County, but the Indians in McMullen and La Salle counties might have obtained opalite locally. McBride et al. (1968: 41, 43, 46) remark that opalized tuff and clay have been noted in Live Oak, McMullen, and Duval counties; dikes of bentonitic clay are reported in Duval, McMullen, and Karnes counties with silicification of dike material occurring in places and veins of pure opal or chalcedony occur. They also remark on more than 50 scattered siliceous hills or knobs (along the path of the Catahoula Formation) in southern McMullen and northern Duval coun-

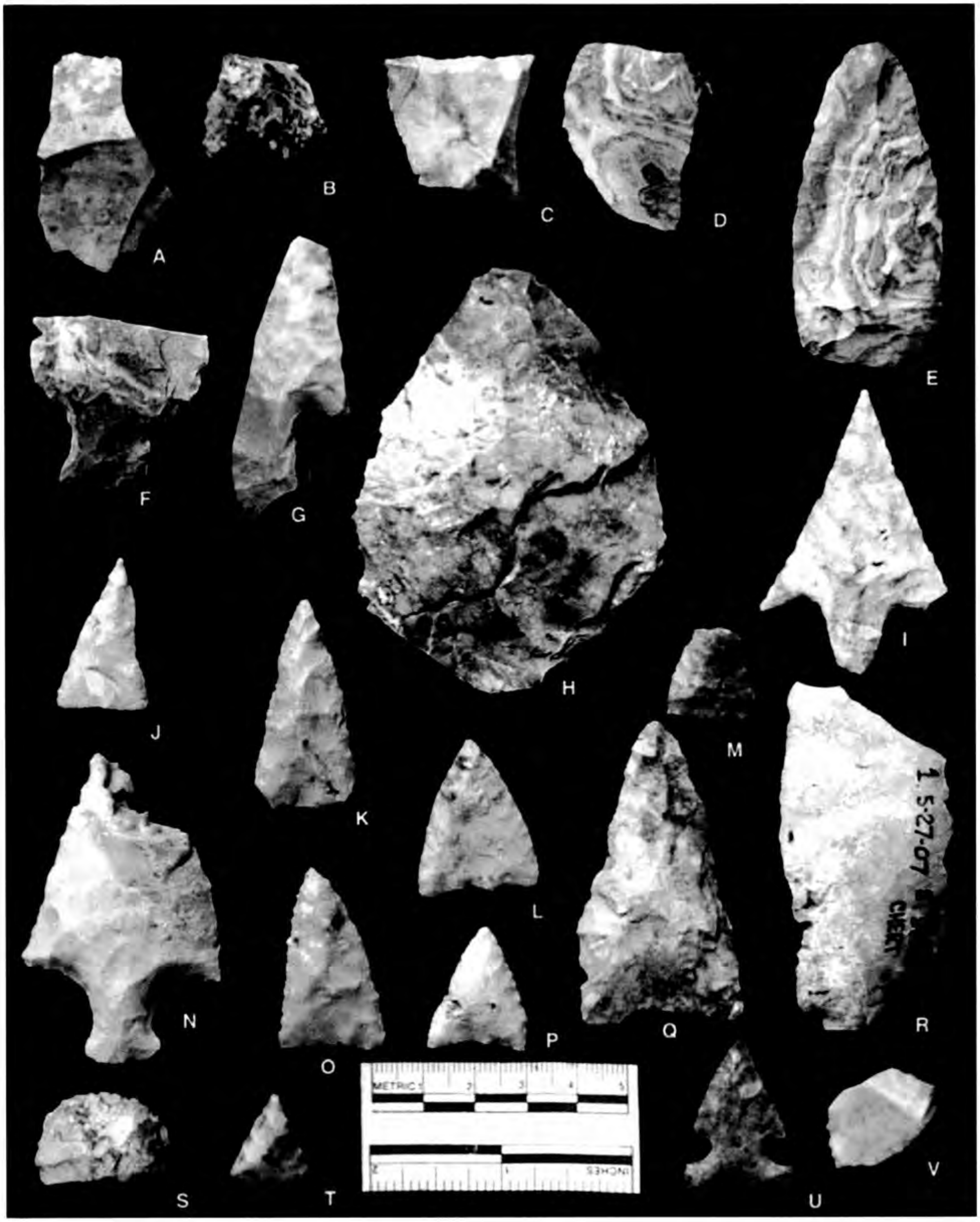

Figure 5. Opalized tuffaceous bentonitic clay artifacts from the lower Rio Grande: projectile points, tools, lithic reduction debris, waste flakes, and at center, a quarry blank. Photo by Mike Krzywonski. See text for details on each artifact.

ties, the siliceous material occurring as chalcedony cemented sandstone, silicified tuffaceous clay, and bands and veins of light bluish-gray to white opal and chalcedony.

John Boland (personal communication 2006) remarked on artifacts (the distal end of a biface tool and the proximal end of a small triangular point) from a site in southern Jim Wells County that appeared to be made of El Sauz chert. The senior author examined Boland's artifacts from Jim Wells County and the material they were made of appeared to be indistinguishable from El Sauz chert; possibly the stone is from Starr County, but there may be additional outcrops of opalite (opalized tuffaceous bentonitic clay) in other south Texas counties (see above).

There have been no excavations in the El Sauz chert resource area in Starr County and it is not known when local Indians began to use the quarry sites, however, the authors do not know of any Paleo-Indian projectile points made of this material. Points made of El Sauz chert (see Figure 5) include a Hidalgo point from the Early Archaic Period and a Caracara from Late Prehistoric times that were found in western Hidalgo County (Kumpe n.d.; Turner and Hester 1993).

El Sauz chert is a distinctive (recognizable) material that is commonly pale grey, but oranges, pinks, reds, purples, yellows, golds, and caramels are frequently seen colors; Richard McReynolds (personal communication 2009), working with stone from 41SR395 and 41SR396, found that El Sauz chert fluoresces white under ultraviolet (black) light. Vugs are a characteristic of the stone, occurring in raw material, quarry blanks, and finished artifacts. Along the lower Rio Grande in Texas, the geologic sources of El Sauz chert are apparently located within a small area of Starr County (see Figure 2) and the chert can be a valuable archeological tool, useful for determining prehistoric trade or travel patterns. Depending on the area or areas involved, collections of artifacts from Starr and/or Hidalgo counties could, or even should, include artifacts made of El Sauz chert. Archeologists working along the lower Rio Grande may find it useful to be familiar with the stone and El Sauz chert, in a variety of colors, has been placed at TARL, the Texas Archeological Research Laboratory in Austin.

The heavily quarried outcrops of El Sauz chert in Starr County, particularly El Cerrito Villarreal and El Cerrito Garcia, are perhaps the most visually dramatic archeological features of the prehistoric era to be found along the lower Rio Grande. Numerous ancient cultures apparently used this often colorful chert to make tools and weapons.

ACKNOWLEDGMENTS

The authors are grateful to J. M. Villarreal for access to his property and for providing the latitudes and longitudes of El Cerrito Villarreal and El Cerrito Garcia. We also thank Medardo Garcia for access to his property, and Benito Trevino for arranging our visit to the area. Richard McReynolds provided information on El Sauz chert under ultraviolet light and brought his opalite artifacts from La Salle and McMullen counties to our attention. John Boland, Paul Keller, and Terry Kumpe loaned artifacts for photos; John Boland also brought opalite artifacts from Jim Wells County to our attention.

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Artifacts from the Pecan Springs Site (41KR21) in Eastern Kerr County, Texas

John H. Benedict and Jose Contreras

ABSTRACT

This paper documents some of the prehistoric artifacts found at site 41KR21, on the flood plain of Cypress Creek in Kerr County, Texas. Over 1,800 artifacts were examined, primarily chert projectile points and tools, from private collections and high quality digital photographs. Types and proportions of these Archaic Period points are similar to other burned rock midden sites on the eastern Edwards Plateau of Texas. The assemblage of stone, bone, and shell artifacts suggests this site was used intermittently as a campsite, food processing station, and lithic tool/projectile point manufacturing site over a period of about 8,000 years.

INTRODUCTION

The 41KR21 archeological site was first recorded on June 2, 1968. It was described as a burned rock midden by R. E. Gingrich. Since 1996, the present landowner at the site has excavated numerous artifacts, and relic collectors have paid to dig portions of the site, yielding hundreds of other specimens (see www.randysdig.com). In December, 2004, avocational archeologist Bob Wishoff excavated two 2x2 meter square test units. They found snails, animal bones, chipped chert tools and projectile points, flake debitage, fire-cracked limestone, and two hearths at 91 cm (Wishoff 2004, 2005).

Our report documents some of the artifacts found at the 41KR21 site. It is located on private property at the junction of an intermittent stream and Cypress Creek in eastern Kerr County. The landowner has kindly allowed us to record many of the site's artifacts from his and other private collections, and from photographs he has taken during more than 10 years of site excavation by collectors. This study is limited in that the artifacts were not found using conventional archaeological methods. Thus we can only generalize about the site provenience-stratigraphic conditions where the artifacts were found. However, we believe these data have value because of the large number, more than 1,800 artifacts, and because we know the general site conditions under which they were found. Our photographs, drawings, artifact measurements, and report findings for this site have been sent to the Texas Archeological Research Laboratory.

SITE DESCRIPTION

The site is located on Cypress Creek about 5 miles northwest of Comfort, Texas, and about 5 miles north of the Guadalupe River, on a 12 acre parcel of private property (Figure 1). The owner purchased the property in 1996 and began excavating for artifacts. The site area is level to gently sloping towards the east. Based on results from shovel and backhoe excavations, screening, artifacts and fire-cracked rock discovered, this site begins at the far west edge of the property, where it borders the arroyo of an intermittent stream and extends about 110 meters to the far eastern edge where the land begins to slope steeply downward to form the bank of Cypress Creek, then north about 20 meters beyond the owner's house, and south of his barn about 70 meters; creating a somewhat oval site measuring about 120 meters north to south, by 110 meters east to west. Both the house and barn are located on portions of burned rock middens #1 and #5, respectively.

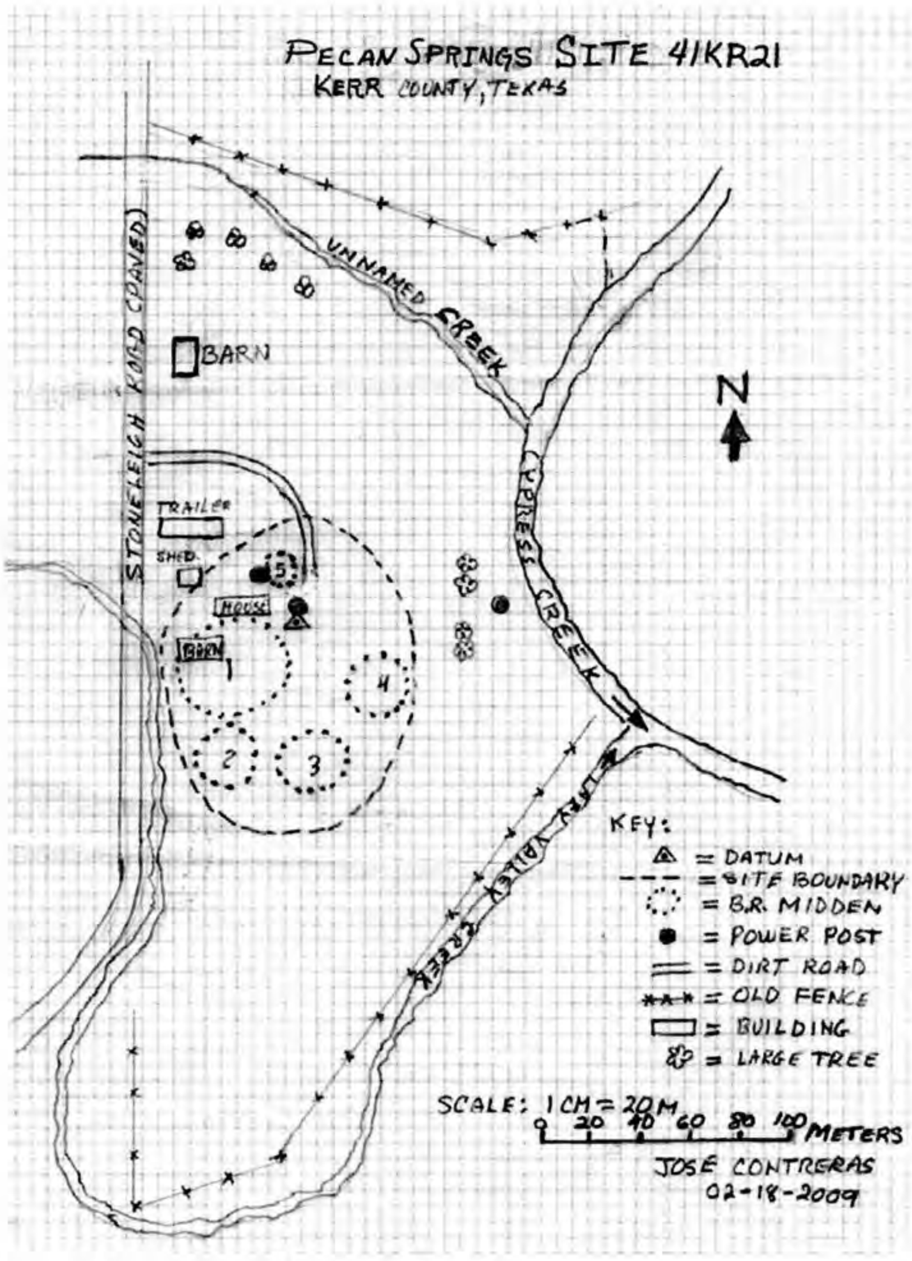


Figure 1 Measured Sketch Map of Site 41KR21.

About three-fourths of the known midden area had been excavated by February 18, 2009 (Figure 2).

The site consists of at least five burned rock middens (Figure 3) and associated occupations. Among the materials found at the site are large numbers of chert tools, such as scrapers, choppers, drills, large thin bifaces ("blades") and projectile points; shell ornaments; animal bone and teeth, likely deer and buffalo; limestone manos, and metates; quartz grinders; and great quantities of chert debitage and *Rabdotus* land snails.

Based on types of projectile points and tools found, the site was probably inhabited, at least intermittently, beginning in the Early Archaic, 8,000 years ago, through the Late Prehistoric, about 500 years ago. Certain dart point types were found in large numbers (Table 1) suggesting the site was most commonly used from 4,500 to 1,500 B.P. Only 11 arrow points were found compared to 1,455 dart points.

Figure 2. Site 41KR21, Midden View Looking East.

Water Resources

The site is partially bordered on three sides, in an oxbow, by an intermittent creek (known as Lost Creek) and Cypress Creek (Figure 1). There are several weak springs on the southeast side of the site. They produce water flow into the intermittent creek the last 200 meters before it empties into Cypress Creek. There are several additional springs on the property, the largest of which is on the bank of Cypress Creek approximately 100 meters north east of the midden site. This larger spring is seen on the USGS Cypress Creek 7.5' map. According to the owner, the large spring has not quit flowing in recorded history. Cypress Creek empties into the Guadalupe River in the town of Comfort, about 6 miles southeast.

Soils

The soil at the site is the Boerne (Figure 3) from the Nuvalde-Oakalla-Boerne association based on the USDA soil maps (Dittemore and Coburn 1986). Boerne soil is a relatively deep, gently sloping soil of floodplains, bottomlands, and river terraces. It is a moderately rich mollisol, supporting grasses, shrubs, and trees in bottomland and riparian habitats. The soil texture is fine to course sandy loam. These soils are infrequently flooded.

Topography and Vegetation

This site and its water sources are located at the intersection of several long wide valleys that connect to the Guadalupe River valley, and are filled with alluvial mollisols of the Doss-Kerrville and Nuvalde-Oakalla-Boerne soil associations. Today much of this bottomland is in farmland due to its moderately rich soils. In prehistoric times it is likely these valley bottomlands were grass covered prairies interspersed with motts of trees, especially along water courses, and on hill sides where soils were thin and rocky. These savanna-like grasslands are thought to have been

Table 1. Total number and percent of projectile point types identified from actual artifact collections and photographs taken at Site 41KR21 over a 10 year period ending November, 2008. Site located on Cypress Creek 6 miles northwest of Comfort, Texas.

Point Type	Number found	Percentage found
1. Pedernales	454	30.97
2. Marshall	133	9.07
3. Bulverde	119	8.12
4. Marcos	117	7.98
5. Castroville	108	7.37
6. Nolan	107	7.30
7. Montell	92	6.28
8. Kinney	80	5.46
9. Martindale	38	2.59
10. Travis	27	1.84
11. Williams	25	1.71
12. Ensor	19	1.30
13. Langtry	15	1.02
14. Uvalde	15	1.02
15. Frio	14	0.95
16. Abasolo	13	0.89
17. Almagre	12	0.82
18. Edwards*	9	0.61
19. Carrizo	8	0.55
20. Angostura-like	8	0.55
21. Zorra	7	0.48
22. Early Triangular	7	0.48
23. La Jita	6	0.41
24. Edgewood	6	0.41
25. Darl	5	0.34
26. Bell	5	0.34
27. Wells	4	0.27
28. Ellis	4	0.27
29. Lange	2	0.14
30. Tortugas	2	0.14
31. Perdiz*	2	0.14
32. Gower	1	0.07
33. Andice	1	0.07
34. Morrill	1	0.07
Totals	1,466	100

*An arrow point; all others are dart points.

dominated by tall grass species (Diggs et al. 1999), like Switch Grass (*Panicum virgatum*), Yellow Indian grass (*Sorghastrum nutans*), Big Bluestem (*Andropogon gerardii*), Eastern Gama Grass, (*Trisacum dactyloides*) and Little Bluestem (*Schizachyrum scoparium*); that likely fed migratory herds of buffalo and other game in prehistory when this archaeological site was occupied. Today these grasslands have been grazed out by domestic livestock or plowed up and replaced with crops, commonly hay and small grains.

Figure 3. Soil Profile of Midden 4, Looking East. Surface to bottom of profile is 70 cm.

The vegetation found on the 41KR21 site today consists of: native tree species such as oaks, pecan, bald cypress, ashe juniper (cedar), sycamore, elm, and walnut, along with native forbs and vines like wild grape, greenbrier, Engelmann-daisy, bush sunflower, Maximillian sunflower; native and introduced grasses, like sideoats grama, common Bermuda grass, Texas winter grass, little bluestem; and yuccas, sotol, and prickly pear cactus. On the site this vegetation is found mostly on stream banks because the level bottom land has been farmed in the past (more than 10 years ago using shallow plowing), and now the site area is scraped clean from collector/hobbyist artifact excavation activities (Figure 2).

The elevation at the site is about 463 meters (1,520 feet). The site is on a relatively level plain surrounded on three sides by stream cut arroyos down to the limestone bedrock. To the immediate southwest the land rises sharply up the rocky limestone walls to over 560 meters elevation on nearby hill tops (Figure 4). As typical of the Edwards Plateau, the locale has a limestone base with stream bottoms and gravel bars composed mainly of limestone with some igneous and chert gravel, and sand (Dittemore and Coburn 1986)

The owner believes the site has been farmed for 100 years or more, and the top 4 inches or so of soil has been removed from much of the surface to form a berm along the eastern edge of the site along the creek.

CULTURAL REMAINS

Features

The primary features at this site are multiple burned rock middens. The midden rocks appear to be in mound, or disk shaped masses, oval in shape, from 20-30 cm below the surface, and from 30-50 cm thick (Figure 3; Wishoff 2005). Estimates of the diameters of these middens obtained from the owner are: #1, 30 meters; #2, 15 meters; #3, 28 meters; #4, 15 meters; #5, 10 meters. Middens #4 and #5 had not been fully excavated as of February 2009.

Wishoff (2005) states, that he discovered two hearths in midden #1 during his excavations of two 2x2 meter test units near the southwest corner of the barn. The hearths were about 90-91 cm below the surface and about 90 cm in diameter.

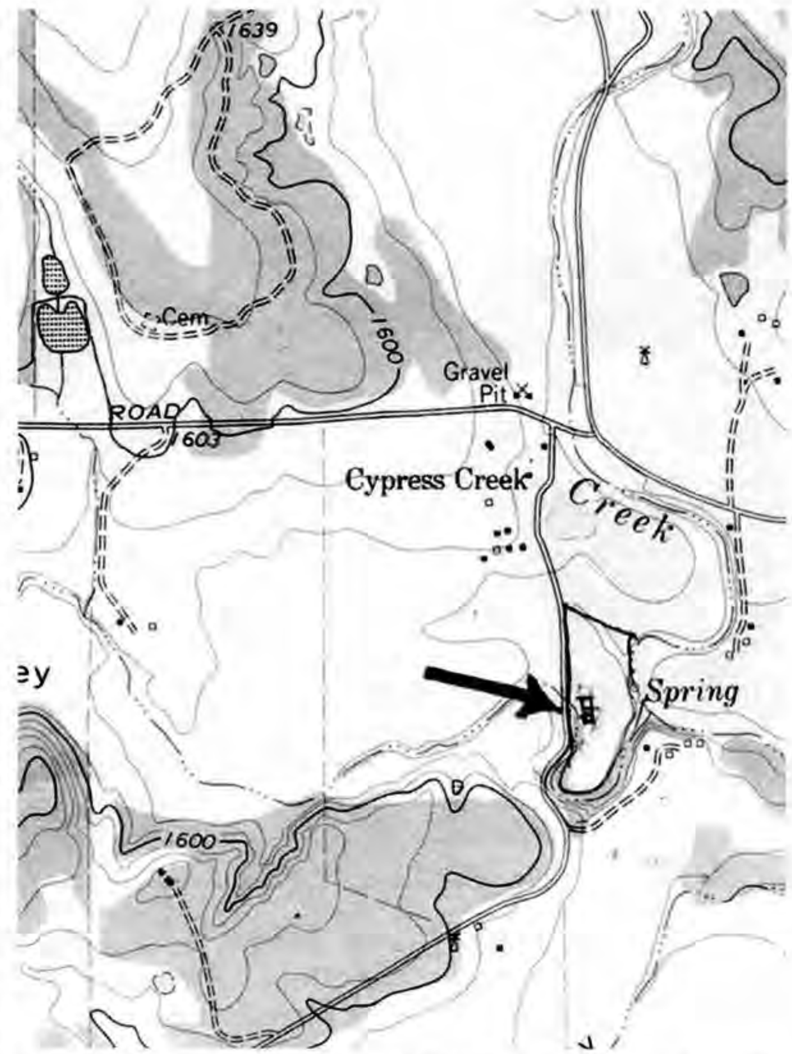


Figure 4. Terrain and topography around 41KR21. Arrow indicates site locality.

Artifacts

Excavations at this site have produced numerous examples of the material culture that existed here. Common materials repeatedly found are cracked bone (possibly deer and buffalo), snail shells (*Rabdotus* sp.), chipped chert tools and projectile points, and quantities of small to large chert debitage; and rarely metates and manos, drilled shell ornaments, grinding stones, and hammerstones. Most of this cultural material was discovered in and near (within 20 meters) the burned rock middens. Many of the artifacts remain in the landowner's collection. Most of the chert stone used to make these tools and projectile points is Edwards chert, and possible some Georgetown. The chert color runs from almost creamy white to rootbeer color to dark chocolate brown (Figure 5). The root beer and browns can be almost translucent to opaque, with or without white patina. The most common color is a medium brown.

We examined approximately 1,800 stone and shell artifacts in collections and in photographs consisting of: shell ornament, metates, manos, scrapers, grinders, drills, butted bifaces, thin bifaces, choppers, corner tang knives, incised stone, projectile points, stone pipe, and hammerstones (Turner and Hester 1999). Projectile points were the most common artifacts found and thin bifaces second.

Projectile Points

The total number of projectile points we could identify to type from photographs and collections was 1,466 (Table 1). Of this number, 242 were from actual artifacts in collections that we could physically examine (Table 2); and 1,224 (Table 3) were from high quality digital photographs. The total projectile types recorded was 34. Arrow points made up less than 1% of these and consisted of only Edwards and Perdiz (Table 1; Turner and Hester 1999). Keep in mind that this site has been plowed and several inches of top soil has been removed from the surface of the midden site to build a flood control berm along the eastern edge of the property. Arrow points located in the top 10 centimeters or so of soil before it was scraped could have been removed to the berm.

Seven types of dart points (Figure 5) compose over 75% of the projectile points we recorded from this site: Pedernales 31%, Marshall 9%, Bulverde 8%, Marcos 8%, Castroville 7%, Nolan 7%, and Montell 6% (based on the combined photographic and collections data) (Turner and Hester 1999). These findings are similar to what has been observed at many other burned rock midden sites in the hill country (Collins 2004; Weir 1976). Weir compared the points from 16 hill country sites and found 50 point types, with the 7 most common being: Pedernales 32%, Bulverde 15%, Nolan 7%, Travis 6%, Castroville 5%, Montell 5%, and Marshall 5%—making up about 75% of all points found (Table 4).

Stone Tools and Ornaments

The numbers of stone, bone, and shell tools and ornaments, and preforms that we could examine in collections and photographs were small, about 330 artifacts (Table 5; Figures 6, 7). This probably occurred because these artifacts are not as popular with collectors as are projectile points; or they were broken when excavated and collectors discarded them at the site. We observed numerous examples of discarded broken biface blades and projectile points, and whole and broken preforms and uniface scrapers at the site.

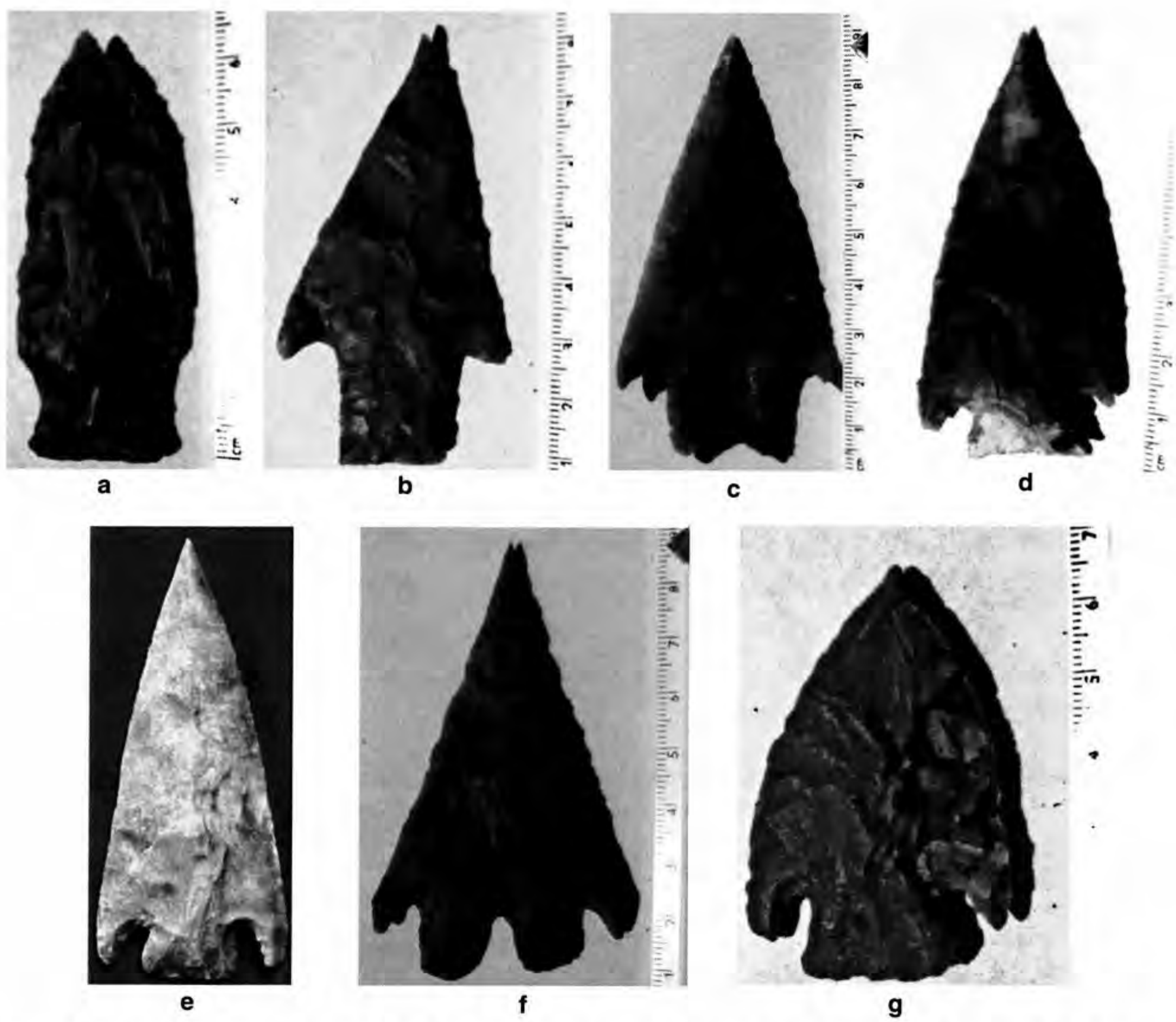


Figure 5. Selected Dart Points from 41KR21. a, Nolan; b, Bulverde; c, Pedernales; d, Marshall, e, Castroville, f, Montell, g. Marcos

Table 2. Total number and percent of projectile points identified from actual artifacts excavated at Site 41KR21 over a 10 year period ending November, 2008.

Point Type	Number found	Percentage found
1. Pedernales	78	32.23
2. Marshall	31	12.81
3. Castroville	21	8.68
4. Bulverde	16	6.61
5. Kinney	14	5.79
6. Marcos	11	4.55
7. Montell	11	4.55
8. Nolan	11	4.55
9. Edgewood	6	2.48
10. Ensor	5	2.07
11. Frio	5	2.07
12. Zorra	4	1.65
13. Williams	3	1.24
14. Edwards*	2	0.83
15. Travis	2	0.83
16. Langtry	2	0.83
17. Abasolo	2	0.83
18. Tortugas	2	0.83
19. Ellis	2	0.83
20. Angostura-like	4	1.65
21. Andice	1	0.41
22. Bell	1	0.41
23. Darl	1	0.41
24. Lange	1	0.41
25. La Jita	1	0.41
26. Wells	1	0.41
27. Morrill	1	0.41
28. Almagre	1	0.41
29. Early Triangular	1	0.41
30. Martindale	1	0.41
Totals	242	100

*An arrow point; all others are dart points.

Table 3. Total number and percent of projectile points identified from photographs of artifacts excavated at Site 41KR21 over a 10 year period ending November, 2008.

Point Type	Number found	Percentage found
1. Pedernales	376	30.72
2. Marcos	106	8.66
3. Bulverde	103	8.42
4. Marshall	102	8.33
5. Nolan	96	7.84
6. Castroville	87	7.11

Table 3. (continued)

Point Type	Number found	Percentage found
7. Montell	81	6.62
8. Kinney	66	5.39
9. Martindale	37	3.02
10. Travis	25	2.04
11. Williams	22	1.80
12. Uvalde	15	1.23
13. Ensor	14	1.14
14. Langtry	13	1.06
15. Abasolo	11	0.90
16. Almagre	11	0.90
17. Frio	9	0.74
18. Carrizo	8	0.65
19. Edwards*	7	0.57
20. Early Triangular	6	0.49
21. La Jita	5	0.41
22. Darl	4	0.33
23. Bell	4	0.33
24. Angostura-like	4	0.33
25. Wells	3	0.25
26. Zorra	3	0.25
27. Ellis	2	0.16
28. Perdiz*	2	0.16
29. Gower	1	0.08
30. Lange	1	0.08
Totals	1224	100

*An arrow point; all others are dart points.

Table 4. Total number and percent of projectile points identified from 16 Hill Country burned rock midden sites (Weir 1976).

Point Type	Number found	Percentage found
1. Pedernales	1,116	32.49
2. Bulverde	526	15.31
3. Nolan	235	6.84
4. Travis	217	6.37
5. Castroville	178	5.18
6. Montell	157	4.57
7. Marshall	155	4.51
8. Ensor	144	4.19
9. Frio	92	2.70
10. Darl	78	2.27
11. Marcos	69	2.00
12. Tortugas	67	1.95

Table 4. (continued)

Point Type	Number found	Percentage found
13. Lange	66	1.92
14. Fairland	32	0.93
15. Wells	32	0.93
16. Williams	26	0.74
17. Martindale	21	0.62
18. Uvalde	17	0.49
19. Kinney	17	0.49
20. Gower	12	0.34
21. Angostura	9	0.26
22. Other	156	4.80
Totals	3,434	100

Table 5. Number of stone tools and ornaments identified from actual artifact collections and photographs at Site 41KR21 over a 10 year period ending November, 2008.

Tools & Ornaments	Number in collections	Number in photographs	Total number
Thin triangular, ovate, & lanceolata bifacial blades	27	195	222
Corner tang knives biface	1	5	6
Butted bifaces	3	13	16
Projectile preforms biface	5[1]	25	30
Scrapers uniface	6	?[2]	6
Graver uniface	2	1	3
Drills/perforators	10	19	29
Hammer/grinding stones	5	5	10
Gorget	1	2	3
Incised/engraved stone	1	0	1
Mano	1	0	1
Metate/Pitted stone	1	0	1
Discoidal stone	0	1	1
Pipe	1	0	1
Total	64	266	330

1. Many preforms for dart points were found but few photographed or retained in actual collections.
2. There were some in photographs but not clearly identifiable.

The most abundant artifacts we examined in this category were the thin triangular, ovate, and lanceolate bifaces (Figures 6, 7); 222 of which were recorded. These bifaces were from 8-15 cm. long, and were straight or curved, and finely chipped with sharp edges. We also recorded 6 corner tang bifaces. The next most abundant artifacts were the projectile point preforms and drills/perforators. Very few ornaments or manos or

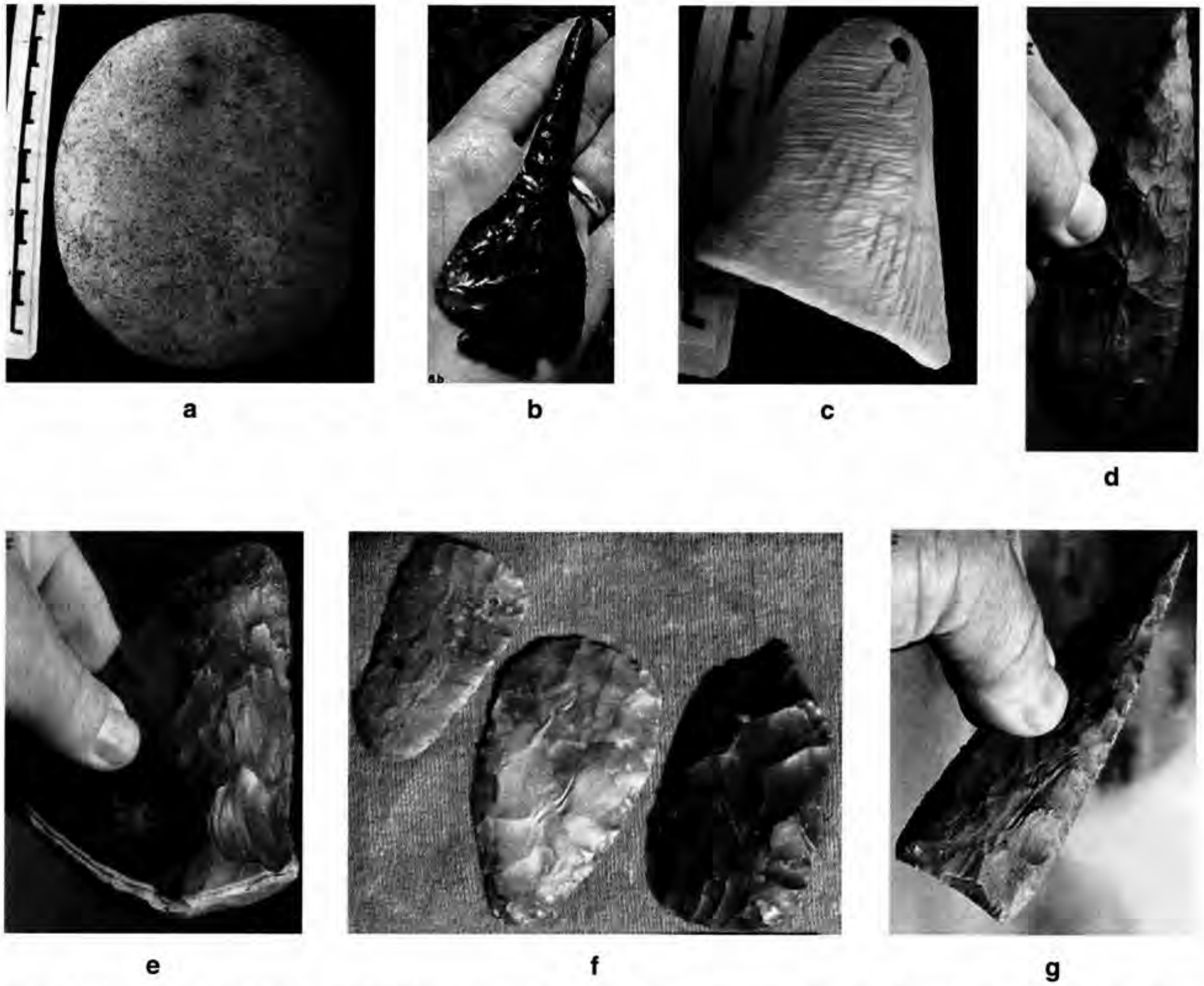


Figure 6. Selected Artifacts from 41KR21. a, quartzite grinding/hammer stone, 17 cm in diameter; b, drill made on dart point (l, 14 cm) ; c, conch shell pendant (l, 9 cm); d, lanceolate thinned biface (l, 13 cm); e, butted biface (l, 13 cm); f, ovate thinned bifaces (left to right, lengths are 8, 10 and 10 cm); 6, g, triangular thin biface (l, 11 cm).

metates were observed. The single metate/pitted nutting stone recorded was unusual in that it was heavily pitted on all surfaces, triangular in shape and about 50 cm on each side, and 15 cm thick (Figure 7).

A number of small to large (13-16 cm.) butted knives (butted bifaces) were found at the site (Figure 6; Turner and Hester 1999). Several had considerable polish on the distal surfaces from use cutting plant and/or animal materials.

Chert debitage is abundant throughout the site, and ranges from large core like pieces and blade like angular flakes, to fine flakes. A mound of the larger pieces of chert artifacts and debitage was created by collectors as they removed all the larger pieces to this mound on the south west edge of the Brown site. The mound is about 5 meters long by 2 meters wide and 10 to 30 cm. deep. Much of this is broken scrapers, drills, points, blades, and whole and broken preforms, scrapers and choppers, and tested chert cobbles.

Chronology

The projectile point types found at the 41KR21 site (Table 6) suggest that the site was first occupied at the end of Late Paleoindian and into Early Archaic. Since then it has been occupied, at least occasionally, through the Middle Archaic, Late Archaic, and Transitional Periods up through the Late Prehistoric (Table 6).

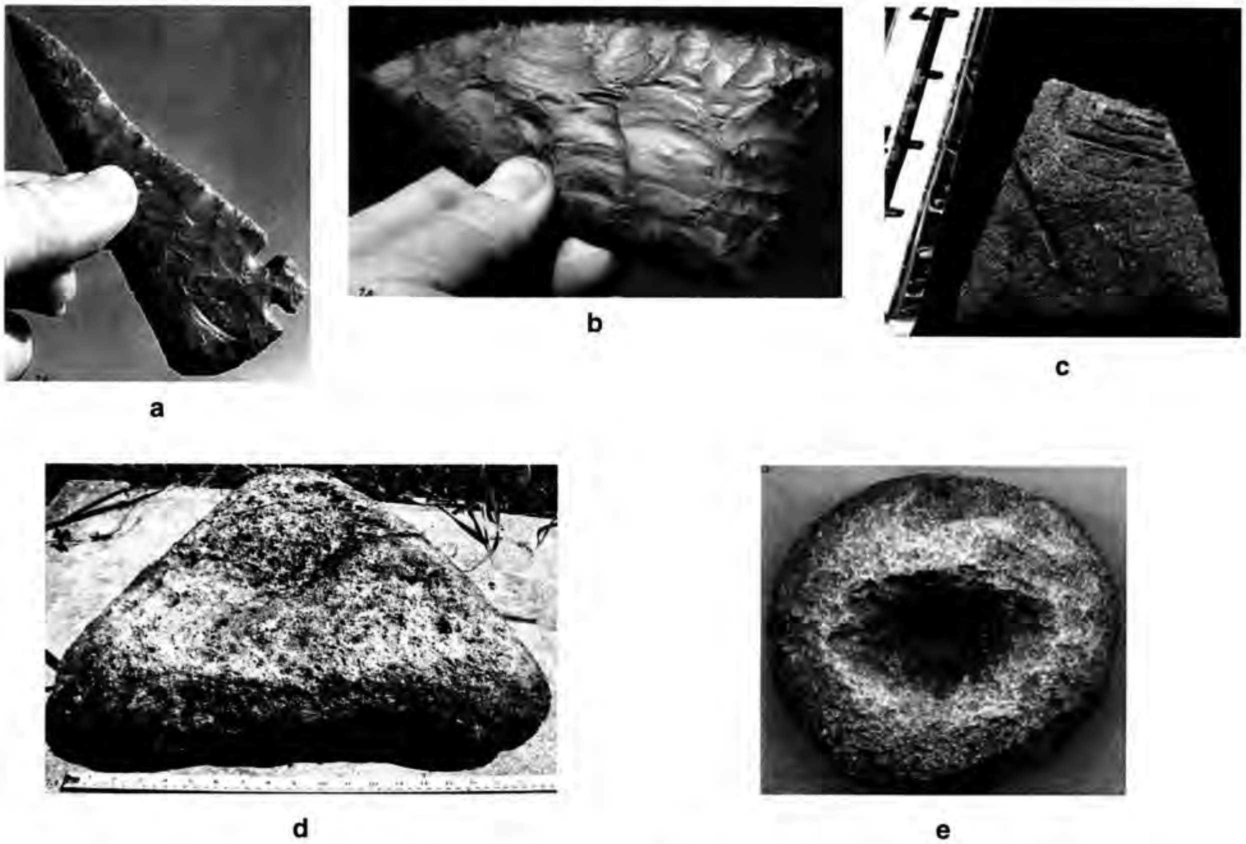


Figure 7. Selected Artifacts from 41KR21: a, corner tang biface, (l, 12 cm); b, thin triangular biface (l, 12 cm); c, incised stone (l, 4 cm); d, pitted limestone metate (l, 49 cm); e, perforated limestone disk (diameter, 15 cm).

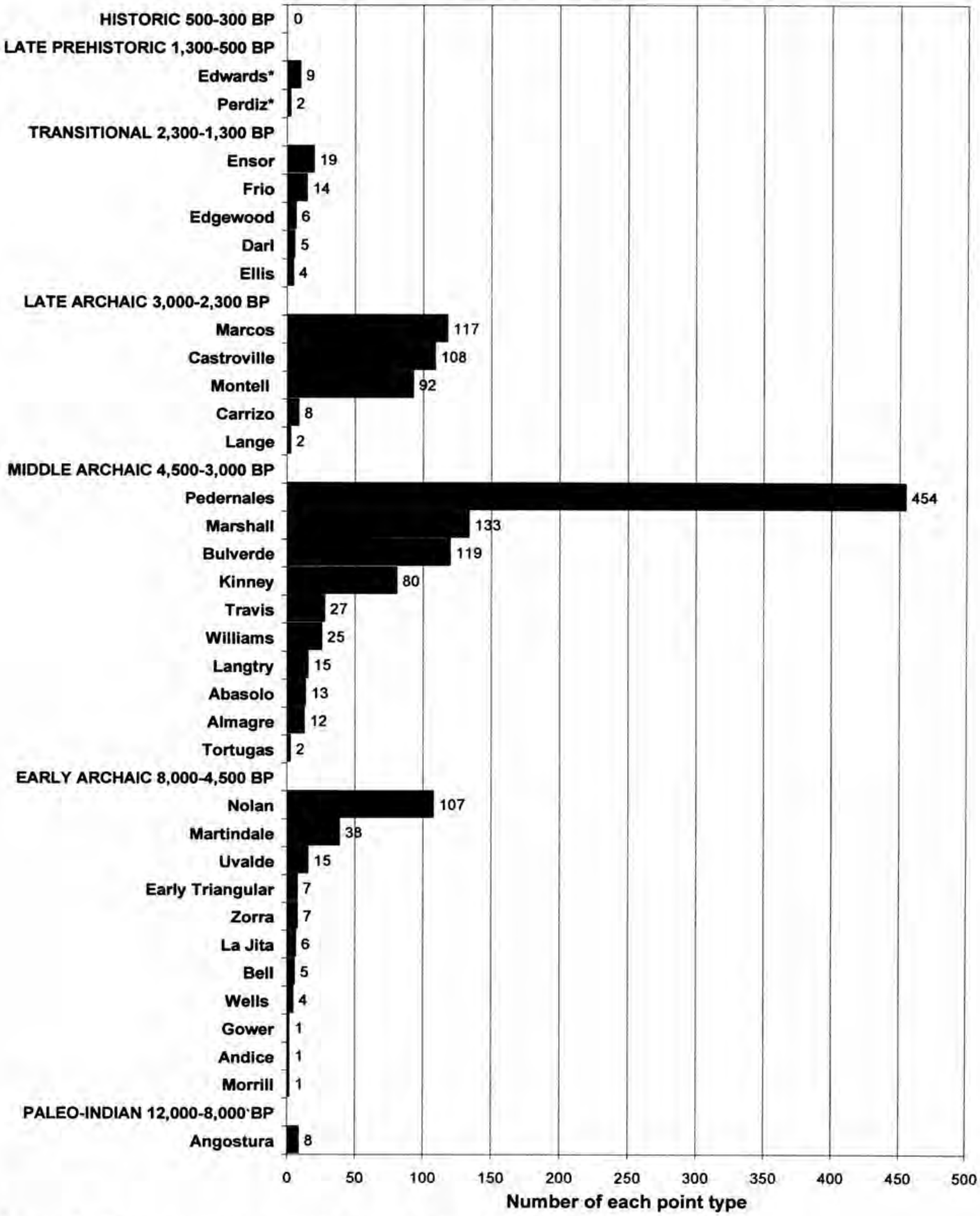
SUMMARY AND DISCUSSION

The 41KR21 burned rock midden site was a prehistoric hunter-gatherer *open campsite*. The site was used as a food processing facility and tool manufacturing site, probably as part of tribal/family unit subsistence activities. The fire cracked rock is likely the result of its use in hearths and ovens to heat, process and prepare plant and animal materials for food, tools and clothing.

Lifeways and culture of the peoples that built and used the 41KR21 burned rock middens, or for that matter any burned rock middens in the hill county, are little known (Collins 2004). Evidence suggests these peoples were hunters of buffalo, deer, antelope, and other large and small game using atlatl darts tipped with most of the points listed in Table 1. According to archeological studies and speculation these peoples moved frequently following food sources and availability within their territory, and commonly traded for food and materials from outside of their territory (Black et al. 1997; Collins 2004). For example, the marine shell gorget found at this site likely came from at least 200 miles away on the Texas coast (Figure 6).

Recent studies (Black and Creel 1997; Decker 1997; Dering 1997) have found and identified the remnants of animals and plants cooked in other Hill Country earth ovens. These plant and animal species were from both upland and riparian habitats as were the plant species used for fire wood in /ovens. Based on species of plant and animal remnants identified in other central Texas middens we speculate that the common plants eaten at the 41KR21 site were sotol, yucca, acorns, walnuts, pecans, prickly pear cactus pads and seeds, hawthorn, and roots of winecup (*Callirhoe sp.*), edible scurf-pea (*Psoralea sp.*), bull-nettle (*Cnidoscolus*); and Lily family bulbs such as wild hyacinth (*Camassia scilloides*),

Table 6. Total number of identifiable points (photographed and actual) from 41KR21. Time periods based on Turner and Hester (1999).



* Asterisk indicates arrow point, remainder are dart points.

wild onion (*Allium Drummondii*), and false garlic (*Nothoscordum bivalve).*

The tuber-like root of edible scurf-pea (*P. hypogacum (*syn. *Hypogaea)),* that grows in this area of the hill county and out on the prairies today was known to be an important food of Indians in historic times (Ajilvsgi 1984; Cowen 1991; USDA, Forest Service 1937). It has been called prairie potato, little bread root, and Indian turnip (Howard 1993) and was a component of oak savannas, and tall grass prairie plant communities. Eaten raw contains toxins that cooking in hot rock ovens likely destroys, making this plant palatable and nutritious as cooking does for yucca, acorns, sotol, and other plants.

Black and Creel (1997:298-304) argue that burned rock middens occur most commonly in the central Texas in association with oak-grasslands because the plants listed above, especially acorns, were most available in these habitats. They believe acorns were a main food source and dietary component as acorns are elsewhere in America and the world (Bainbridge 1985).

Current thinking is that the rock ovens were used by Indians beginning possibly 9,000 years ago to process both edible and otherwise toxic and indigestible plant foods like yucca and sotol stems, geophytes, and acorns, especially during periods of scarce animal food (Black et al. 1997:301-305). The rock ovens were processing facilities to provide the major component of prehistoric diet—digestible, carbohydrate-rich plants. When Indians returned frequently to the same site and repeatedly used rock ovens to process food, burned rock middens developed. By 5,300 BP burned rock middens were well developed in many of the most food resource rich locations in the Hill Country (Black et al. 1997:301; Collins 2004), possibly due to more xeric conditions and disappearance of buffalo at this time. Many of these middens continued to be used, at least intermittently, into the early Historic Period.

Some of the animal remains found in midden sites were catfish, mussel shell, snail shells, turtles, snake, armadillo, rabbit, prong horned antelope, white tailed deer, buffalo, sparrow, coyote/dog and many other small animals. The bones of these animals show stone knife cuts, scrapes and other marks from processing by man. Considerable cracked large bone fragments, probably buffalo and deer and or pronghorn antelope, and some buffalo teeth have been found at the 41KR21 site in the midden layers with Pedernales, Marshall, Marcos, and other points, suggesting deer/antelope, buffalo, and other animals were killed with these points, brought to this site, processed, and eaten cooked or uncooked. The meat cutting process could have been done using the dart points, various biface blades, and/or butted knives (Figures 5, 6, 7).

Evidence from early records of Apache, Comanche, and the many earlier tribes Cabeza De Vaca encountered (Krieger 2002; Fehrenbach 1974), indicates that consumption of raw flesh at the kill site was common—especially organs, possibly liver, blood, bile, stomach contents, and milk (Lehmann 1927). Shattered leg bones at the 41KR21 site suggest bones were broken open with stone tools and the marrow removed and likely eaten or rendered for fat and eaten, or used as a food trade item (Black and Creel 1997: 299) as recorded by Cabeza De Vaca in 1528-1534 when he lived with Indians near the mouth of the Guadalupe River, and other tribes across South Texas and Mexico (Krieger 2002).

The 41KR21 site was probably most populated during the wetter, mesic periods, that brought buffalo into the hill country valleys to feed on the prairie grasses. This may have occurred in two periods, at 6,000 to 5,000 years BP, when Bell and Andice dart points were popular; and again at 2,000 to 1,500 years BP, when Marcos, Montell, and Castroville were the styles in fashion (Collins 2004).

Based on the low number of dart points of Bell and Andice found at 41KR21 it is likely that this site a high level of use until roughly 4,000 BP through 1,500 BP. This time span would be would be during the Middle Archaic and Late Archaic, when Pedernales, Marshall, Marcos, Montell and Castroville were popular and the most numerous points found at the site. Butted bifaces and corner-tang knives, as well as triangular thin bifaces or knife blades ("Friday"), and other knife blades of several designs, appear frequently at this site. These knives are also known to be associated with burned rock middens from the Late Archaic Period (Turner and Hester 1999).

In summary the 41KR21 site appears to be a rather "typical" Hill Country campsite, with burned rock middens used for food processing (Black et al. 1997; Collins 2004; Weir 1976). It was likely chosen as a preferred campsite because of the relatively high availability of plant and animal food, water, and firewood. The site was probably used intermittently by nomadic hunter-gatherers for about 8,500 years, from the Early Archaic to the Early Historic period when Europeans arrived.

ACKNOWLEDGMENTS

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Portable Stone Mortars and Stone Pestles from Hidalgo and Starr Counties, Texas

Don Kumpe, John R. Boland, and Eugene Pilarczyk

ABSTRACT

Stone pestles and portable stone mortars uncovered during land clearing and farming activities in Hidalgo and Starr counties, Texas are reported and described. The types of stone artifacts in Hidalgo County are briefly examined and a cultural boundary to the eastward distribution of Caracara arrow points is apparent. Unusual types of stone transported into areas of Hidalgo and Starr counties are described.

INTRODUCTION

Forty-four stone pestles have been reported on the lower Rio Grande in Zapata County, Texas and northern Tamaulipas, Mexico at Falcon Reservoir (Chandler and Kumpe 1996); Boyd (1996; 1997) reports mortar holes and metates in sandstone bedrock, and deep abrading marks in sandstone bedrock and in portable sandstone abrading stones at a site on the Tamaulipas side of Falcon Reservoir. Large portable stone mortars, however, have not been previously reported along the lower Rio Grande and stone pestles are not previously reported in Starr or Hidalgo counties.

Farmers in Hidalgo and Starr counties near McCook have been plowing up pestles for decades (Eugene Pilarczyk, personal communication 2004), and a stone mortar weighing 33 pounds was plowed up on the Cameron Ranch in Starr County west of McCook (Doug Cameron, personal communication 2006). Another stone mortar was plowed up east of McCook in Hidalgo County (James A. McAllen, personal communication 2006).

Used as a reference point in this paper, McCook is a small agricultural community in west-central Hidalgo County, approximately 5 miles east of Starr County and 50 miles east of Falcon Reservoir. While the artifacts and archeological features reported at the reservoir take advantage of locally abundant lithic resources, the area about McCook in Hidalgo and Starr counties, with the exception of caliche outcrops, is devoid of lithic resources.

Eight pestles are reported from near McCook, but many that were found in the area have been lost or given away over the years and pestles found on farmland are often damaged by plowing. Fragments of pestles may be seen by area farmers, but not recovered "because they were broken." Ten miles east of McCook, near the intersection of Wallace Road and FM 490, the senior author recovered a sandstone pestle that does not appear in this paper as it retains only a part of one end.

A local overview is provided by a brief look at the types of stone artifacts found in Hidalgo County and, in so doing, a cultural boundary to the eastward distribution of Caracara points in Hidalgo County becomes apparent.

THE TYPES OF STONE ARTIFACTS IN HIDALGO COUNTY

Since late 2003, John R. Boland and the senior author have searched that area of Hidalgo County that lies west of the north-south length of U.S. 281, an area largely on the front line of urban sprawl. Nevertheless, 232 areas of lithic scatter were found in orchards and fields. All of the locations lacked context and more than 40 have since vanished, replaced by new schools,

Figure 1. Map of Portions Hidalgo and Starr Counties. Note the town of McCook, referenced several times in this paper.

colonias, subdivisions, *ranchitos*, and caliche pits. Although an appreciable variety of artifacts were recovered, the numbers of specimens provided (below) rely heavily on incomplete specimens.

If 20 or more complete and/or fragmentary specimens of a projectile point type were found we considered it to be common and the common types of dart points were found to be Abasolo, Catan, Kinney, Matamoros, and Tortugas. Also recovered were Angostura (2), Bell (1), Desmuke (3), Early Triangular (4), Ensor (6), Langtry/Arenosa (13), Marcos (1), Martindale (1), Pandora (3), Plainview (1), Refugio (2), Scottsbluff (1), Shumla (2), and Zorra (4) (Kumpe n.d.; Turner and Hester 1999). The sizable Hidalgo County collection of Eugene Pilarczyk includes a large Williams point and Chandler and Kumpe (1994a) report a Folsom that was found in Hidalgo County in 1969. Some of the dart point types that appear to be scarce or rare in Hidalgo County occur more frequently in parts of Starr County (senior author's personal experience).

The common arrow point types in our search area were Cameron, Caracara, Fresno, and Starr; we also recovered Padre (2), Toyah (6), and one unidentified (Guerrero-like) arrow point (Kumpe n.d.; Turner and Hester 1999). The Armando Vela Collection from eastern-central Hidalgo County (east of the north-south length U.S. 281) is described by Mallouf et al. (1977: Appendix, 255-286); it includes 2 Perdiz, but *no* Caracara, although Boland and the senior author recovered 27 Caracara in Hidalgo County sites west of U.S. 281 (Kumpe n.d.). No Caracara have been found east of U.S. 281 since 1977 (Armando Vela, personal communication 2006) and farther east there are no Caracara in the coastal collections (Kumpe et al. 2000: 39). Therefore, in the vicinity of the north-south length of U.S. 281 there appears to be a cultural boundary to the eastward distribution of Caracara points in Hidalgo County.

The chipped stone tools from the search area include perforators, gravers, flake and blade tools, gouges, knives, choppers, and a variety of biface and uniface scrapers, the latter quite numerous and some are diminutive. The ground stone artifacts recovered were abrading stones (2), 10 small fragments from 6 tubular sandstone pipes (plow impacts are particularly damaging to these hollow artifacts), and one sandstone pestle (Kumpe, n.d.; Turner and Hester 1999).

THE PORTABLE STONE MORTARS

Figures 2 and 3 illustrate a large portable stone mortar from the Cameron Ranch in Starr County. Don Cameron (personal communication 2008) remarks that the mortar was uncovered when their land north of Scoggins Feed Lot (Starr Feed Yards) at Rincon was root plowed about 25 years ago. After root plowing, the brush was piled and burned and tractors began working the land; when Don drove up to check on the work he discovered that a driver had found the stone mortar and hung it on his tractor. Don took possession of the mortar and stores it on his property at Leon Springs, where Richard McReynolds took the photos in Figures 2 and 3 and described the stone as unfamiliar grey granite. A circular hole in the bottom of the mortar appears to have been caused by interior impact. Starr Feed Yards at Rincon is 14 road miles west of McCook on FM 490.

Figure 2. Interior View of Don Cameron's grey granite stone mortar from north of Rincon in Starr County. It was exposed by root-plowing. Scale is 6 inches. Photo by Richard McReynolds.

Figure 3. Side View of Don Cameron's mortar from Starr County. Scale is 6 inches. Photo by Richard McReynolds.

Measurements for Figs. 2 &3:

Max. Height - 9 11/16"	Hole in bottom - 1 9/16"
Max. Width - 9 13/16"	Interior top - 6 5/16"
Min. Width - 8 1/8"	Weight - 33 lbs.

Figures 4 and 5 illustrate a smaller portable stone mortar from Hidalgo County. It was found by a tractor driver on the Retama Ranch, which was farmland about 2 miles north of Monte Christo Road. The mortar, deeply scarred with plow marks, was acquired in trade for a longhorn skull about 1980 and is part of the McAllen Ranch collection (James A. McAllen, personal communication 2006). The authors were unable to physically examine this mortar, but from McAllen's color photos it appears to be a smooth rounded boulder-like rock and the stone does not appear to be grey granite (see above), green

Figure 4. Mortar from Retama Ranch, Hidalgo County. In the James A. McAllen collection, with the photo provided by Mr. McAllen.

Figure 5. Base and Side View of Retama Ranch, Hidalgo County Mortar. In the James A. McAllen collection, with the photo provided by Mr. McAllen.

syenite, or yellow silicified sandstone (see below). The measurements (below) and the photos in Figures 4 and 5 were provided by James A. McAllen.

Interior depth - 4 ¾"
Width - 8 ¾"
Length - 10 ½"
Height - 6 ¼"
Thickness - 1 ½"

THE PESTLES

Figure 6, A is a complete stone pestle/abrader made of dark brown, fine-grained sandstone. It is deeply grooved (to 7 mm) on 2 sides from use as an abrading stone. The length of the longest groove is 213 mm and both grooves appear to bend around harder areas in the stone, thus the snaking, decorative look of the grooves. Some of the numerous plow strikes have broken substantial pieces of stone from the edges of both grooves and flattened the pestle. On the narrow end, a small area has been flattened by use wear from grinding. This pestle was found north of McCook in Hidalgo County by Antonio Ceballos. It is 322 mm in length, has a maximum diameter of 67 mm, and weighs 4.69 lbs.

Figure 6, B is a complete stone pestle made of dark grey abrasive sandstone. It is heavily scarred by plow strikes and was found by Larry Skloss in an area of Starr County known as the Brannan, which is northwest of McCook. It is 245 mm in length, has a maximum diameter of 56 mm, and weighs 2.88 lbs.

Figure 6, C is a complete stone pestle/abrader of grey, fine grained sandstone with use wear from

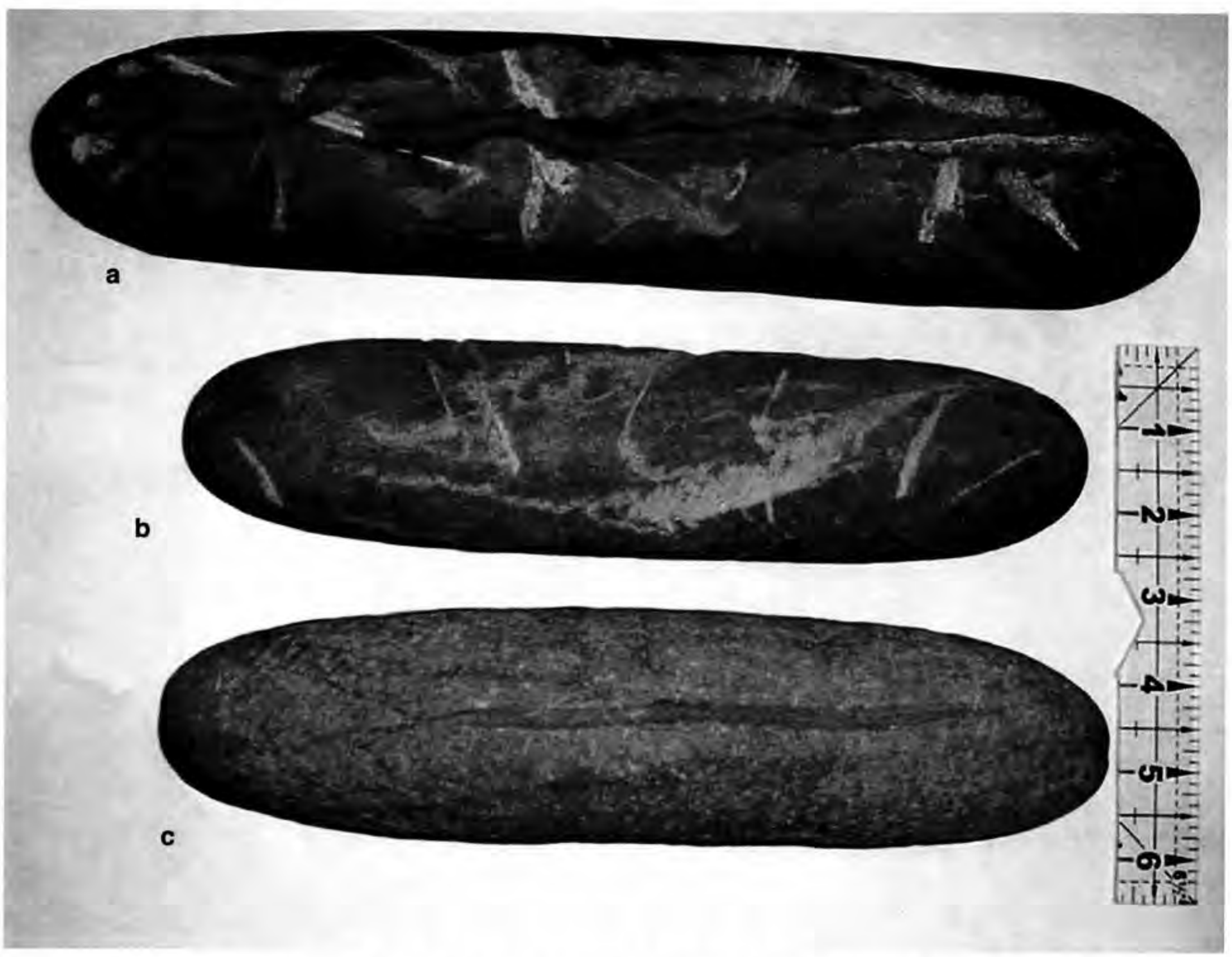

Figure 6. Pestles from Hidalgo and Starr Counties, Specimens 1-3. A and C were also used as abrading stones, and A and B are scarred by plow marks. Scale 6.5 inches. Photo by John Boland.

pounding on one end. It was heavily pecked to a cylindrical shape and has one moderately deep (to 3 mm) abrading groove. This pestle was found in the area of McCook. It is 253 mm in length, has a maximum diameter of 62 mm, and weighs 3.34 lbs.

Figure 7, A is a complete stone pestle/abrader of light tan, fine- grained sandstone, which is scarred with a few plow marks. It has one very shallow abrading groove and was found by Eugene Pilarczyk in the McCook area. It is 280 mm in length, has a maximum diameter of 59 mm, and weighs 3.29 lbs.

Figure 7, B is a complete stone pestle of fine-grained tan sandstone, which is only revealed by a deep plow scar as the surface has acquired a dark patina mottled with tan. It was found northwest of McCook in Starr County. It is 200 mm in length, has a maximum diameter of 56 mm, and weighs 2.06 lbs.

Figure 7, C is a complete cone-shaped pestle made of unfamiliar durable dark green stone without inclusions or shades of color. The broadly rounded polished ends are unlike those of the cylindrical pestles (above) and, while it was certainly used for pounding, use wear suggests it was also used for grinding, perhaps within a stone mortar. The cylindrical pestles are thought to have been largely used to process mesquite beans (see Discussion), but the use of this cone-shaped specimen with broadly rounded ends may have differed from the norm. Unlike the

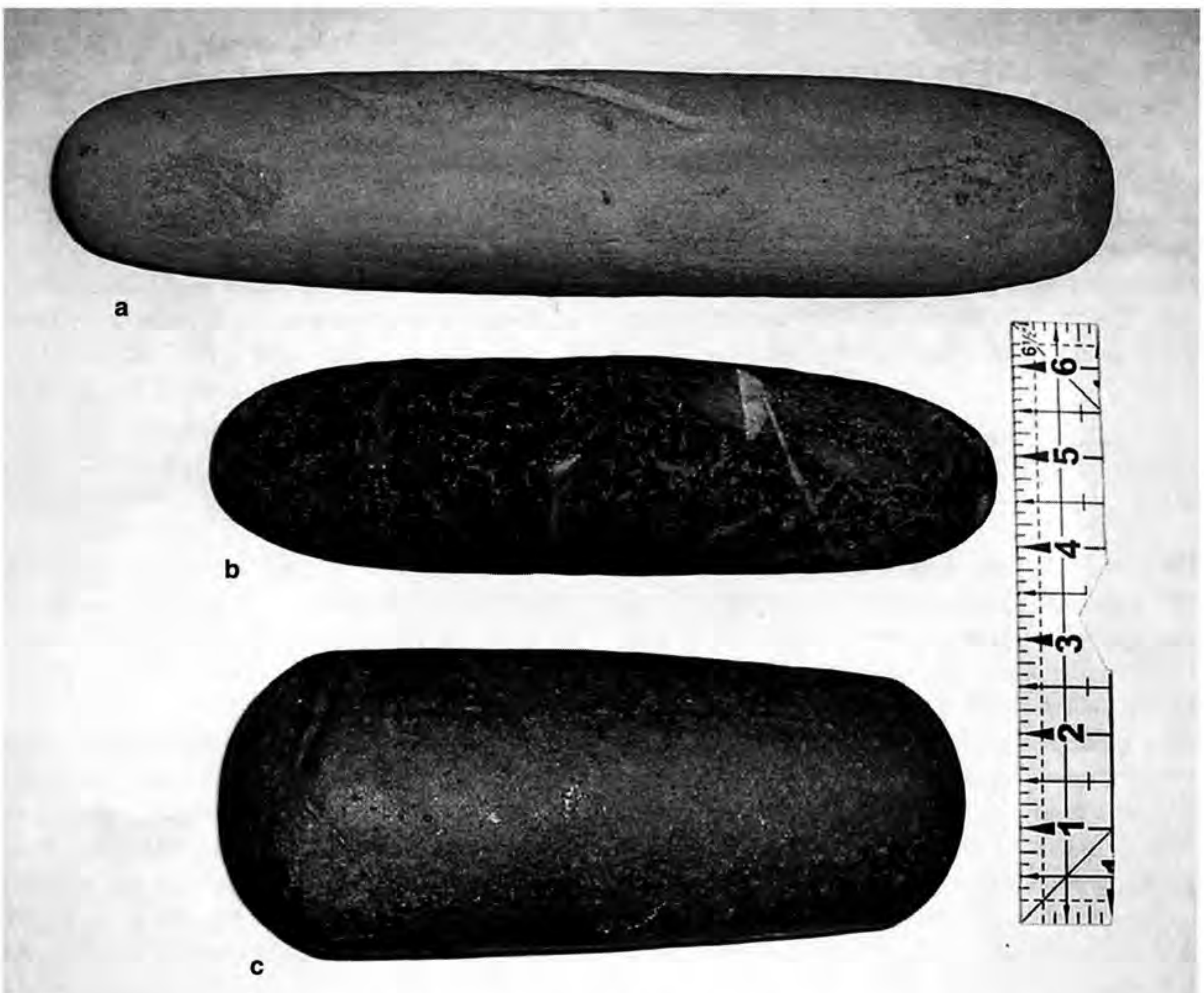

Figure 7. Pestles from Hidalgo and Starr Counties, Specimens 4-6. A, also used as an abrading stone; c, hard dark green stone. Scale is 6.5." Photo by John Boland.

softer sandstone pestles, this durable green stone pestle suffered only narrow, shallow cuts when plow struck. It was found by Paul Keller on his property west of FM 681 and south of Mile 16 Road, southeast of McCook in Hidalgo County. It is 180 mm in length, has a maximum diameter of 74 mm, a minimum diameter of 63 mm, and weighs 3.76 lbs.

Specimen No. 7 is not illustrated. It is a dark grey complete stone pestle that was shaped by pecking and then smoothed, but not to the extent of obliterating all of the peck marks. It has a few plow marks and both ends are rounded and polished from use wear. Conrad W. Prukop, Sr. found this pestle on his farmland east of Moorefield Road and north of FM 1925, which is about 10 miles southeast of McCook near the old town site of Monte Christo in Hidalgo County. The pestle is 321 mm in length, has a maximum diameter of 65 mm, and weighs 4.5 lbs.

Specimen No. 8 is not illustrated. It is a complete stone pestle with a grey exterior, but wide crushing plow strikes reveal greyish-tan sandstone. It is well smoothed with no sign of pecking and both ends are well rounded and polished from use wear. Like Specimen No. 7, this pestle was found by Conrad W. Prukop on his property southeast of McCook in Hidalgo County. It is 380 mm in length, has a maximum diameter of 69 mm, and weighs 6.5 lbs.

UNUSUAL LITHIC MATERIALS FOUND NEAR MCCOOK

Lacking lithic resources in the vicinity of McCook, local Indians transported a variety of stone into sites, often as raw material, and among these are notably common yellow cobbles. This yellow material has been identified by James Fallon as fine grained, highly indurated silicified sandstone that is nearly chert (Chandler and Kumpe 1995). "Yellow silicified sandstone" cobbles are rounded and light yellow to yellow-gold in color; the smooth thin exterior is "soft", i.e. it powders when scraped. In Rio Grande gravels south of Sullivan City in Hidalgo County the numerous yellow silicified sandstone cobbles stood out and were easily found because of their color. This stone is also commonly seen in prehistoric sites along the Rio Alamo near Mier, Tamaulipas, in Starr County, and in western Hidalgo County, where 5 yellow silicified sandstone choppers and a larger number of the cobbles were noted in one site on Mile 7 Road, that site now vanished beneath a *colonia*. Local Indians used this material to manufacture Clear Fork tools and knives but it was favored for choppers (Kumpe n.d.). Among the unusually large stones that are sometimes plowed up in prehistoric sites near McCook is a roughly diamond-shaped "boulder" of yellow silicified sandstone (280 x 182 x 93 mm) that weighs 13.14 pounds. It was found a few miles west of McCook in Starr county by Chris Respondek and the dimensions of this rock are comparable to the dimensions of McAllen's mortar, which, from McAllen's color photos, does not appear to be yellow silicified sandstone.

A distinctive coarse-grained green stone, used to manufacture a biface gouge (66 x 52 x 20 mm) found southeast of McCook in Hidalgo County, has been identified as syenite by UTSA geologists Stuart Birnbaum and Eric Swanson (personal communication to Richard McReynolds 2009). Speckled with tiny dark inclusions and larger irregular whitish inclusions, "green syenite" is considered uncommon along the lower Rio Grande and has never been seen except as artifacts, including waste flakes. Among the artifacts of green syenite are a sizable cleaver-like tool from 41SR172 in Starr County, and a remarkably large portable metate (222 x 192 x 53 mm) found by Pilarczyk on "Tiger Island" at Falcon Reservoir in Zapata County (Figure 8). The metate weighs 6.67 pounds, is light olive green on the polished surfaces, and the use wear, which was in a back-and-forth motion, is 153 x 50 mm with a maximum depth of 15 mm. Except for polished areas and the area of a small break at the narrow end, the metate is covered by a dull gold patina and appears to be on a green syenite *fragment* approaching the size of McAllen's smaller mortar.

El Sauz Chert, which outcrops as bedrock or cobbles at different locations (Including 41SR137) north of La Sagunada Road in Starr County, is frequently seen in prehistoric sites near McCook; there are boulder-size fragments at the bedrock locations and it can rarely occur as boulders among the cobble outcrops (Kumpe n.d.). Banks (1990: 50-51) remarks that El Sauz Chert is a distinctive lithic resource from the Catahoula Formation, and Mallouf and Tunnel (1979) identified El Sauz Chert as opalized tuffaceous

Figure 8: Metate Made on Green Syenite. From "Tiger Island" at Falcon Reservoir, Zapata County. Scale is 6.5". Photo by John Boland.

bentonitic clay; it is often colorful (reds, oranges, golds), but more often light grey. The outcrops of El Sauz Chert are about 35 miles west of McCook in Starr County, but this apparently valued resource is commonly seen in western Hidalgo County, where the senior author's records (Kumpe n.d.) contain exactly 100 entries noting artifacts (including waste flakes) of El Sauz Chert. Mallouf and Tunnel (1979) note the presence of El Sauz Chert in the Vela Collection from eastern-central Hidalgo County. Opalized tuffaceous bentonitic clay, indistinguishable from El Sauz Chert, is seen in prehistoric sites along the Monterrey Highway southwest of Reynosa, but in such large quantities that it is believed to be from undiscovered outcroppings in Tamaulipas and/or Nuevo Leon, Mexico (senior author's personal experience).

DISCUSSION

The lower Rio Grande appears to be an improbable source of sizable and suitable materials for the manufacture of large portable ground stone mortars. Yellow silicified sandstone may reach boulder size and a ground stone artifact made of yellow silicified sandstone (a unique double bit celt from Nuevo Leon, Mexico) has been reported by Chandler and Kumpe (1995), but this material is not proven suitable for mortars. Green syenite, a granite-like material, was utilized for the large, deeply ground metate from Falcon Reservoir (Figure 8); this material is undoubtedly suitable for stone mortars, but, along the lower Rio Grande, the large fragment of green syenite used for the metate is possibly unique. Although El Sauz Chert occurs as boulders and as boulder-size fragments broken from bedrock, this fine-grained material is unsuitable for mortars.

An editor's addendum by Jimmy Mitchell (Hester 1979) mentions a large stone mortar at the Hidalgo County Historical Museum in Edinburg, but no provenience was available at the time. That museum is now the Museum of South Texas History and the large stone mortar is from Tamaulipas (James A. McAllen, personal communication 2008). Lisa Adams (museum registrar) describes the mortar as "dark grey with tiny black spots and finely mottled"; it is very similar to Cameron's mortar from Starr County. The following measurements were provided by Lisa Adams:

Maximum Interior Width 7 ½" x 7 5/8"	Maximum Exterior Width 9 9/16" x 9 5/8"
Interior Mouth 6 7/16" x 6 5/8"	Exterior Mouth 7 1/8" x 7"
Maximum Height 11 3/8" 9 ½"	Minimum Height Weight - 35.5 lbs.

Large stone mortars must have been highly valued and could apparently last for generations. Pedro Mercado, a mechanic at Las Milpas in Hidalgo County, grew up on a ranch at Verde Chico, Tamaulipas, which is northwest of Soto la Marina. There was a large stone mortar on the ranch and Pedro's father related that Pedro's grandfather, Jesus Mercado, found the mortar on their property in 1918. Pedro's grandmother, Trinidad Orta Mercado, subsequently used it for years, into the 1930s, to grind corn for tortillas. It remains on the ranch to this day and Pedro recently took a photo of the mortar (Figure 9), measured its height at 33 cm, its interior diameter at 37 cm, and

Figure 9. Stone Mortar from Verde Chico,Tamaulipas. Height is 33 cm. Photo by Pedro Mercado.

estimated that it weighs about 40 pounds. Verde Chico is approximately 55 miles north of a Huastecan site, San Antonio Nogalar, where Stresser-Pean (1977) reports a number of large portable stone mortars.

Quite a few pestles were carried into the McCook area and this suggests that nearby food resources justified the effort to manufacture pestles elsewhere and transport them for miles. The most likely resource is mesquite beans as it is known that mesquite pods were pounded into meal using a mortar; metates do not work because the mass becomes too sticky (Castetter and Underhill 1935, from Dering 2006). Chatfield (1893:44) describes a method for processing mesquite beans by a group of Carrizo Indians on the lower Rio Grande, apparently during the late 1800s, and the beans were pounded:

> The Carrizo Indians, who formerly lived in this neighborhood, and some of whose descendents are still among us, used to gather quantities of the pods every year, which they pounded up and treated with scalding water. Then they made it into lumps of paste or dough, weighing about a pound each, which would keep indefinitely, and at any time, by dissolving one of these lumps in boiling milk, a sweet, palatable and nutritious dish of pudding could be made. We don't suppose the Carrizan mode of preparing mesquite is an art that is utterly lost, but it is several years since any of the 'bolas' have been seen here.

Boyd (1996: 22, 23) remarks (from personal communication with Tom Hester in 1996) that the use of stone pestles with wooden mortars would account for pestles in sites that are far removed from known bedrock mortar hole sites. The stone pestles found near McCook are miles from the nearest bedrock and 7 of the 8 reported were probably used with wooden mortars; use wear on the green stone pestle (Figure 7, C) suggests that it may have been used with a stone mortar. Pestles found near McCook are almost always scarred with plow marks and were frequently used as abrading stones, which reduced the need to carry sandstone into the area.

Cameron's grey granite mortar from Starr County closely resembles the Edinburg museum's grey granite mortar that was found to be from Tamaulipas, and it seems likely that stone mortars found on the lower Rio Grande would originate where there are lithic resources suitable for their manufacture, and where mortars were a part of the cultural inventory.

Large portable stone mortars are reported among the Huasteca at San Antonio Nogalar (Stresser Pean 1977) and apparently occur elsewhere in Tamaulipas (James A. McAllen and Pedro Mercado, personal communications 2008). While there is no earlier record of Huastecan stone mortars reaching the lower Rio Grande, Hester et al. (1996) remark on a concentration of Mesoamerican obsidians occurring at sites in the Rio Grande delta. Along with ceramics and jadeite, the obsidians are believed to have reached the Rio Grande delta as part of a Huastecan-Brownsville Complex trade relationship (Hester 1994; Hester et al. 1996), which, without knowing their geologic sources, also appears to be the most likely origin of the grey granite mortar found in Starr County and the green stone pestle from Hidalgo County. McAllen's mortar may have reached Hidalgo County in the same way; stone mortars of the sizes and configurations reported might have been little if any more difficult to transport than the large ceramics which were a part of the trade.

ACKNOWLEDGMENTS

The authors would like to thank Richard McReynolds for indispensable help and sage advice, UTSA geologists Stuart Birnbaum and Eric Swanson for identifying lithic materials, James A. McAllen for sharing information from the McAllen Ranch collection, Mike Krzywonski for help with references, and Lisa Adams at the Museum of South Texas History in Edinburg for measuring a large heavy mortar. Thanks also to Paul Keller, Conrad W. Prukop, Sr., Chris Respondek, and Larry Skloss for loaning their artifacts for documentation. We would also thank Pedro Mercado of Las Milpas and Verde Chico for sharing information on an ancient stone mortar his family has curated for over 90 years.

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Appendix

Mortars and Pestle from Santander Jimenez, Tamaulipas, Mexico

Mike Krzywonski

In 2009, I was shown 2 mortars and a pestle plowed up (with a horse-drawn plow) in a field on a private ranch in the vicinity of Municipio Santander Jimenez, Tamaulipas (Figure 1). These specimens are owned by Johnny Cavazos, and have been photographed by Nathanael Flores. These artifacts are briefly reported in this Appendix. The characteristics of the specimens can be compared to those recovered from the Rio Grande Valley and southern Texas.

Figure 1. Mortars and Pestle from Municipio Santander de Jimenez, Tamaulipas.

In Figure 2, the larger mortar is illustrated. Overall length is 210 mm, while lip to lip diameter is about 190 mm. The plow blade had hit the buried mortar, causing abrasions and a break on the inner side of part of the lip.

Figure 2. Large Mortar (see Fig. 1) from the Municipio Santander de Jimenez.

Figure 3. Pestle from Municipio Santander de Jimenez.

Found with the mortar was a pestle (Figures 3, 4), though it is not known if it was within the mortar bowl or cavity, or perhaps next to the mortar. It is about 85 mm high, but diameter data are not available. As seen in Figure 4, one end is dome-shaped and bears extensive wear.

Figure 4. Another View of Pestle from Municipio Santander de Jimenez.

A smaller mortar (Figures 5, 6) was apparently found in the same field, though details of its discovery are vague. It is about 73 mm high and the diameter at the lips of the bowl is 100 mm. The rim is uneven, and in one area, there may have been abraded that was subsequently smoothed.

Figure 5.Small Mortar from Municipio Santander de Jimenez.

Figure 6. Another View of Small Mortar from Municipio Santander de Jimenez.

Unfortunately, there are no data at this time on the nature or age of the site at which these were found. Santander Jimenez is situated about 70 miles north of the Huastecan site of San Antonio Nogalar. As noted in the main body of this paper, numerous portable stone mortars are illustrated for that site.

I would like to thank Mr. Cavazos and Mr. Flores for making these data available.

A Note on Experiments in Making *Oliva Sayana* Shell Beads and Tinklers

Jesse Todd

ABSTRACT

Brief experiments were carried out to gauge the difficulty, and the time involved, in perforating *Oliva sayana* shells in the manufacture of olive shell beads and tinklers.

INTRODUCTION

In his discussion of the Sierra de Tamaulipas sequence, MacNeish (1958:191) compares its traits with the Late Barril and Brownsville complexes of South Texas. He mentions that *Oliva* shell tinklers and beads occur in the complexes and these ornaments appear at Huasteca in the Las Flores and Panuco Periods and the Rockport Focus of the Corpus Christi region. The *Oliva* shell tinklers and pendants that MacNeish discusses are made from *Oliva sayana*, the Lettered Olive, found along the Texas Gulf Coast.

The Lettered Olive (*Oliva sayana*) ranges from along the Gulf of Mexico states to the West Indies and Brazil. The shell has a polished cream-colored background with numerous brownish zigzag markings. Five or six body whorls dominate the shell and the spire is short and acute. A long, narrow aperture that is purplish is present and an oblique notch is at the shell's base. It can be found in inlets and offshore and in faunal habitats (Andrews 1992:59-60).

In this paper, the length of time required to make an *Oliva* shell bead (Figure 1a) and tinkler (Figure 1b) is discussed. Two tasks were undertaken. The first task was to determine how long it would take to remove the olive shell's spire by rubbing it across a small sandstone ground stone to make the bead and the second was to see how long it would take to make a perforation in the olive by using a quartzite biface for a drill and grinding the edge on the ground stone to make the tinkler. Both tasks were timed using a stop watch. The span of time from when the shell was picked up to when the task was done and the shell placed on the ground was considered the time it took to complete the task.

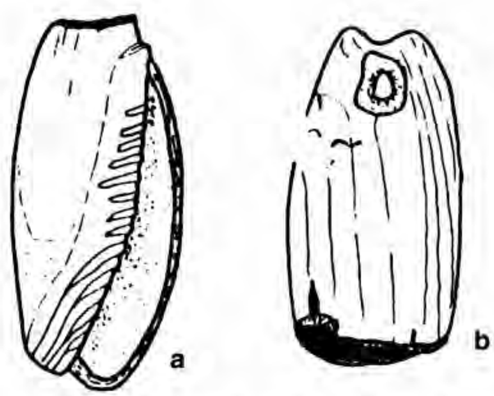

Figure 1. *Oliva sayana* shell bead (a) and tinkler (b) from burial at site 41HG27. Modified from Hester and Rodgers (1971:369).

According to Hester and Rodgers (1971:30), olive shell beads recovered from site 41HG27 ranged from 42 to 50 mm long and 22 to 24 mm in diameter. Tinklers ranged from 30 to 54 mm long and 12 to 23.5 mm in diameter. The lower one-third of spire end was cut off to make the tinkler and single perforation was made at the posterior end. Shells used in experiment were 59.0 and 63.8 mm long and 19.5 and 21.2 mm in diameter.

THE SHELL BEAD

It took approximately 2 minutes and 41 seconds of grinding, including two stops to look at the shell, to make the shell bead shown in Figure 2. A small columella (Figure 3) was present at the end of the experiment, but, when pressed with a fingertip, the columella fell off, but more was present in the shell. The small metate was held at a 45 degree angle during the grinding process.

THE SHELL TINKLER

Starting the perforation was difficult due to the round shape of the shell. The thickness of the shell where the perforation was attempted is 4.3 mm. A perforation 1.5 mm deep was made in about 6 minutes and 20 seconds. The author had to stop and rest his thumb occasionally (not counted in the time). By this time, the tips of two quartzite bifaces were broken. The author discontinued the experiment after 10 min-

Figure 2. Olive shell bead.

Figure 3. Olive shell columella.

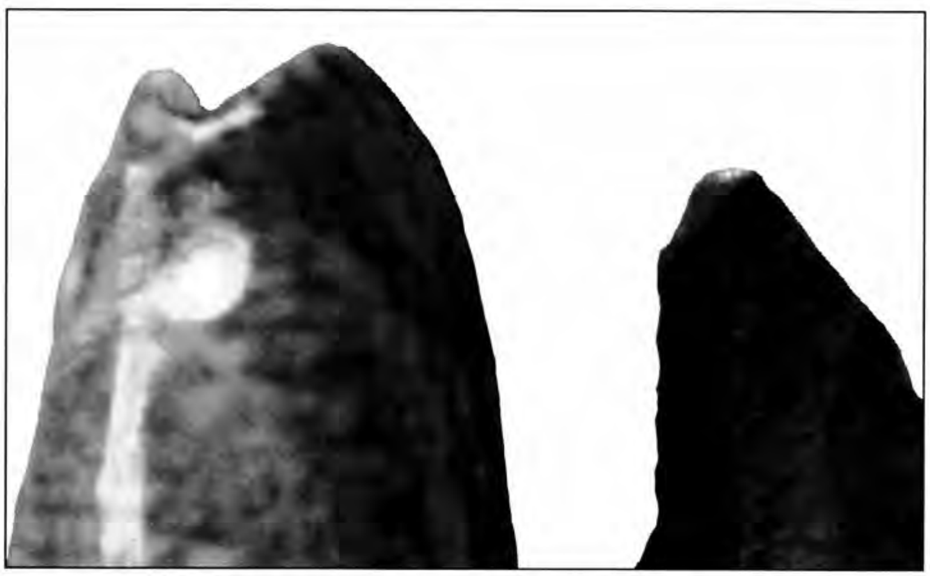

Figure 4. Perforation (the white spot) after 10 minutes of drilling and the broken tip of one of the quartzite bifaces.

utes when all he was doing was widening the hole and not making much headway in increasing the depth of the perforation (Figure 4).

The grinding of the spire end of the olive shell then began. The length of the shell was 63.8 mm and in 8 minutes and 56 seconds, 19.4 mm of shell was removed. The shell became hot during the grinding process so the hand was padded that held the shell. More of the shell could have been removed except the author has a big hand and the grinding process was coming close to not only grinding the shell but the hand as well.

One of the problems encountered during the grinding process was that the shell would be ground at an angle due to the shape of the small metate (Figure 7). The author continually had to rotate the shell to compensate for the angle. The tinkler is shown in Figure 5 and the inside of the shell is shown in Figure 6.

Figure 5. Olive shell tinkler.

Figure 6. Inside of olive shell tinkler.

CONCLUSIONS

After creating the tinkler, the author believes that the small columella in the bead was perforated allowing for stringing because even though a portion of the columella could be removed by finger pressure, no clear hole was present. The tinkler could have been strung more easily due to the hole that was left after grinding as shown in Figure 7. More than likely, a flat or relatively flat piece of sandstone was used during the grinding of the shell.

The aboriginal makers of the shell tinkler may have had a tool kit that included instruments for cutting the shell off and not grinding the shell and extremely hard instrument(s) for making the perforation which appears to be the most labor intensive part of making the tinkler. Chandler (1996:11) has shown that the use of a hafted chert perforator and bow drill is an efficient manner in which to perforate a shell although it still labor intensive, taking about 25 minutes. In addition, Chandler also experienced chert perforator tip breakage. Some of the recovered shell tinklers from archaeological sites have a slit made where the shells were perforated. This may have been done to ease the drilling of the hole and provide less shell for the drill to penetrate.

Figure 7. Small sandstone metate used in experiment.

The author has a new appreciation for the amount of work that went into creating the olive shell beads and tinklers, especially during the perforating process.

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Description of a New Bifacial Core Form from Central Texas: Tabular Cores with Oblique Platforms

Christopher Lintz

ABSTRACT

This paper describes a newly recognized kind of core herein called "tabular cores with oblique platforms." This distinctive kind of bifacial core is unusual in that it does not employ the typical biface reduction strategy and likely represents the development of a specialized reduction strategy for the production of long and thin flake blanks from relatively thin, tabular nodules of chert. One example from Edwards County is described and illustrated, although another example was also noted from Fort Hood, located some 270 km away. Although the temporal, spatial and cultural affiliations are not yet known, this paper serves to call attention to these interesting items, in the hopes that other analysts can refine their temporal and contextual affiliation.

INTRODUCTION

A standard and very simplified definition of a biface is simply "an artifact bearing flake scars on both faces" (Crabtree 1972:38). Nothing in this definition indicates whether the flake scars represent minute incidental use-wear scars, small to medium size pressure flake scars, or large percussion flake scars. There is also no necessary implication that the biface or objective piece represents an informally utilized or minimally modified flake implement with minute series of flake scars on both faces, a formally shaped implement such as a point or knife, an intermediate stage in biface tool production, or a standard bifacial core.

Bifacially chipped objects that include formally shaped implements, bifacial cores, and intermediate stages of tool production usually employ a strategy that is called the biface reduction strategy (BRS; Collins 1975; Callahan 1979; Whittaker 1994). The similar use of the names of the objects and the formal manufacturing strategy of reducing nodules and blanks through a series of stages to finished implements sometimes leads to confusion. The present paper documents a distinctive kind of bifacial core from central Texas that does not utilize the typical BRS. Herein named the "oblique platform variety of tabular cores," documentation of these objects is based on an admittedly small sample of specimens observed from surface contexts in Coryell and Edwards Counties of central Texas (Figure 1). The existence of technologically similar objects from areas about 270 km apart suggests that the technology may have been shared, yet it represents a specialized manufacturing strategy reserved for the production of large, flat, tabular flakes from thinly bedded or tabular chert nodules. These new kinds of bifacial cores (as objects) may have been escaped recognition in earlier studies, and might be quite common in some areas where appropriate kinds of chert exposures were present. At this time, the temporal, spatial and cultural affiliations of these bifacial tabular cores with oblique platforms are not known. My hope is that by calling attention to the existence of these objects, other analysts may look for them in other site assemblages and begin to document their distribution and affiliations.

The best way to describe the distinctiveness of these bifacial artifacts is to contrast them with the products derived from typical or standard biface production methods. Accordingly, I first discuss the technology of making bifaces using the BRS and describe the morphology of typical stages along the way of making bifaces. Then after the standard traits are presented, I describe and illustrate the bifacial core found in Edwards County as a means of showing

Figure 1. Location of counties in Central Texas yielding oblique platform tabular bifacial cores.

how different these objects are. Finally, I discuss the suitability of this non-biface core reduction strategy to specific forms of chert. I speculate that these bifacially-worked objects represent static examples of a specialized knapping strategy suited for select shapes of knappable materials that complemented and may have been used simultaneously with other knapping strategies used for different forms of chert nodules. The strategy is efficient in minimizing the preparation waste and productive in maximizing the number of large, thin tabular flakes. The technology does not necessarily maximize the amount of usable cutting edges. As such, they are best suited for the manufacture of flake blanks for the production of other tools, rather than serve as utilized flakes.

STANDARD BIFACE REDUCTION STRATEGY (BRS) METHOD

The making of formally-shaped and regularly patterned chipped stone tools according to the usual biface reduction strategy (BRS) method involves either (1) striking a nodule of chert (percussion) using a hard hammer (hammerstone) or soft billet made of bone, antler or hard wood or (2) adding increased pressure on a piece of chert by means of a flaking implement (pressure flaker). Percussion flaking is less precise than pressure flaking due to varying degrees of hand-eye coordination, and inexact motor skill control involved in the placement of the application of force. In this process, hammerstones and billets are used in removing large flakes from cores and the rough shaping and thinning of implements from cobbles or large flake blanks. In contrast, pressure flaking is used for converting thin flake blanks into delicately shaped implements like notched haft elements or serrated edges for projectile points, or putting the finishing edge on scrapers or other implements. Pressure flaking can also be used in non-BRS technologies, such as pushing blades from polyhedral cores where precise placement of the flaker for the removal of desired flakes is required.

Many lithic technologists advocate that the strategy of reducing a raw cobble of blank to a finished bifacial implement by percussion typically involves a BRS (Collins 1975; Callahan 1979; Whittaker 1994). Whereas archaeologists debate whether prehistoric peoples recognized distinct steps in the bifacial manufacturing process, such debate is unknowable. The fact remains that most modern flintknappers recognize alterations in goals or objectives as they convert raw blanks or nodules into a thinned bifacial tools. Modern knappers frequently change the size and kinds of billets, alter the orientation of the biface, employ different strategies in setting up and removing flakes, and change their manner of edge manipulation during different stages in biface production in order to accomplish specific goals. Thus, bifacial reduction manufacture typically involves the removal of flakes from opposing faces of a nodule to transform a nodule into a finished tool; the process creates a single distinctive edge around the perimeter of the object that tends to be centrally located relative to the implement's cross section. During intermediate stages of BRS, the knapping edge is sometimes moved closer towards one face to set up a platform necessary to drive off long flakes from the adjacent face. But such manipulation is temporary relative to the usual position of sinuous edge located near the middle of the core mass when viewed on edge. Collins (1975), Callahan (1979), and Whittaker (1994:201-206) all recognize five similar stages employed in the biface reduction process for making tools. These involve:

Stage 1: Chosing a suitable blank. The blank is a usable piece of lithic material (nodules, split cobbles or large flakes), of adequate size and form and accommodate the thinning and shaping anticipated to achieve the desired tool form.

Stage 2: Edging the blank. During this initial stage, the knapper creates a single edge around the perimeter of the cobble so that the negative ventral flake scar can serve as platforms for removing flakes from the opposite face. The edge angles tend to be relatively steep—often on the order of 50 to 80 degrees. If tabular blanks were chosen, one of the main goals is to merge parallel edges of a rectangular form into a single sinuous edge. Typically early stage bifaces tend to be thick (with width-to-thickness ratios of ca. 1:2 to 1:3 or items about twice to three times as wide as they are thick), relatively amorphous in outline form and cross section, a very sinuous single perimeter edge, and rather large flake scars on each face. Typically the flake scars may not extend to the center of the objective piece and large areas of cortex may often be present in the middle of one or both faces. Despite general claims that edging is a necessary early step in the biface reduction strategy, recent study of very large, thin, bifaces from the Hoerster cache found three of 18 specimens made from thin tabular chert nodules as retaining small remnants of cortex on tips, and natural concave edges of these trade blanks (Lintz and Saner 2002:19). Clearly the morphology of the selected nodule or blank and the stage of "completion" bare considerable weight in the degree of edging standard bifaces.

Stage 3: Initial or primary thinning the biface. During this stage of primary thinning, the knapper uses the ridges between adjacent flake scars on to direct fractures past the mid-line axis of the biface to remove mass from the middle of the face. Also, the removal of mass mid-cobble attempts to control irregularities in the original morphology of the blank. Little concern is expressed about the outline or symmetry of cobble. The resulting biface is still a relatively thick, with width-thickness ratios of 1:3 to 1:4, asymmetrical outline, but with a lenticular and refined cross section. The edges tend to be relatively placed along the middle of the implement cross-section, and appear semi-sinuous. Edge angles often range from 40 to 60 degrees. Small areas of cortex may remain in the middle of one or both faces.

Stage 4: Refining or secondary thinning the biface form. Flaking tends to continue the efforts to thin and shape the form of the biface. Flake scars tend to be narrower and persist in the removal of more mass from the middle of the implement than from the overall loss or reduction of the implement width. Objective pieces have a flattened, lenticular cross section with little to no cortex, and width-thickness ratios of 1:4 to 1:5. The biface edge is less sinuous and initial efforts are made at creating a symmetrical form depending upon the shape of the final implement. Edge angles often range between 25 to 45 degrees.

Stage 5 Finishing the implement form. The final stage is refining the final form by trimming off jagged edges and platform remnants, refining the overall symmetry shape, and sometimes adding notches for hafting. Sometimes, the trimmed edges are modified by pressure flaking to create notches, serrations, or beveled edges. Some thinning may persist such that the width-thickness ranges from 1:4 to more than 1:6 and the edge alignments are straight, and often along the mid-axis of the biface profile.

It is possible that large flakes removed during Stage 1 or 2 could be selected as flake blanks for making other implements, such as unifacial scrapers, drills, or arrow points. In this manner, these early stage bifaces may have directly or indirectly served as bifacial cores. But with further reduction the removed flakes tend to become smaller and eventually they are no longer serviceable to make other tools. With further reduction, the objective piece is converted into a bifacial tool. Characteristics of the early stage cores made using the BRS include the presence of a lenticular cross section, a single sinuous edge around the circumference of the objective piece located near the center of mass in cross section, the occurrence of large flake scars, and sometimes the presence of cortical remnants located near the middle of one or both faces.

AN ALTERNATIVE STRATEGY IN BIFACIAL CORE PRODUCTION

On more than one occasion I have noticed distinctively different bifacial core morphology from widely different areas of Central Texas that do not use this standard BRS methods of biface reduction. I have no idea how widespread or common this form of oblique platform kind of tabular bifacial core is, or even the temporal or cultural affiliation of these objective pieces. However, they seem to represent a very interesting examples of cores prepared to produce distinctive, very large, thin, tabular flake blanks.

One specimen was noticed a few years ago during a brief reconnaissance of chert deposits in the restricted live-fire zone on top of Henson Mountain at Fort Hood in Coryell, County; but a non-collection policy prohibited removal of this surface specimen. The second example, described herein was on the dashboard of a pick-up truck owned by Todd Vargas, a ranch manager for property located along the headwaters of the Nueces River in Edwards County. Even though the Fort Hood example was made of a bluish-gray chert and the Edwards County specimen was a yellowish-tan chert, both were likely from Edwards Group chert sources (Frederick and Ringstaff 1994; Banks 1990). Neither was observed in a site context that could provide information about the age or cultural affiliation of these kinds of objects. But the occurrence of two specimens near Edwards Group formations approximately 170 miles (270 km) apart, suggests that the knapping strategy may be quite widespread and perhaps culturally distinctive. By calling attention to this special kind of core, other researchers can help discern the temporal, spatial and cultural significance, if any, of these specimens.

The following description is based on the specimen from Edwards County (Figure 2). At first glance, the core appears to be a relatively flat, tabular, large rectanguloid biface. Indeed, one archaeologist opined that it was a simple bifacial core when first shown the specimen presumably because large flakes have been removed from both faces of the relatively thin core. But upon closer inspection, the flake removal pattern clearly diverges from the standard reduction strategies for making standard bifacial cores. The maximum dimensions of the Edwards County specimen are 123.0 mm long, 105.0 mm wide, and 19.5 mm thick, and thus this specimen is clearly a very large, thin, tabular artifact with very large flake scars present on both faces.

The most distinctive characteristics that set this piece apart from bifacial objects made from the BRS are:

1. The absence of a single, sinuous or semi-sinuous perimeter edge near the mid-line profile of the biface;
2. The lack of a regular biconvex, lenticular, or even a plano-convex cross section commonly associated with standard biface production (the cross section can best be thought of as either rhomboid or trapezoid depending on the orientation of the piece);
3. The lack of an effort to systematically remove cortex around the perimeter edge that typically occurs in conjunction with the creation of the single sinuous edge (although cache studies indicate that nodule

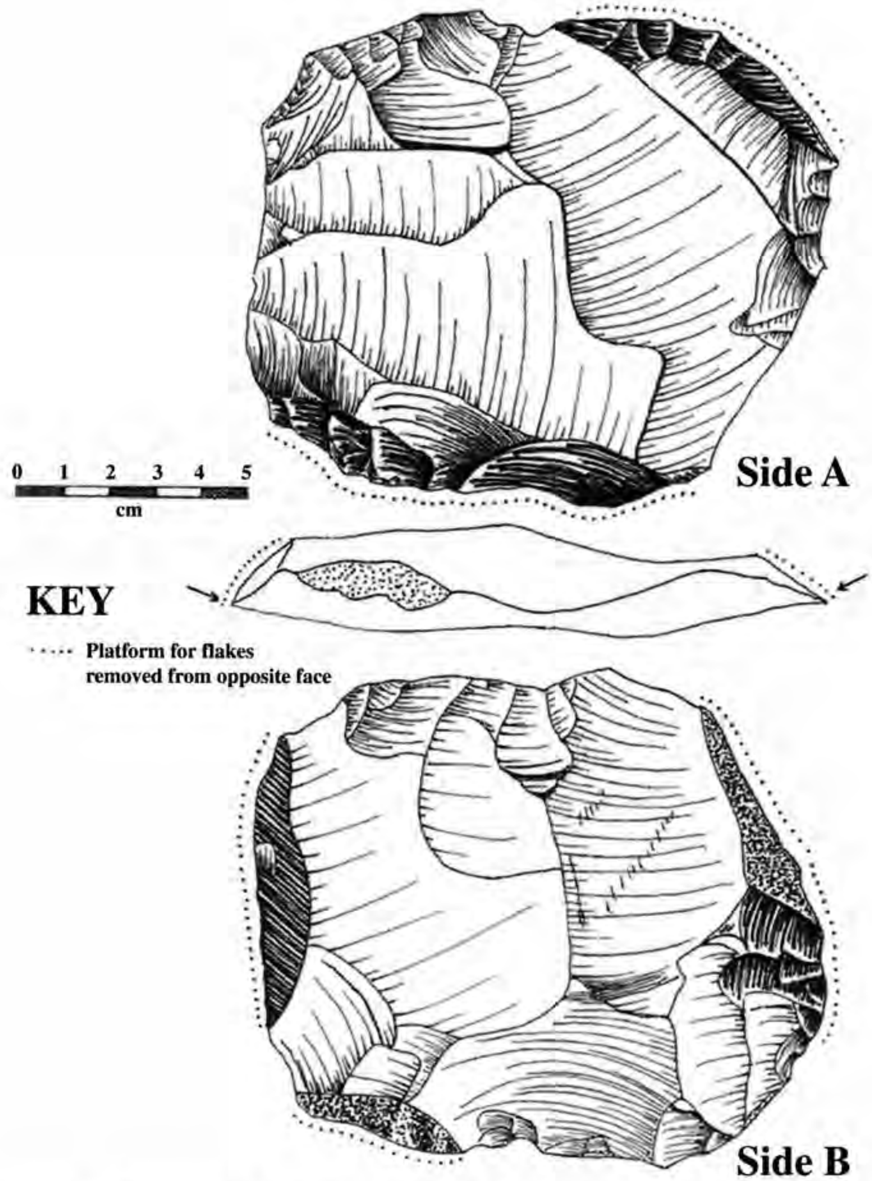

Figure 2. Illustration of the Oblique Platform Tabular Bifacial Core from Edward County, Texas.

shape affects decisions about the systematic removal of cortex around the perimeter of the biface [Lintz and Saner Jr. 2002]);

4. Lack of effort to impose a symmetrical shape to the implement; *and*
5. The lack of a mid-line ridge down the middle of each face formed by the common termination of flakes struck from opposing lateral edges of a biface, which is often, but not always present in BRS objects.

Instead, this distinctive bifacial core is further distinguished by:

1. The presence of two relatively broad flat or tabular faces that are nearly parallel to each other;
2. The presence of short, steeply sloping or obliquely angled bevels along most perimeter edges that served as platforms for removing long, broad, tabular flakes from each face;

3. The presence of very long, broad, tabular flake scars extending three-fourths or more of the way across the face of the core and originating from multiple different perimeter obliquely-beveled platforms on each face;
4. The retention and maintenance of a broad, tabular form; and
5. The presence of cortex along three platform areas instead of occurring near the middle of each face as would be expected from typical BRS.

The flakes on both faces originate from five steeply beveled platforms that generally correspond to three of the four sides of the rectangular core; one side contained two platforms that slope towards different faces, which were separated by a large, deep flake scar with a collapsed platform. Considerable variation exists in the formation of these beveled platforms, which range from 39.1 to 94.2 mm long, 15.2 to 22.1 mm wide, and platform dorsal angles ranging from 68° to 84° (Table 1). There is also no consistency in the side of the biface containing the beveled slope; adjacent platforms may sometimes slope towards the same face, and other times they do not. Similarly, opposing edge platforms may or may not slope to the same edge. Thus, cross sections through the core may be described as rhombic in some places and trapezoidal in others.

Although most of the two broad faces of the core show remnants of a few, long and broad flake blank scars, the size of these scars may have completely removed evidence of earlier flake scars. Perhaps the platform bevels that once sloped towards one face might have been altered during the life of the core so that platform rejuvenation shifted the high edge of the bevel from one face to the other. This suggestion is supported by two observations. First, the origins of large flake blank scars along one edge occur on opposite faces, despite the marked slope of the platform, which would have resulted in an unlikely obtuse platform-face angle for the removal of one flake. Second, the five beveled platforms show a wide range of platform morphology, ranging from cortical surfaces, to multiple trimming scars resulting in a faceted platform, to the presence of a large single flake scar that results in an unfaceted platform surface. The presence of cortex along three areas forming oblique platforms sloping towards the same face along two adjacent edges tenuously suggests that the original selected cobble was a relatively thin, oval piece of chert eroded from bedrock sources, rather than procured from secondary gravel deposits.

Possibly the single, large unfaceted platform was created by the removal of a platform rejuvenation flake to create a new platform surface. Such rejuvenation efforts might have been struck to clear up knapping problems along an original platform edge. Along one edge of the rectangular biface, a large deep flake scar with a possible collapsed platform separates two platforms beveled towards opposite faces. One of these bevels is entirely cortical and the other is made by a series of closely spaced trimming flakes. The presence of large cortical surfaces right on the margin of the platforms is one of the best indicators that the BRS was not used in fashioning the core.

A series of large flake blank scars have been removed from each of the distinctly beveled platforms (Table 2). Current evidence indicates that between one and five large flake scars have been struck from each platform. Clearly this should be regarded as a minimal number since evidence of earlier flake removals may have been destroyed by these last scar removals. Often these large flake removals converge from opposite ends of the core, but sometimes, depending on the bevel of the platforms, some flake blank scars on one face are perpendicular to each other and struck from adjacent edges. No significant knapping problems, such as significant hinge fractures or stacked terminations that resulted in a knot or lump of debris, are present on either side of the core. Indeed, except for the one deep flake with a collapsed platform, the reasons why this core was abandoned or not reworked into a bifacial implement are unclear.

Measurements collected on the dimensions of large flake blank scars on each face are prone to under-represent true sizes, since later flake scars could have reduced the maximum lengths or widths of earlier flake scars. Nonetheless, the sizes of the largest flake scars are impressive. Flakes removed from the cores ranged from at least 44.5 mm to 101.2 mm long and from at least 29.1 to 55.1 mm wide (Table 2). The thickness of the flakes is unknown. None of

Table 1. Attributes and Metric Variables of Beveled Platforms Along the Edge of the Biface Core

Platform Characteristics	Angle (degrees)	L (mm)	W (mm)	No.Flakes Removed	Face Side
	Platform Sizes				
1) Unfaceted platform single flake scar made by a possible rejuvenation blow.	73	64.8	22.1		A
2) Faceted platform made from three main scars and many minor scars; partially collapsed.	68	94.2	16.6	4	B
3) Cortex partially covering 2/3 of edge and faceted platform caused three closely spaced flake scars form the relatively steep beveled platform.	84-68	93.1	16.8	4+ cortex	A
4) Faceted platform made by small, thin cortex and three wider flake scars form the steep bevel platform	78	5.96	1.38	3+ cortex	B
Collapsed Platform separates Platform 4 and 5, which slope towards opposite faces.					
5) Cortical surface covers all of platform	75	39.1	15.2	cortex	A

Table 2. Dimensions of Flake Scars on the Oblique Platform Bifacial Core from Edwards County, Texas.

		Length (mm)	Width (mm)
Face A	1.	85.9	58.8
	2.	101.2	50.0+
Face B	1.	74.3	41.3
	2.	79.1	54.4
	3.	44.5	29.1
	4.	incomplete	55.1
	5.	46.7	incomplete
Average		71.95	48.12
Maximum Size		101.20	55.10
Minimum Size		44.50	29.10

these flake blank scars displays salient or deep bulbs of percussion. In general, thin, or diffuse bulbar scars suggest that the knapper was seeking relatively flat, tabular flake blanks that were probably removed with soft hammer or billet percussion implements (Whittaker 1994). Overall, these relatively large, flat flake blanks would have been suited to shape into a range of thin delicate implements, such as drills, points, or scrapers. The sharp edges of these large flakes might have been utilized without further modification, but polyhedral cores and other blade cores provide much greater efficiency in producing more total cutting edges per mass of material.

DISCUSSION

The detailed description of the single distinctive bifacial core with oblique platforms from Edwards County represents a single static example of a bifacial reduction strategy that was employed to produce large, tabular flake blanks. As yet, nothing beyond conjecture is know about the earlier stages used to set up the core, or the disposition of such cores upon exhaustion of it usefulness. Many worn out cores may have been simply abandoned without further modification. However, the size and thinness of the resulting core, and the presence of beveled margins, suggests that without much additional effort, the core could have been easily transformed into other implements using the standard BRS. In light of the unknown context of the Edwards county specimen, we will never know whether the core was discarded/abandoned, or stashed for further use. But the recovery of the Edwards County example provides clues into the existence of core knapping strategies that are distinct from the standard knapping strategies used to make bifaces.

Several questions remain. What was the technological advantage of this form of core over other morphological varieties of cores? And why did this alternative core reduction strategy arise? I suspect that the reduction strategy may have been developed both with the end product in mind as well as the constraints imposed by the particular shape of select kinds of chert nodules available in the region. Clearly, the size of the flake blanks scars provides clues that the knapper was not seeking blade-flakes, as could be obtained from polyhedral cores, or moderate size flake blanks, such as produced from the early stages of typical BRS reduction. The production of large, long, broad flake blanks may have necessitated the development of different reduction strategy that was suited to specific shapes of chert nodules.

Cherts in the Edwards Group formations typically come in three forms: (1) irregularly, three-dimensionally shaped nodules that cross-cut bedding plains, (2) relatively thin tabular disc-shaped nodules up to a meter or less in diameter that form parallel to the bedding plain, and (3) continuous beds of chert measuring up to 0.5 m thick (Kibler 2000:209). Quite likely the latter two chert forms may be the same form, but are differentiated only in nodular size. Continuous bedded chert may be nodules covering tens or hundreds of meters in area. Geological stresses imposed on the limestone formations since formation typically fracture the chert beds into blocks and chunks, whereas the smaller nodules would often escape the damage from bending or folding stresses of the surrounding limestone matrix. Subsequent dissolution of limestone carbonates by surface and ground water typically exposes or even frees the harder chert nodules for easy procurement with little or minimal quarrying efforts. I suspect that the distinctive reduction strategy that produced the specialized oblique platform bifacial cores arose the combination of the use of relatively thin chert nodules, and the desire to produce flat, tabular flake banks.

The reduction strategy apparently used in producing large tabular flake blanks from bifacial tabular cores with oblique platforms involves the following (Figure 3):

1. Select either thin tabular nodules or blocks of chert without inherent flaws.
2. Develop oblique platforms by striking a series of trimming flakes where needed to achieve edge angles ranging between 65° and 80°; if cortical surfaces are sloping at an adequate angle, then no edge trimming is required.
3. Using a soft billet, strike a series of large tabular decortication flakes from each face from the acute-angle side of the platforms.

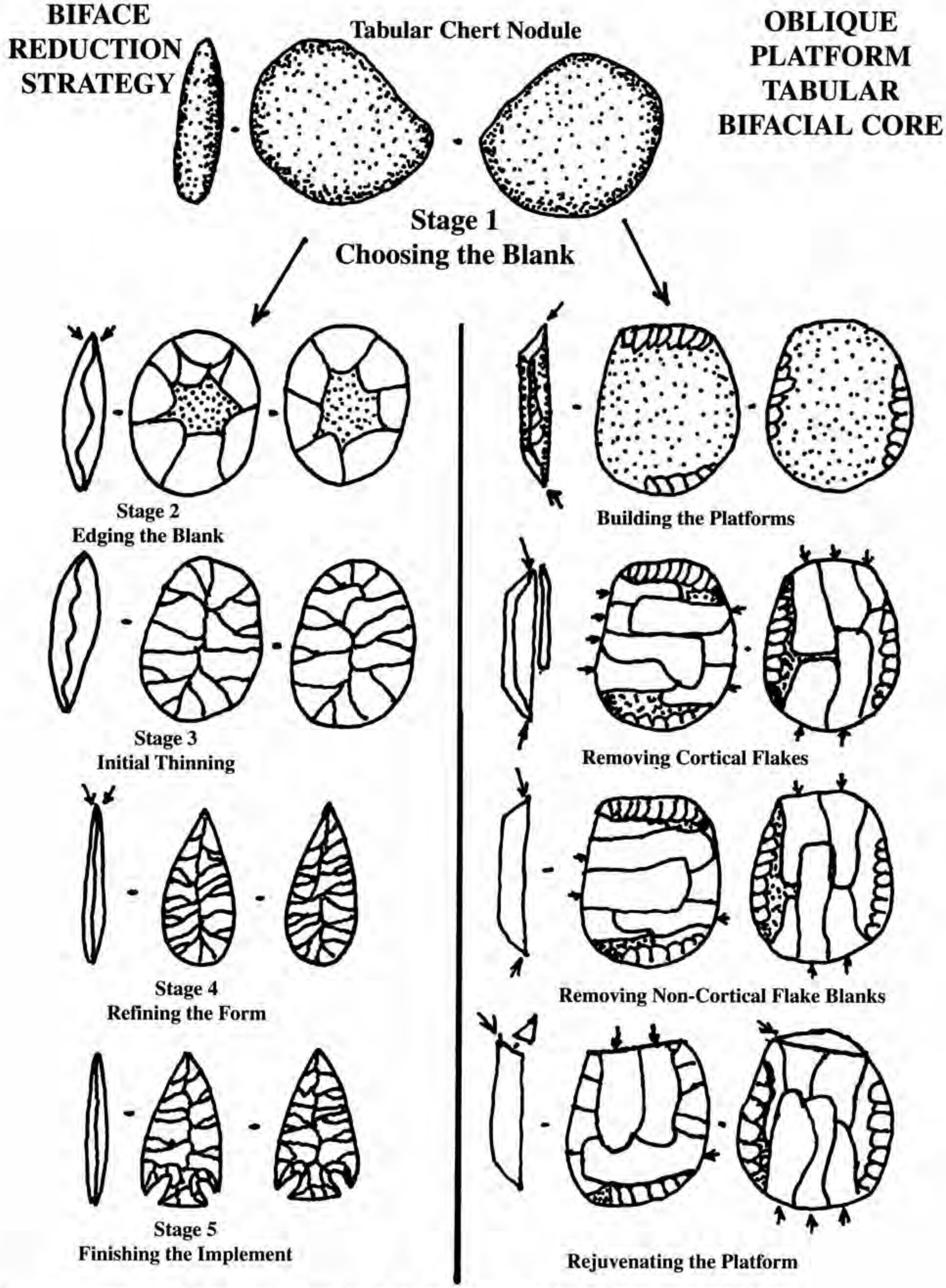

Figure 3. Comparison of Reduction Strategy for Standard Bifaces and Oblique Platform Tabular Cores.

4. Continue to remove large tabular flake blanks using flake scar ridges to channel fracture paths across faces of the core.
5. As flake blank reduction continues, and the thickness of the platforms diminish, or if platforms collapse, then either strike a single rejuvenation flake to refresh the edge and clear platform problems, or retrim the existing platform and refresh the acute edge angles, or drive off a new series of trimming flakes from the other face to completely change the slope of the platform.
6. Continue removing large flake blanks from the core until an adequate number of blanks have been amassed, the core becomes too thin to continue the process, the knapping ruins the core with a transverse fracture, or the thinned core is transformed into a bifacial implement.
7. The transition of the oblique platform core into a bifacial tool by means of the BRS, is accomplished simply by removing the beveled edge from near one face and shifting the edge towards the middle of the mass by striking a series of relatively short trimming flakes from the steep side. This activity may require the removal of the cortical platforms, if present. After a regular bevel has been achieved near the middle of the mass, then the BRS can be initiated to convert the thinned core into the final shaped bifacial implement—such as a knife, cleaver, or chopper.

SUMMARY

The oblique platform variety of bifacial cores is an artifact form that, at a cursory level of examination, appears to be routine thinned biface. This paper shows however, that the reduction strategy used to amass tabular flakes is quite different from the standard biface reduction strategy. It appears that this is a specialized technique used to produce long, thin, broad, flake blanks that can serve as flake blanks for further reduction into a range of other tool forms. The large size of the apparent flake blanks suggests that this type of core is not efficient in yielding maximum cutting edges as might be needed for modified flakes. The development of this kind of core reduction strategy seems especially suited for use with the thin tabular bedded nodules of chert found in Edwards Group formations throughout central Texas. Although the temporal, spatial and cultural affiliation of these artifacts is presently unknown, it is my hope that the cultural context can be discern as other avocationalist and collectors scour their collections and researchers recover comparable artifacts under controlled excavation conditions. The identification of other examples are needed to elucidate the initial stages of core preparation, the sizes of the raw nodules sought for this strategy, as well as the forms of discarded or abandoned cores at the conclusion of their use-life.

ACKNOWLEDGMENTS

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Petrographic Examination of Hematite Sample from Site 41BX502, Bexar County, Texas

John T. Kuzmich II

ABSTRACT

A hematite hammerstone, found in early contexts at site 41BX502, has been sampled for study. Thin section analysis, using a petrographic microscope, found sub-angular quartz particles in a fine hematite matrix. This stone is probably derived from the Lion Mountain Sandstone of the Llano Uplift region.

INTRODUCTION

Ongoing archaeological excavations at site 41BX502, on San Geronimo Creek in western Bexar County, led to the discovery of a large chunk of hematite that the archaeologists felt was not of local origin (Figures 1 and 2). The specimen appears to have been used as a hammerstone during the Late Paleoindian period at the site. Researchers at the site felt that a more precise identification of the raw material was needed, and hopefully, its geologic source.

Figure 1. View of Excavation Unit at 41BX502. Location of hematite chunk is indicated on the right margin.

Figure 2. Close up View of Hematite Chunk. Specimen is shown in situ at 41BX502.

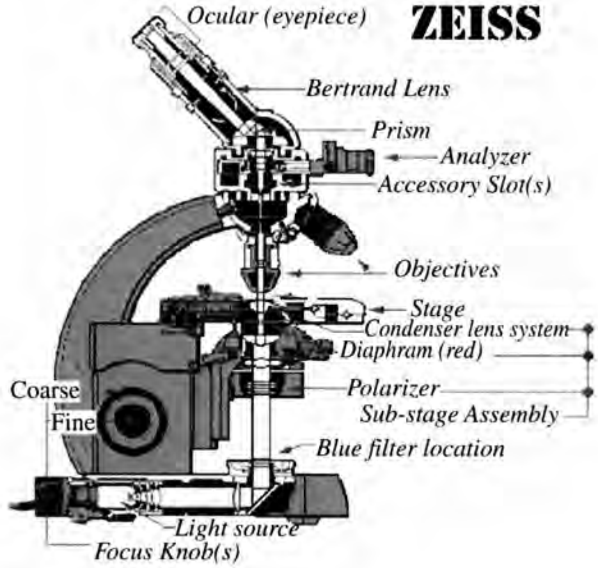

Figure 3. Understanding a Microscope

PROCEDURES

The sample was cut with a diamond blade saw, polished with 400-grit silicon carbide powder, mounted on a glass microscope slide with UV 131 adhesive and then hand polished with 1200-grit powder to a thickness of 30 micrometers. This thickness is the preferred thickness for petrographic analysis as the behavior of light interacting with minerals is well established at this thickness. Pictures of the thin section were taken with a petrographic microscope under plane polarized light, cross-polararized light, and reflected light at magnifications of 4x and 10x (Figure 3). Finally, random quartz particles were measured and separated by size into categories of large (>.1mm) or small (<.1mm).

DATA/DATA ANALYSIS

In Figure 4, a-f, the petrographic images portray quartz grains within a hematite matrix. The particle size data in Table 1 gives a size distribution, which is generic and cannot be used as fact based upon the limited number of measurements taken from the quartz grains. These data could be used to get a basic understanding of the particle size distribution within the thin section, but a minimum of 300 points would have to be counted for statistical validity.

plane polarized light—Polarized light vibrating in a single plane perpendicular to the direction of propagation. (Wikipedia)

cross polarized light—The component of the electric field, the space surrounding an electric charge whose direction is given by the direction of that force, vector normal to the desired polarization component. (Wikipedia)

reflected light—The main geometric rule is that the angle of reflection equals the angle of incidence. Since we are concerned only with the light that is reflected into the viewer's eyes, the most important light sources are those that lie at the end of sight lines from the eye to the screen and back at equal angles. (Color Usage Research Lab).

Illustration adapted from Carl Zeiss, Inc.

Table1.
Large particles range in size from .2 mm to .47 mm. Small particles vary in size from .035 mm to .094 mm

Large Particles, mm	Small Particles, mm
0.36	0.05
0.26	0.08
0.32	0.06
0.28	0.04
0.44	0.094
0.33	0.076
0.34	0.04
0.47	0.035
0.2	0.07

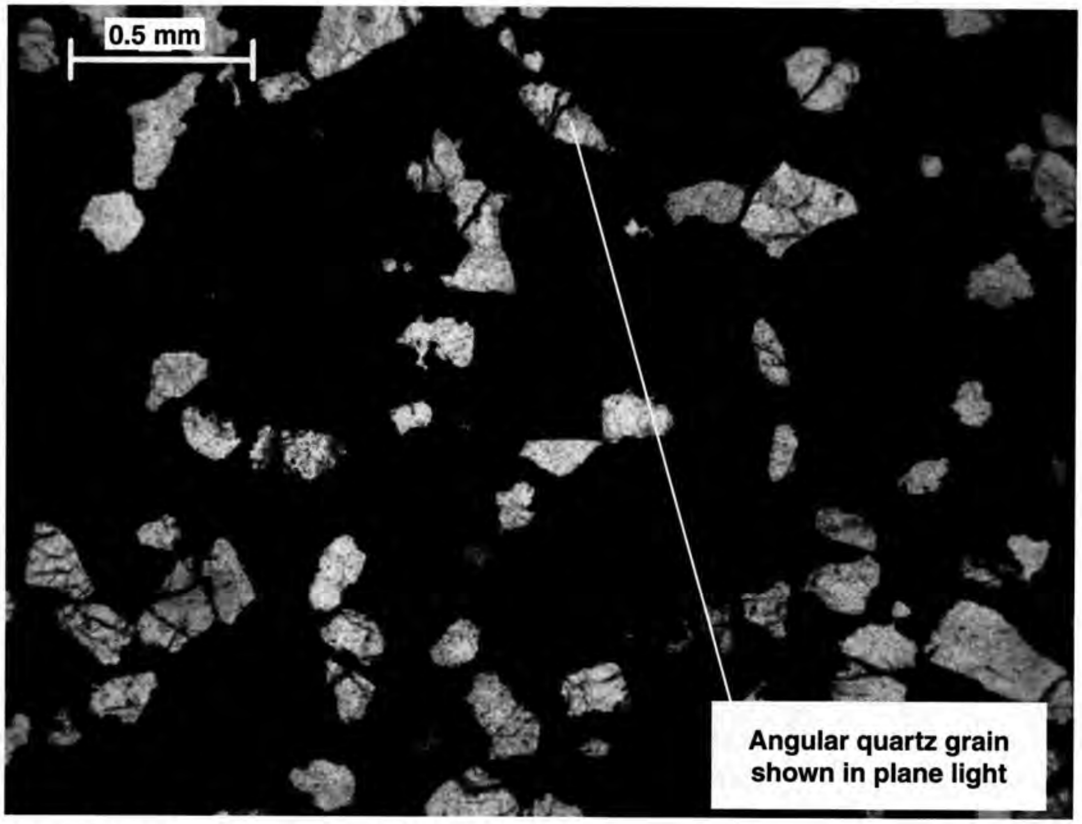

Figure 4(a). 4x Magnification, plane light. Scale is 0.5 mm

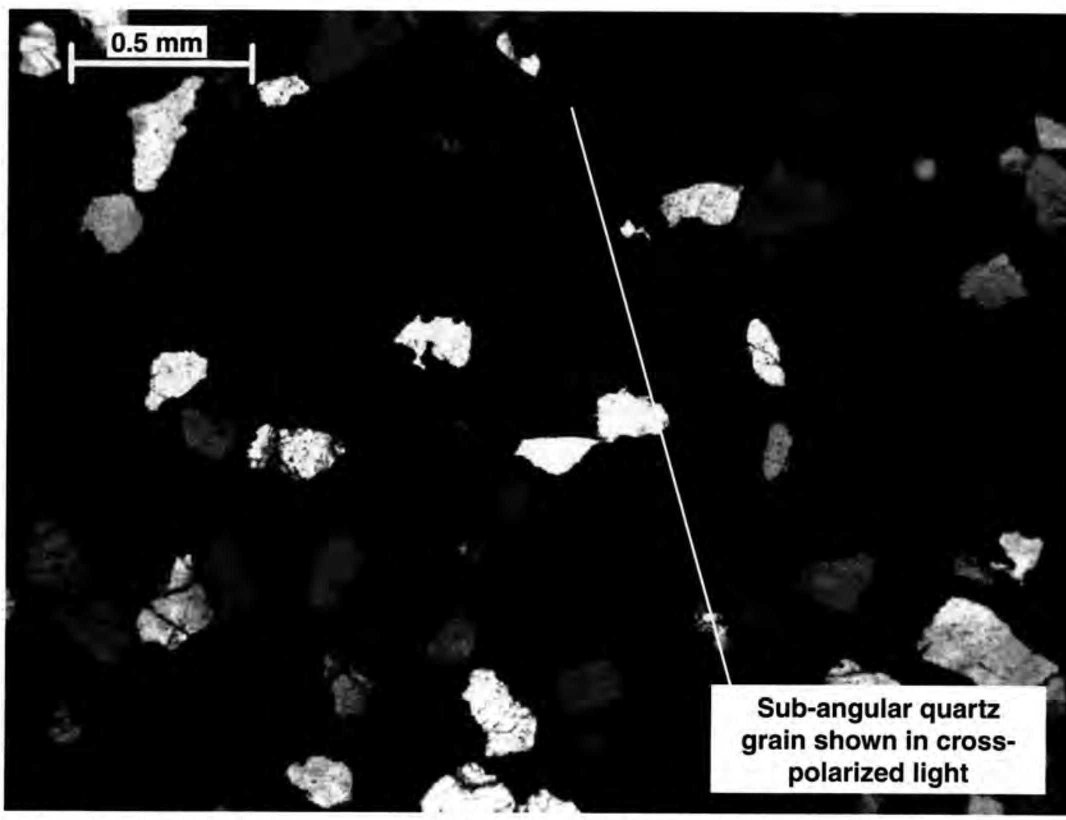

Figure 4(b). 4x Magnification, cross polarized light. Scale, 0.5 mm.

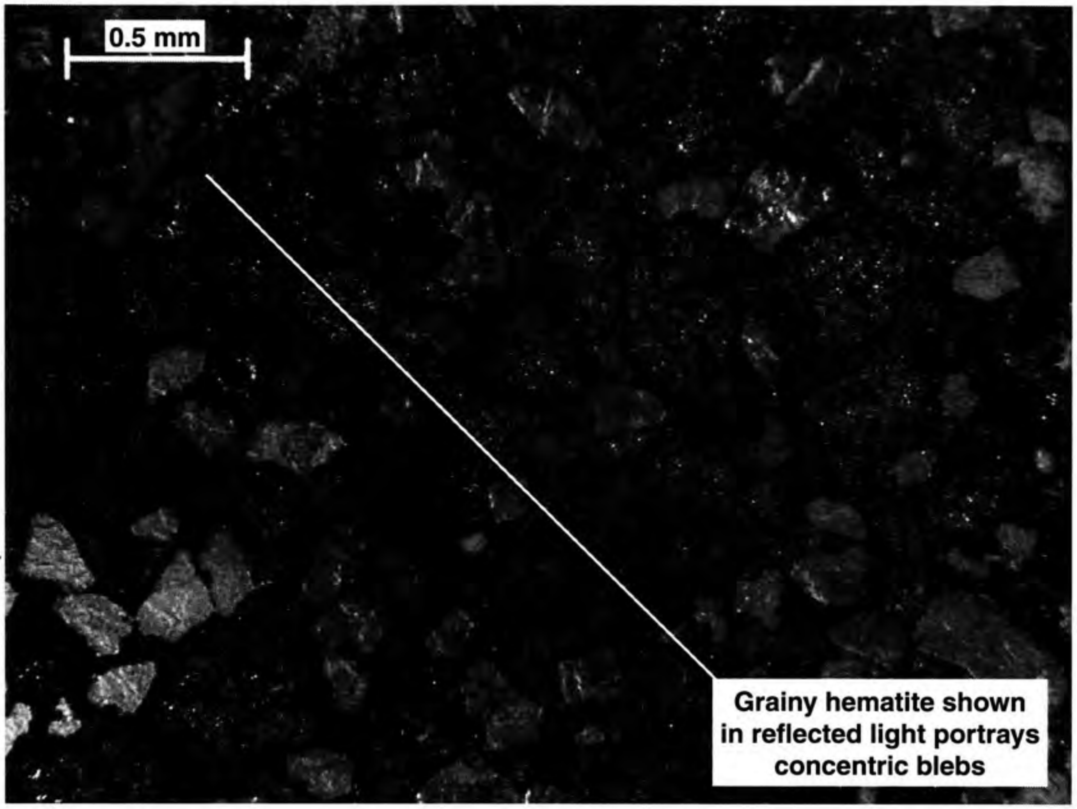

Figure 4(c). Magnification, reflected light. Scale bar = 0.5 mm.

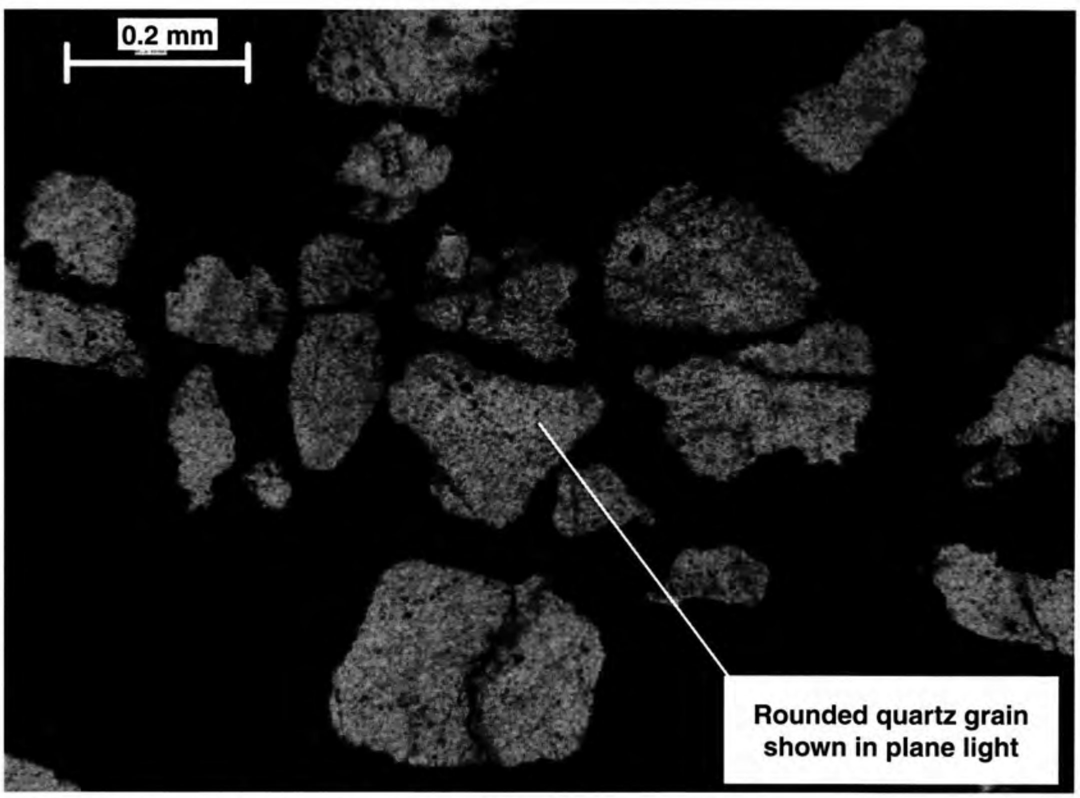

Figure 4(d). 10x magnification, plane light. Scale is 0.2 mm.

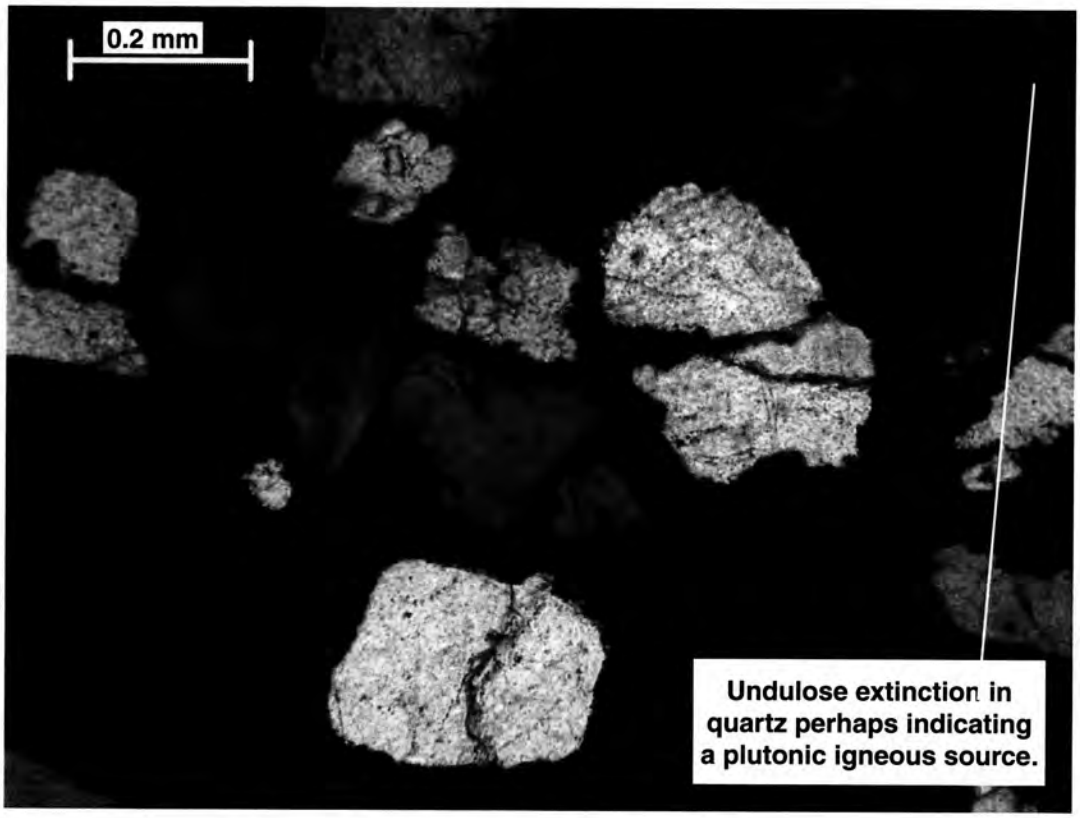

Figure 4(e). 10x magnification, cross polarized light. Scale bar = 0.2 mm.

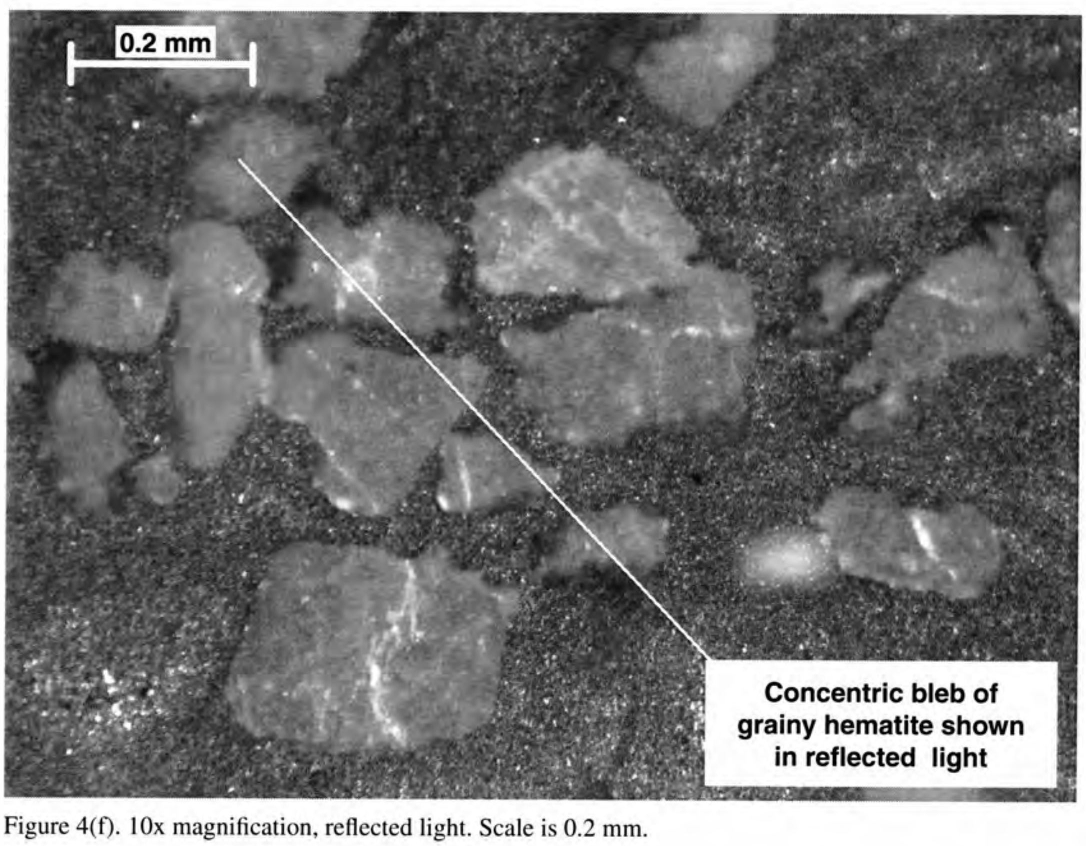

Figure 4(f). 10x magnification, reflected light. Scale is 0.2 mm.

RESULTS/ANALYSIS

The pictures taken with a petrographic microscope shown in Figure 4, a-f, of this paper depict mostly angular to sub-angular quartz particles in a fine hematite matrix. The hematite matrix in Figure 4 shown by the 4x magnification in reflected light appears grainy and occurs in concentric blebs (bubble-like inclusion of one mineral within a larger one). The quartz particles do not touch and their scattered arrangement makes no specific flow patterns giving the appearance of quartz particles being dropped into a gel of hematite. As this is an unlikely scenario, it leads to conclusions that hematite was either eroded and reworked to be deposited as particles along with the quartz, or the hematite either partially or completely replaced quartz particles during diagenesis (Boggs 2006).

CONCLUSIONS

The hematite artifact from 41BX502 does not appear to be originally from the region where the site is located. In researching possible areas in Texas that have ore deposits, or that could be said to bear hematite, the Llano Uplift region is the best candidate for finding hematite- bearing rocks. The Valley Spring gneiss member found in the Llano region is mainly composed of magnetite with varying amounts of hematite that is said to be an alteration product of magnetite. Hematite formed this way contains more or less residual magnetite called martite. Glauconitic Lion Mountain sandstone member in Llano weathers to yield siliceous hematite which is found on outcrops as a float. These hematite pieces range from pebble to boulder size and are mostly rounded and commonly polished with broken fragments yielding numerous sand grains, brachiopods, or fragments of fossils (Virgil et al. 1949).

Analyzing the thin section made from the boulder chip under plane polarized, cross-polarized, and reflected light along with generic spreadsheet analysis of particle size distribution gives a clear depiction of angular quartz particles in a grainy hematite matrix. Finally, the sandy appearance of the thin section from the rounded and polished hematite boulder best resembles that found in the glauconitic Lion Mountain sandstone member of the Llano Uplift region.

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Waco "Sinkers" and Heavy Black Hematite from the Lower Rio Grande

Don Kumpe

ABSTRACT

Six ground stone artifacts, a mano and five Waco "sinkers," from the lower Rio Grande are described and illustrated; five of the artifacts are made of heavy black hematite. A geologic source for hematite was found and the general location is provided.

INTRODUCTION

Ground stone artifacts made of a dark, unusually heavy stone are occasionally found along the lower Rio Grande. Chandler and Kumpe (1994: 15, 18), in the course of describing a pipe that was made of this material, described the dark unusual stone as heavy black hematite. They remarked on having seen other ground stone artifacts made of hematite and one of the artifacts they referred to was a Waco "sinker" (Figure 1, A). Turner and Hester (1999: 316) remark that Waco "sinkers" are hypothesized to serve as "sinker weights" or as "bola stones", but their use is undetermined.

Hester et al. (1978) report notched ground stsone artifact similar to the Waco form in Willacy County. This paper reports five additional Waco artifacts from the lower Rio Grande (Figure 1, A-C; Figure 2, A-B) and four are made of hematite; a cone-shaped mano made of hematite is also reported (Figure 1, D).

A geologic source for heavy black hematite was located by the late Richard (Dick) Clardy, who obtained a GPS reading and collected samples of the stone from a hillside 22 miles south of Valadeces Chico, Tamaulipas.

THE ARTIFACTS

Figure 1, A is a complete Waco artifact made of heavy black hematite. Like the other artifacts made of this material, the stone sparkles when angled in light and weakly attracts a magnet. It is from the west bank of the Arroyo Morteros in Starr County and was found during the 1960s. Dimensions are: L, 54.6 mm; W, 37.4 mm; T, 26.9 mm. It weighs 102.6 grams.

Figure 1, B is a complete Waco artifact made of hematite; the stone is largely coated with calcite. It was found (like Figure 1, C) along the west bank of the Rio Alamo near Mier, Tamaulipas. Dimensions are: L, 52 mm; W, 40.5 mm; T, 24 mm. It weighs 103.9 grams.

Figure 1, C is a complete Waco artifact made of bluish-grey stone that is possibly limestone; it was found on the Rio Alamo near Mier, Tamaulipas, where Berlandier (1980) remarks that a similar "bluish" stone is limestone (see discussion). Dimensions are: L, 62.5 mm; W, 31.5 mm; T, 28 mm. It weighs 76.2 grams.

Figure 1, D illustrates three views of a cone-shaped mano made of heavy black hematite; a shallow depression in the narrow end may be from use as a "nutting stone". This artifact was found on the Arroyo Salinillas at Falcon Reservoir in Tamaulipas. It is 48.1 mm in length, has a maximum width of 52.16 mm, and weighs 276.7 grams.

Figure 2, A illustrates two views of a comparatively flat Waco artifact missing nearly all of the notched area at one end. It is made of hematite and (like Figure 2, B) it was found on Los Lobos Point at Falcon Reservoir in Zapata County. Dimensions are: L, 61 mm; W, 33 mm; T, 16.5 mm.

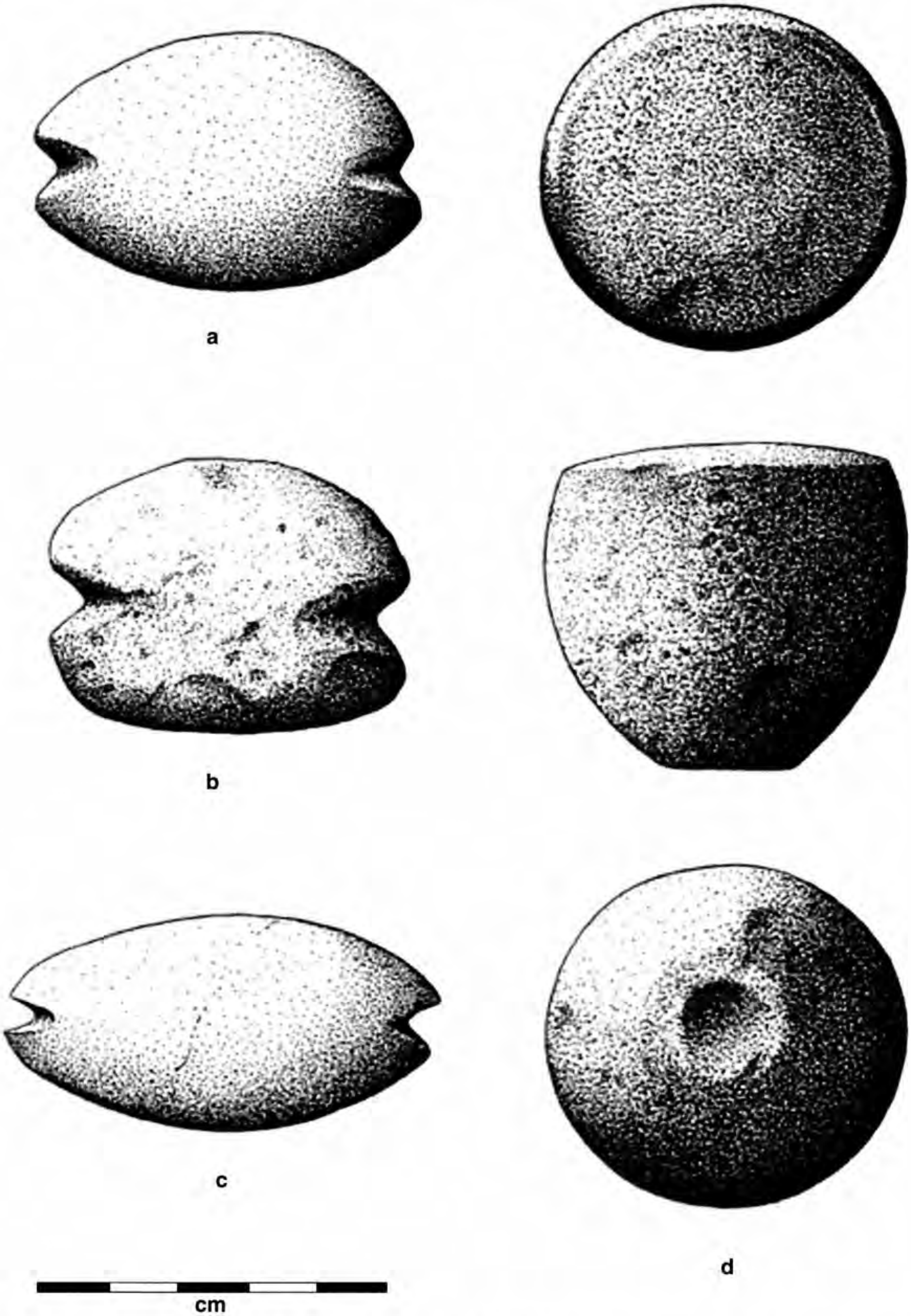

Figure 1. Ground Stone Artifacts (a, b, and d are hematite). A, a Waco artifact from Starr County; b, c, Waco artifacts from Mier, Tamaulipas; d, three views of a mano from Arroyo Salinillas, Tamaulipas. Drawings by Richard McReynold's

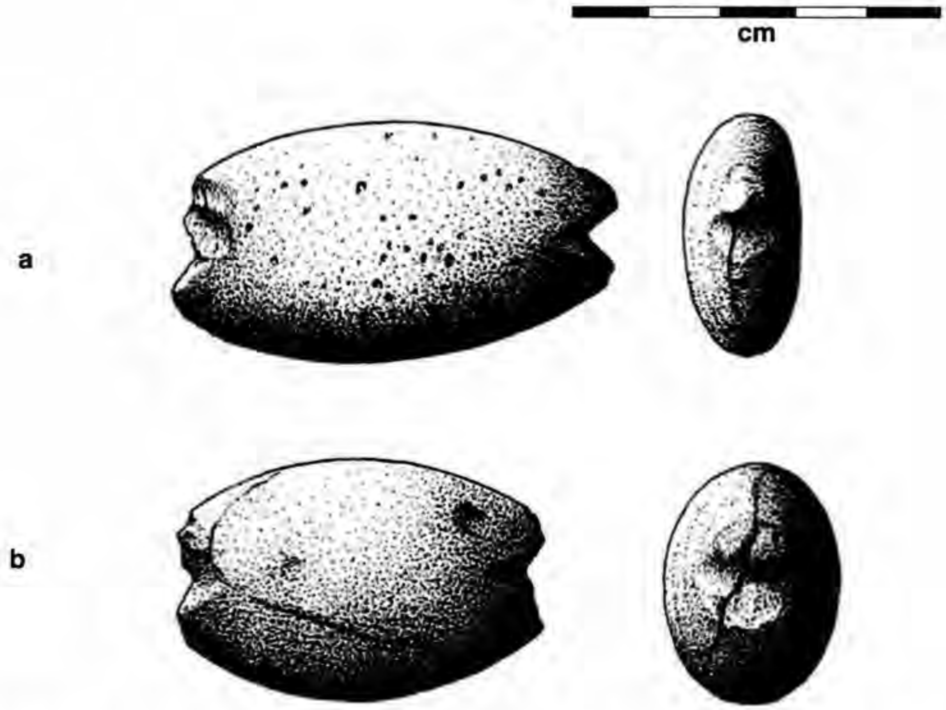

Figure 2. Ground Stone Artifacts. a, two views of a Waco artifact from Los Lobos Point, Falcon Reservoir, Zapata County; b, two views of another artifact from Los Lobos Point. Both are hematite. Drawings by Richard McReynolds.

Figure 2, B illustrates two views of a Waco artifact missing parts of both ends. It was found on Los Lobos Point at Falcon Reservoir in Zapata County. Dimensions are: L, 50 mm; W, 33 mm, T, 25 mm. It weighs 82.2 grams.

DISCUSSION

One of the two Waco artifacts reported from the Rio Alamo near Mier, Tamaulipas is made of bluish-grey stone that may be limestone (Figure 1, c). Berlandier (1980:588), while visiting Mexico during the early 1800s, remarked on the large beds of rounded cobbles of "bluish limestone with a conchoidal texture" and the Rio de Mier (the Rio Alamo). During prehistoric times, local Indians occasionally used larger bluish limestone cobbles to manufacture choppers (author's personal observations). Thermally altered (fractured and color-changed) heaps of the "bluish limestone" cobbles are associated with the many historic period lime kilns (Figure 3) found along the Rio Alamo near Mier. George (1975:35-36, Figure 12) illustrates a similar lime kiln (now submerged) within the Falcon Reservoir basin. Carpenter (1969) notes the danger in lime manufacturing. He points to a case involving Guadalupe Cordova, his wife Maria, and son Jose, in which all had been blinded, by 1850, by burning lime, possibly during unsafe slaking procedures.

Richard Clardy located a geologic source for heavy black hematite in northeastern Nuevo Leon, Mexico, 22 miles south of Valadeces Chico, Tamaulipas. Samples of the stone were collected from a hillside and Clardy (personal communication 2003) remarked that the hematite was on only one side of the hill. He also remarked that the hematite samples yield a red pigment when ground or crushed. The hematite returned from Nuevo Leon resembles the hematite used to manufacture the ground stone artifacts reported in this paper, but there may be additional undiscovered sources for hematite.

Although proven to be local material, only a handful of artifacts made of heavy black hematite have been found along the lower Rio Grande. This paper reports a mano and 4 Waco artifacts made of hematite; Chandler and Kumpe (1994) report a hematite pipe

Figure 3. View of a lime kiln near the Rio Alamo, Mier, Tamaulipas. Thermally altered heaps of the "bluish limestone" cobbles are associated with the kiln.

from northeastern Nuevo Leon, Mike Krzywonski's specimen #636 is a small hematite pipe from Falcon Reservoir in Zapata County, and the author has fragments of two additional hematite pipes from Nuevo Leon. Tom Hester (personal communication 2009) remarked that the Waco artifact from Willacy County (Hester et al. 1978) may be hematite, but, presently, there are only nine ground stone artifacts from the lower Rio Grande that are certainly made of hematite (one mano, four pipes, and four Waco artifacts).

Including the five specimens in this paper, a total of six Waco artifacts are reported from the lower Rio Grande and at least four are made of hematite. The manufacturers of Waco artifacts along the lower Rio Grande may have been familiar with a geologic source for hematite and they appear to have favored this unusually heavy material.

ACKNOWLEDGMENTS

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The Laguna Point—Projectile Point Variation in the Early Archaic Prehistoric Period of Texas

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ABSTRACT

The name *Laguna* is assigned to a group of Early Archaic projectile points that were once included within the descriptive term "Early Barbed." The points are described. Attribute and technological considerations relative to Calf Creek Horizon points are discussed.

INTRODUCTION

The Early Archaic period of Texas prehistory has been generally defined in terms of cultural lifeways and projectile point styles. Although Angostura, Gower, Uvalde, and Martindale (Collins 1995) points may be the hallmarks of this period, many variants, some typed (e.g., Baker, Bandy, Jetta, Merrell) and some untyped, exist. Generic projectile point type names, such as "Early Barbed," "Early Split Stemmed" and "Early Corner Notched" have been used rather than assigning proper names from type sites because the numbers of distinctive points found at Early Archaic sites is typically low, and the contexts in which they have been found are unclear, either coexisting on the same surface or mixed within a thick, unstratified matrix. Investigations at sites such as the Richard Beene Site in Bexar County (Thoms 1992), the Gatlin Site in Kerr County (Houk, et.al., 2008), the Woodrow Heard Site in Uvalde County (Decker, et. al., 2000), the Varga site in Edwards County (Quigg, et. al., 2008) and the Wilson Leonard Site in Williamson County (Collins 1998) have significantly improved our understanding of the Early Archaic period.

Technologically, projectile points within Collins' Early Archaic and early Middle Archaic periods (Collins 1995) through Taylor points (one of the "Early Triangular" styles) belong to what the writer refers to as the Early Archaic pressure flaking tradition. This is basically defined by the continued use of large pressure flake removal techniques (likely leg-assisted) to manufacture projectile points while converting from use of lanceolate points to points with defined stems and barbs, which are very likely adaptations to use of the atlatl to hunt smaller, swifter game. Clearly the Early Archaic period encompasses the transitional techniques and survival systems from Paleoindian to classic Archaic, and it is important to our understanding of Texas prehistory.

This report focuses on the projectile point style for which the term "Early Barbed" (now the term "Devil's Variant is often included) was originally intended, and uses the name "Laguna" suggested by Paul Stein for a site near the ghost town of Laguna in Uvalde County, Texas, where a number of these points were found by collectors. The observations and interpretations presented in this report are based on examination of 90 Laguna points from various sources. First-hand data were obtained from specimens from the following counties: Bell – 4, Bandera – 12, Bexar – 9, Edwards – 1, Gillespie – 5, Hays – 3, Kerr – 5, Uvalde – 6, Williamson – 4. Published data and measurements from scaled images in the reports cited and illustrations by Richard McReynolds and the writer were used for the remaining 41 specimens.

DESCRIPTION

Relatively large blades with recurved edges and V-shaped basal notches that form widely flaring barbs with wide bases distinguish Laguna points. The recurved blade edges usually terminate in an acuminate distal tip. The range in size is highly variable, from 39 mm to 170 mm in length, with some of the smaller specimens being rather ordinary in quality and some of the larger specimens being exceptionally well made. Small, thin specimens may be delicately flaked, while most mid-range specimens tend to be of sturdy proportion. Quantitative and qualitative attributes of Laguna points are shown in Tables 1-3.

Blades

The recurved edges of the blade usually resemble the shape of a bell. Ironically, the lower end of the spectrum of Calf Creek Horizon points have been called Bell points, for Bell County, Texas, where they were first recognized at the Landslide Site (Sorrow et al. 1967). Flake scars are usually a combination of percussion thinning flakes, overlapped and reduced in size, by large, narrow (mean 22 mm x 8 mm) pressure flake scars that are oriented diagonally, or obliquely, across the blade (86%). Orientation is in a lower-left to upper-right pattern, with flake scars from right edges tending to be more acutely oblique than those from the left edges. On 52% of the points, large oblique pressure flake removals have been performed to produce a relatively thin, twisted blade. The mean blade width-to-thickness ratio at its midpoint is 6.5 to 1. Distal tips are generally pointed, often needle-like. Reflaking of the blade is common (24%), but usually minor in degree. Laguna points are commonly made to be asymmetrical, with the tip not aligned precisely with the stem longitudinal axis (i.e., not perpendicular to the base).

Barbs

Barbs do not extend below the stem base, and they are generally about half way above it. The barb base is usually at an acute angle (17 degree mean, but highly variable) to the X axis (notch termination to notch termination) of the point. Barb bases tend to be wide with squared bases, like those of some Marcos, Castroville, Bandy and Calf Creek Horizon points. However, the barb base is often wider than the rest of the barb, and the inside corners of the barbs of many specimens (53%) are rounded, making the notches intentionally wider at the notch entry and accentuating the flared appearance of the barbs. The recurved blade edges, relatively narrow stem, V-shaped corner notches, and angle of the barb base further accentuate the flared appearance of the barb. Flared barbs appear to be an intentional attribute of Laguna points. Occasional examples do not have widely flaring barbs.

Notches

Notches are V-shaped, being widest at the base and narrowest at the notch termination (%100). Maximum notch width and notch depth, or length, are approximately equal. Notching flake scars are random in size and shape.

Stems

The stem shape is highly variable, usually resembling those of Pedernales (57%) or Marshall (30%) points, although narrower and shorter. Approximately 8% of the points, including two from the Woodrow Heard site in Uvalde County (Decker et. al., 2000, Figure 177, Specimens C, E) and one from the Devil's Rockshelter in Val Verde County (Prewitt 1966, Figure 4, Specimen J) have stems that resemble those on Bulverde points, although they are also diminutive in size. Twenty-two percent of the Pedernales-shaped stems are bowlegged, which makes them resemble some Gower and Baker points (Thoms 1992, Figure 10.13, Specimens C-F, I). Stem length and width are generally proportional to blade size. As in Pedernales, Marshall and Bulverde points previously mentioned, the bases are concave to bifurcated. The basal concavity is shallow, but deeper in some specimens with Pedernales-shaped and bowlegged stems, on which the widest part of the stem is above the base but below the notch terminations. The outline shape of basal thinning scars is triangular when their outer edges have been reduced by subsequent notching flakes on the upper part of the stem. When lateral stem edges have been smoothed (8%), it is generally

Table 1. Comparison of Quantitative Attributes—Calf Creek Horizon Points and Laguna Points

Attribute	Calf Creek (462) No. Obs.	Calf Creek (462) Mean	Calf Creek (462) Std. Dev.	Laguna (90) No. Obs.	Laguna (90) Mean	Laguna (90) Std. Dev.	% Variation Between Types	Interpretation
Maximum Thickness	437	6.74	1.1	56	6.50	0.8	3.6%	
x coordinate	458	0.18	3.2	53	0.27	1.7	33.3%	Increment too small to compare
y coordinate	458	1.78	6.2	53	6.75	6.4	73.6%	Increment too small to compare
Maximum Length	414	63.04	16.7	89	63.48	18.1	0.7%	
Maximum Width	433	42.72	7.2	90	45.43	7.8	6.0%	
Width to Thickness Ratio	434	6.36	1.3	53	6.60	6.4	3.6%	
Maximum Pressure Flake Length	61	**29.77**	6.4	56	**22.31**	6.2	25.1%	Smaller platforms, narrower blades
Maximum Pressure Flake Width	67	**12.15**	2.4	58	**7.93**	2.2	34.7%	Smaller platforms, thinner flakes, closer overlap
Stem Length	419	**18.82**	5.0	89	**13.34**	2.1	29.1%	Intentional feature of Calf Creek
Stem Thickness	443	6.26	1.1	53	5.91	0.9	5.6%	
Base Alignment	460	**0.71**	1.4	80	**-1.44**	0.7	302.8%	Intentional feature of Calf Creek
Base Width	410	**17.35**	2.1	73	**13.75**	2.3	20.7%	Intentional feature of Calf Creek
Maximum Base Width	177	**18.13**	2.0	76	**15.36**	2.2	**15.3%**	Intentional feature of Calf Creek
Maximum Stem Width @ Notch Term.	296	**18.85**	1.9	88	**15.59**	1.7	**17.3%**	Intentional feature of Calf Creek
Minimum Stem Width	357	**16.72**	1.5	87	**14.25**	1.6	**14.8%**	Intentional feature of Calf Creek
Maximum Stem Width below Notch Term.	357	-	-	59	**15.96**	1.8	*	Intentional feature of Calf Creek
Notch Length	177	**16.25**	5.2	62	**10.06**	2.2	**38.1%**	Intentional feature of Calf Creek
Barb Length	177	**13.68**	5.4	58	**7.93**	2.2	**42.0%**	Intentional feature of Calf Creek
Barb Base Width	171	9.27	3.4	40	8.83	3.5	4.7%	
Barb Base Angle	-	-	-	27	17.43	10.2	-	
Barb Thickness	207	**4.04**	0.9	49	**3.46**	0.7	**14.4%**	Thinner preforms, narrower barbs
Basal Thinning Length	792	**20.51**	6.2	83	**12.74**	5.5	**37.9%**	Blades flaked after stems—stems on Laguna shorter
Maximum Notch Width	176	**4.14**	1.0	60	**10.03**	2.8	**58.7%**	Different notching technique

Table 1. (continued)

	Calf Creek (462)			Laguna (90)				
Attribute	No. Obs.	Mean	Std. Dev.	No. Obs.	Mean	Std. Dev.	% Variation Between Types	Interpretation
Point of Maximum Notch Width	173	**-5.50**	3.1	62	**-10.06**	2.2	**45.3%**	Different notching technique
Minimum Notch Width	152	2.80	0.7	82	2.97	1.0	5.7%	Different notching technique
Point of Minimum Notch Width	120	**-8.55**	6.2	82	**-1.00**	0.3	**88.3%**	Different notching technique
Maximum Notching Flake Expansion Stem	444	6.74	1.9	66	6.34	1.4	5.9%	

Table 2. Comparison of Qualitative Manufacturing Attributes—Calf Creek Horizon Points and Laguna Points.

	Calf Creek (462)		Laguna (90)			
Attribute	No. Obs.	Percent	No. Obs.	Percent	% Variation Between Types	Interpretation
Blade Flaking						
Cortex	5	1.14	0	0.00	1.1%	Use of similar blanks/preforms
Ventral/Dorsal Flake Surface	28	6.38	4	5.88	0.5%	
Flaking Technique						
Percussion Only	56	42.64	0	0.00	42.6%	Different tool application
Percussion/Pressure	248	6.35	3	6.00	0.4%	
Large Pressure Only	88	29.54	47	94.00	64.5%	
Blade Edge Smoothing						Different use
Entire	11	2.52	0	0.00	2.5%	
Partial	16	3.67	0	0.00	3.7%	
Remnant	8	1.83	0	0.00	1.8%	
Stem Contouring						
Wedge-shaped Stem						Intentional feature of Calf Creek points
Both Faces	258	62.77	10	20.00	42.8%	
One Face	108	26.28	11	22.00	4.3%	
Flaking Technique						Different flaking tool application
Percussion Only	85	16.36	2	2.10	14.3%	
Percussion/Pressure	139	13.85	1	1.00	12.9%	
Large Pressure Only	0	9.29	42	45.00	35.7%	
Large Pressure/Hand Pressure	555	67.19	1	1.00	66.2%	
Hand Pressure Only	-	-	40	43.00	-	
Indirect Percussion	0	0.00	5	5.40	5.4%	
Ventral Flake Surface	-	-	2	2.10	-	
Flake Sequence						Different flake sequencing
Prelateral/Prenotching	223	26.61	50	50.00	23.4%	
Pre/Postlateral	95	11.34	4	4.00	7.3%	
Postlateral/Prenotching	425	50.72	15	16.00	34.7%	
Prelateral/Postnotching	6	0.72	14	15.00	14.3%	
Postlateral/Postnotching	36	4.29	14	15.00	10.7%	

Table 2. (continued)

	Calf Creek (462)		Laguna (90)			
Attribute	No. Obs.	Percent	No. Obs.	Percent	% Variation Between Types	Interpretation
Basal Pressure Scar on Barb Face	192	51.89	0	0.00	51.9%	
Barb Base Smoothing	10	6.80	0	0.00	6.8%	
Notching						
Stem Smoothing						
Base Only	107	25.18	0	0.00	25.2%	Intentional feature of Calf Creek Points
Remnant Base	11	2.59	1	2.00	0.6%	
Base/Lateral	25	5.88	1	2.00	3.9%	
Base/Remnant Lateral	3	0.71	0	0.00	0.7%	
Lateral/Remnant Base	4	0.94	0	0.00	0.9%	
Lateral Only	24	5.65	2	3.90	1.8%	
Remnant Lateral	4	0.94	0	0.00	0.9%	

Table 3. Comparison of Qualitative Use Attributes - Calf Creek Horizon Points and Laguna Points.

Attribute	Calf Creek (462)		Laguna (90)			
	No. Obs.	Percent	No. Obs.	Percent	% Variation Between Types	Interpretation
Reflaking						
Reduction Stage						
No Reflaking	79	17.83	62	75.61	57.8%	Most Calf Creek reused; most Laguna discarded
Early	92	20.77	18	21.95	1.2%	Occasional early minor damage repair
Moderate	176	39.73	2	2.44	37.3%	Extensive curation of Calf Creek
Late	96	21.67	0	0.00	21.7%	Extensive curation of Calf Creek
Blade Twisting	97	22.93	1	0.01	22.9%	Extensive blade reflaking of Calf Creek
Ridge Above Notches	139	31.59	1	0.01	31.6%	Extensive blade reflaking of Calf Creek
Blade Shoulder	94	22.02	0	0.00	22.0%	Extensive blade reflaking of Calf Creek
Asymmetry	123	29.08	0	0.00	29.1%	Extensive blade reflaking of Calf Creek
Blade Thinning	130	30.66	1	0.01	30.6%	Extensive blade reflaking of Calf Creek
Serration	7	1.60	0	0.00	1.6%	
Beveling	16	3.66	0	0.00	3.7%	
Multiple Notches	4	0.90	0	0.00	0.9%	
Breakage Form						
Two Barbs	30	8.10	21	23.70	15.6%	Laguna barbs less fragile, not curated
One Barb	84	22.64	37	41.60	19.0%	Laguna barbs less fragile, not curated
No Barbs	257	69.37	31	34.70	34.7%	Laguna barbs less fragile, not curated
Tip Intact	148	39.90	37	41.60	1.7%	
Tip Partial Damage	172	46.40	45	50.50	4.1%	
Tip Severe Damage	51	13.70	7	7.90	5.8%	
Stem Intact	345	93.00	74	83.10	9.9%	
Stem Broken	26	7.00	16	16.90	9.9%	Laguna stem breakage minor—primarily base corner
Breakage Type						
Blade						Inadequate sample of Laguna
Impact Face	74	16.70	9	10.00	6.7%	
Impact Burin	6	1.35	1	1.11	0.2%	
Transverse Snap	160	36.12	21	23.33	12.8%	

Table 3. (continued)

Attribute	Calf Creek (462) No. Obs.	Calf Creek (462) Percent	Laguna (90) No. Obs.	Laguna (90) Percent	% Variation Between Types	Interpretation
Reflaked Burin and Transverse Snap	0	0.00	1	1.11	1.1%	
Transverse Snap and Burin from Transverse Snap	0	0.00	3	3.33	3.3%	
Remnant Impact Scar Face	31	7.13	0	0.00	7.1%	
Barb						Different geometry and use
Burin	129	28.35	15	16.67	11.7%	
Transverse Snap	351	47.30	33	36.67	10.6%	
Vertical Snap	27	3.64	2	2.22	1.4%	
Reflaked	112	24.62	9	10.00	14.6%	
Lateral Out Snap	8	1.08	0	0.00	1.1%	
Stem						Different stem geometry
Base Corner Snap	65	14.74	4	4.44	10.3%	
Base Corner Snap and Lateral Stem Burin	0	0.00	2	2.22	2.2%	
Base Corner Flake Damage	4	0.91	3	3.33	2.4%	
Stem Snap	24	5.44	0	0.00	5.4%	
Impact Roll Snap	8	1.81	0	0.00	1.8%	

the lower portion. None of the bases were smoothed on the points in the study sample. 42% of the points (primarily the Marshall and Bulverde shaped stems) have wedge-shaped stems on one or both faces (31% of the stem faces). Base alignment is good, but not precise, thin and sharp.

Breakage

The most common breakage form (20%) of the Laguna point is missing the distal portion of the blade (the remaining blade is large enough to be re-pointed) and both barbs. The next most common form (16%) is missing one barb, followed by a form that is missing the distal portion of the blade (the remaining blade is large enough to be re-pointed), and one barb (13%). Whole points, points missing both barbs, and points missing a small portion of the distal tip occur with about equal frequency (9%). Other forms occur with a frequency of 6% or less.

The most common type of distal breakage is transverse snaps (43%), followed by complex impact fractures/roll snaps (20%). The most common type of barb breakage is transverse and angular transverse snaps (27%), followed by burins from the lateral blade edge (12%). Most stems are intact, with corner snaps being the most common form of damage (12%).

Burning

Only 8% of the points examined showed evidence of burning. One point shows evidence of being heated prior to finishing. Dull surfaces of the unheated preform cover the majority of both faces, while the surface of pressure flake scars used to finish the point have a glossy surface.

Patination

39% of the points examined showed any patina; 4% of these were reflaked after they were patinated.

MANUFACTURING TECHNIQUE

The writer assumes that the preform was made in a similar manner as other projectile points in the Edwards Plateau area, where high quality chert is abundant. The initial piece may be a sufficiently-sized flake or primary biface that has been reduced to a large, thinned biface averaging 70-80 mm. long, 50-60 mm. wide and 7-8 mm. thick. After the preform was made, tools and techniques were employed in a culturally traditional manner to finish the points. Documentation of flake scar overlaps indicated that basal thinning is most commonly performed first, followed by notching and then by final blade flaking and edge alignment. Approximately 6% of the points are manufacturing failures, usually resulting from either notching or removal of large pressure flakes from the right blade edge.

Two manufacture failures in the study sample that were broken during notching give insight to the manufacturing techniques and sequence. The first was found at the Tonn Site on Willis Creek in Williamson County. Apparently the blade was snapped during an attempt to remove large pressure flakes from the notch entry. The notch entries are wide on this specimen (10.37 mm), particularly when compared to the very narrow (2-4 mm.) notch entries on Calf Creek Horizon points. One notch had a unifacially-beveled platform that was dulled, and no notching flakes had been removed from it. The other had a similar size and shape, but had several long flake scars from large flakes that had been removed unifacially, likely by leg-assisted pressure, from the notching platform. Basal thinning had already been done; however, there were no oblique large pressure flakes on either blade face.

The second manufacture failure that was broken during notching is from Bandera County. The notches are different depths/lengths. One barb was lost by a vertical snap originating at the notching platform. The stem length on this notch is 16.1, whereas the stem length on the opposing notch is 6.4. The notching platform width on the short notch is 6.48 mm. On one face there are large pressure flake scars above both notches that appear to have been produced from the area of the notch entries. Both blade faces show very large, oblique pressure flakes; however, the blade edges still retain their platform remnants. As these flakes are larger than most on Laguna points, occur prior to notching and still show platform remnants, they are likely flakes removed to establish the blade contouring for final oblique flaking.

Basal Thinning

Basal thinning was usually done about equally by short and long pressure flakes, which were likely removed by hand and leg-assisted pressure using a bone or antler pressure flaking tool. Other flake scars, such as remnant ventral flake surfaces, percussion flake scars, and apparent indirect percussion flake scars occur on stems in significantly lower frequencies (2.1%, 2.1%, 0.4%, respectively).

Notching

Based on the two manufacture failures described above, relatively wide (6.5-10.5 mm.), beveled notch entries were formed by hand pressure flaking and then abraded to strengthen them. Next, large pressure flakes were removed from each face. As the notch narrowed, hand pressure and indirect percussion were used to remove the final notching flakes. Notching flake scars on 56% of the notches appear to have been made by indirect percussion, particularly in the upper reaches of the notch. Other techniques and combinations thereof occur less frequently (large pressure and indirect percussion – 14%; hand pressure – 6%; large pressure – 6%; hand pressure and large pressure – 2%. 70% of terminal notching scars show intrusion by final large pressure blade flaking scars, which also suggests that final large pressure flakes from lateral blade edges usually removed any remnant large pressure flake scars above the notch that originated from the base. Most notching (46%) was done after basal thinning, but before final large pressure flakes were removed from the blade, with about equal frequency of notching before basal thinning and final blade flaking (23%) and after both basal thinning and final blade flaking (23%). Notching was performed after final blade flaking but before basal thinning on 7% of the study sample. 1.7% of the barbs were removed by notching flake expansion.

Final Blade Flaking

Final blade flaking was performed after basal thinning and notching on 72% of blade faces, before basal thinning and notching on 20% of blade faces, after notching but before basal thinning 6 % of the blade faces and before notching but after basal thinning 2% of blade faces. Blade flaking scars appear to have been made by removing large pressure flakes, likely with leg-assisted pressure flaking, which on some specimens are very oblique (55-65 degree angle to the long axis). These are usually oriented in a lower-left to upper-right (last series 48%) or upper-right to lower-left (last series 33%) pattern diagonally across the blade. Approximately 17% of the oblique flakes are removed unifacially from both edges. Commonly the removal of these flakes leaves very thin blade edges with course serrations, particularly just above the barb/blade juncture, and in about half of the examples formed a cross-sectional twist from the left edges. In addition the final blade flaking usually leaves the stem thicker than the blade. Approximately 20% of the points examined show minor reflaking; however, the recurved blade appears to be made that way intentionally and does not appear to be the result of repeated and sequential reflaking. Two points, Figures 1.b and 3.e, were found that were moderately reflaked to convert the long recurved blade to a short, triangular blade.

GEOGRAPHIC DISTRIBUTION AND AGE

As Houk et al. (2008) note, one of the challenges to establishing precise typological chronologies is that not all types occur at all places or at the same time. This is particularly true of point styles that were used for long periods of time, and may vary not only from site-to-site, but also regionally.

While once primarily thought of as a southwestern type, Laguna points are better described as a Balcones Escarpment type. They have been found along the Balcones Escarpment from Val Verde County in Southwest Texas (Prewitt 1966; Ross 1965) to Bell County in Central Texas, including sites on Bear Creek in Hays County, Barton Creek in Travis County, the Wilson-Leonard and Tonn sites in Williamson County, and the Gault and Martinka sites in Bell County. A lone example is from Lynn County, south of Lubbock, Texas.

Laguna points occur in a similar context as Martindale and Uvalde points; however, they are much less common. Nance (1972) considered early

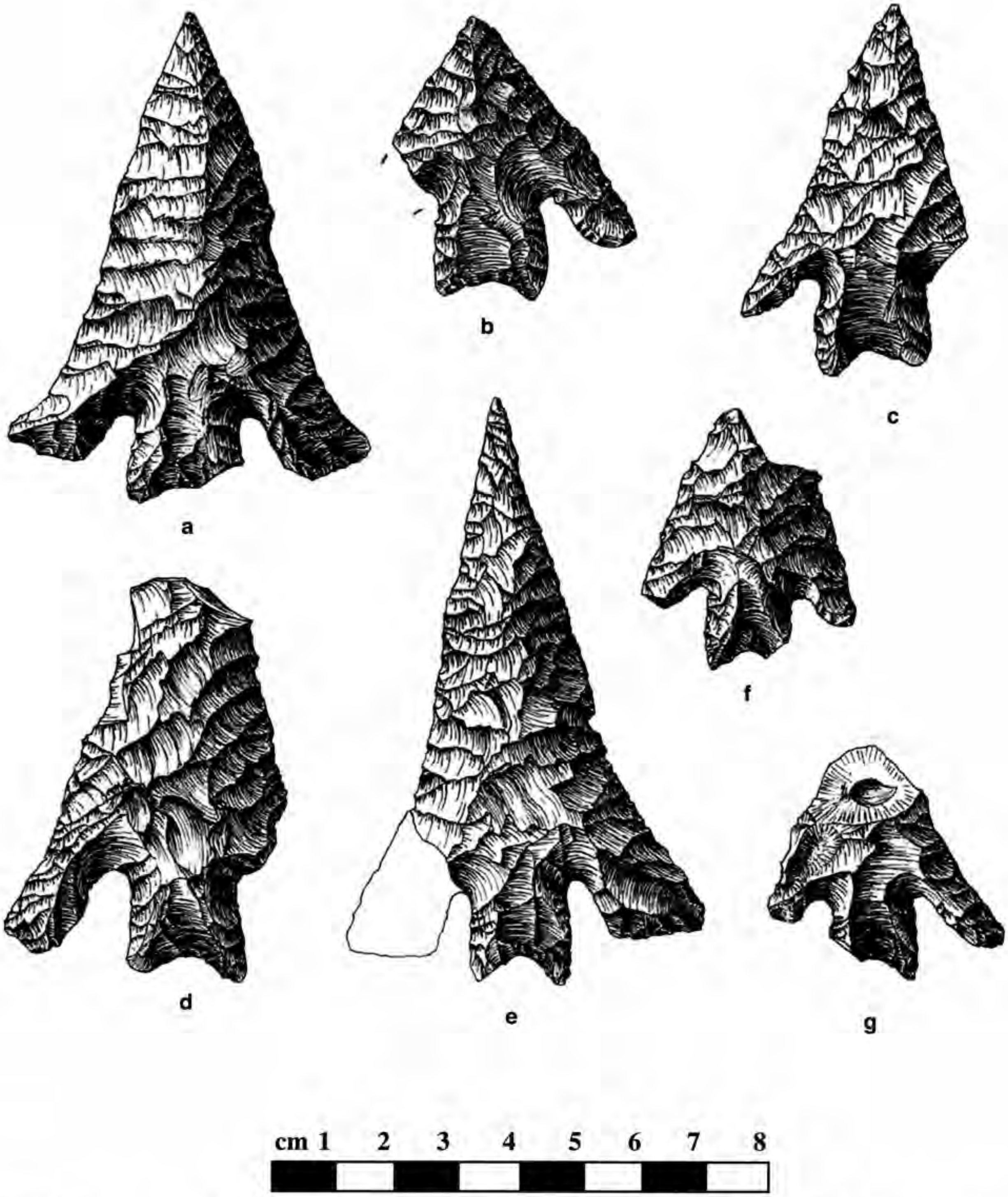

Figure 1. Laguna points. a, Williamson County; b, Gault Site, Bell County; c, Travis County; d. Gault Site, Bell County; e, Lynn County; f-g, Fair Oaks Ranch, Cibolo Creek, Bexar County.

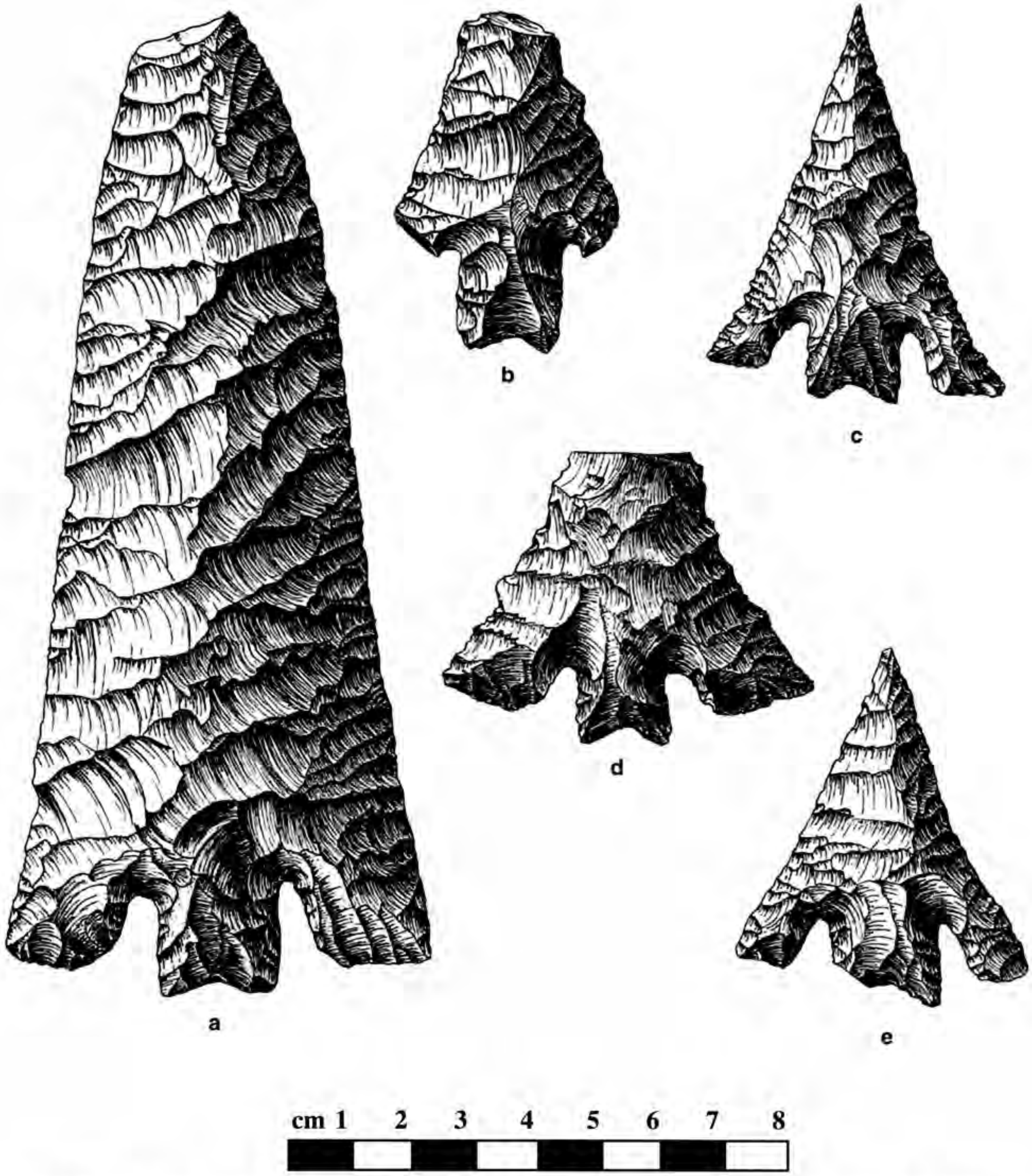

Figure 2. Laguna points. a, San Gabriel River, Williamson County; b, Nasse Creek, Gillespie County; c, Salado Creek, Bexar County; d, Travis County; e, Bell County.

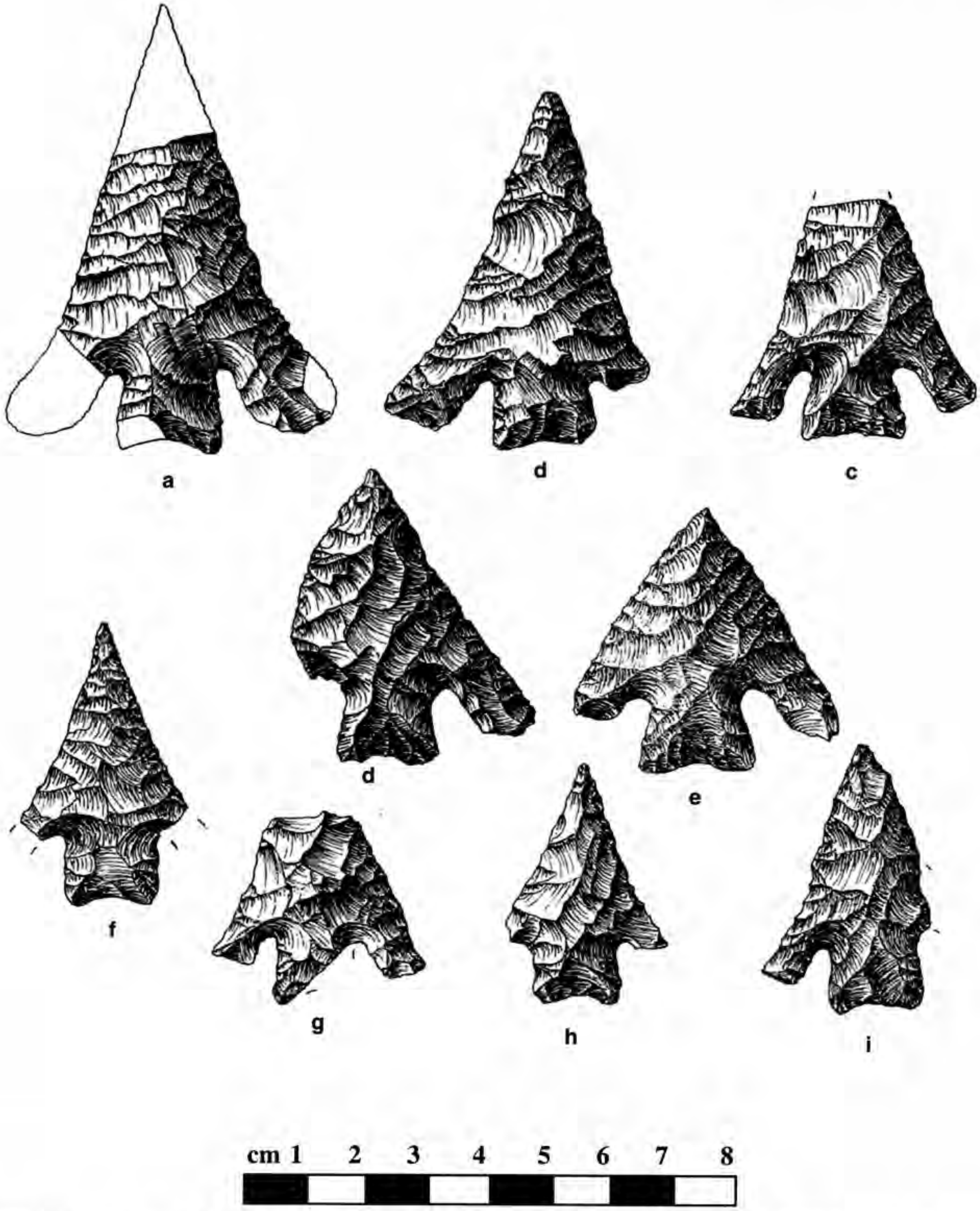

Figure 3. Laguna points. a, Kerr County; b, Barton Creek, Travis County; c, Uvalde County; d, Travis County; e, Uvalde County; f, Kerr County; g-h, Fair Oaks Ranch, Cibolo Creek, Bexar County; i, Kerr County.

barbed projectile points included in the Laguna type description in this report as markers for the Altithermal, a long period of time (7450-4450 B.P.) during which the climate was warmer and drier. However, as Nance cited several early references, it is unclear which "Early Barbed" points he included in this category. Collins (1995) shows the dry period to begin between 9000 and 8000 B.P. and to last until 6000 B.P. based on changes in bog pollen and Hall's Cave microfauna, listing Angostura (9000-8000 B.P.), "early split stem" points (8000-7000 B.P.) and Uvalde/Martindale (7000-6000 B.P.) as diagnostic projectile point styles of the period. At the Wilson-Leonard (Collins 1998) and Gault sites (Collins, personal communication) Laguna type points were found along with the Uvalde/Martindale component, well below the Calf Creek Horizon component. At the Richard Beene Site in Bexar County Laguna points were found on a stable surface (Lower Medina) with Bandy, Baker, Martindale, and Uvalde points (not necessarily contemporary) that dated to ca. 6900 B.P. At the Gatlin site, 41KR621, Houk et al. (2008) demonstrate the association of a Laguna point with a hearth dated at 6570 +/- 50 B.P in Occupation Zone 1.

COMPARISON TO CALF CREEK HORIZON POINTS

Time Period

Laguna points (7000-6000 B.P) predate Calf Creek Horizon points (Andice/Bell/Calf Creek 5500-4500 B.P.) At the Richard Beene Site Laguna points were dated ca. 6900, while Calf Creek Horizon points at the site were found within the Upper Medina paleosol that dated to ca. 4510 B.P. Calf Creek Horizon points consistently occurred in Occupation Zone 2 at the Gatlin Site (Houk et al. 2008). Oksanen et. al. (2008:17) note that the Calf Creek component at the Cibolo Crossing Site reported by Kibler and Scott in Bexar County is dated at 5300-4800 B.P.

Distribution

The geographic range of Laguna points is primarily the area either side of the Balcones Escarpment from the Pecos River to southern Bell County, while the range of Calf Creek Horizon points, as documented by the author's research, is very similar to the distribution of modern bison reported in Texas prior to 1830 (Weniger 1997).

Morphology

Researchers and collectors have commonly called Laguna points Bell, Western Bell, Winged Bell or Swept-Wing Bell. This has been generally on the basis of the wide barbs and their occurrence in Early Archaic strata. However, there are many important differences. Weber (1994, 2000, 2002) presented detailed manufacturing, use and breakage data for Calf Creek Horizon points in Texas, which is used in updated form in this report to compare to Laguna point attribute data (Tables 1-3).

Blades

Blade edges of Laguna points are recurved, or bell-shaped, terminating with an acuminate tip. Blade edges of Calf Creek Horizon points are convex, terminating with a very sharp, but broad distal tip. Approximately 52% of blades on Laguna points are intentionally manufactured with a twisted blade, while only 1% of Calf Creek Horizon points have twisted blades that were not produced by reflaking. Large pressure flake scars on blades of Laguna points are somewhat shorter and narrower, as well as more oblique in orientation than those on Calf Creek Horizon Points.

Barbs

The outwardly flared barbs appear to be a distinctive feature of Laguna points, whereas the distinctive feature of Calf Creek Horizon points appears to be the deep, narrow notches. Barbs of Laguna points are about half the stem length and oriented at an outward angle relative to the stem, whereas barbs of Calf Creek Horizon points are generally almost the length of the stem and parallel to the stem. About 52% of barb faces of Calf Creek Horizon points show remnant basal thinning scars. The flake scars on the barb faces of Laguna points are from notching and lateral blade edges.

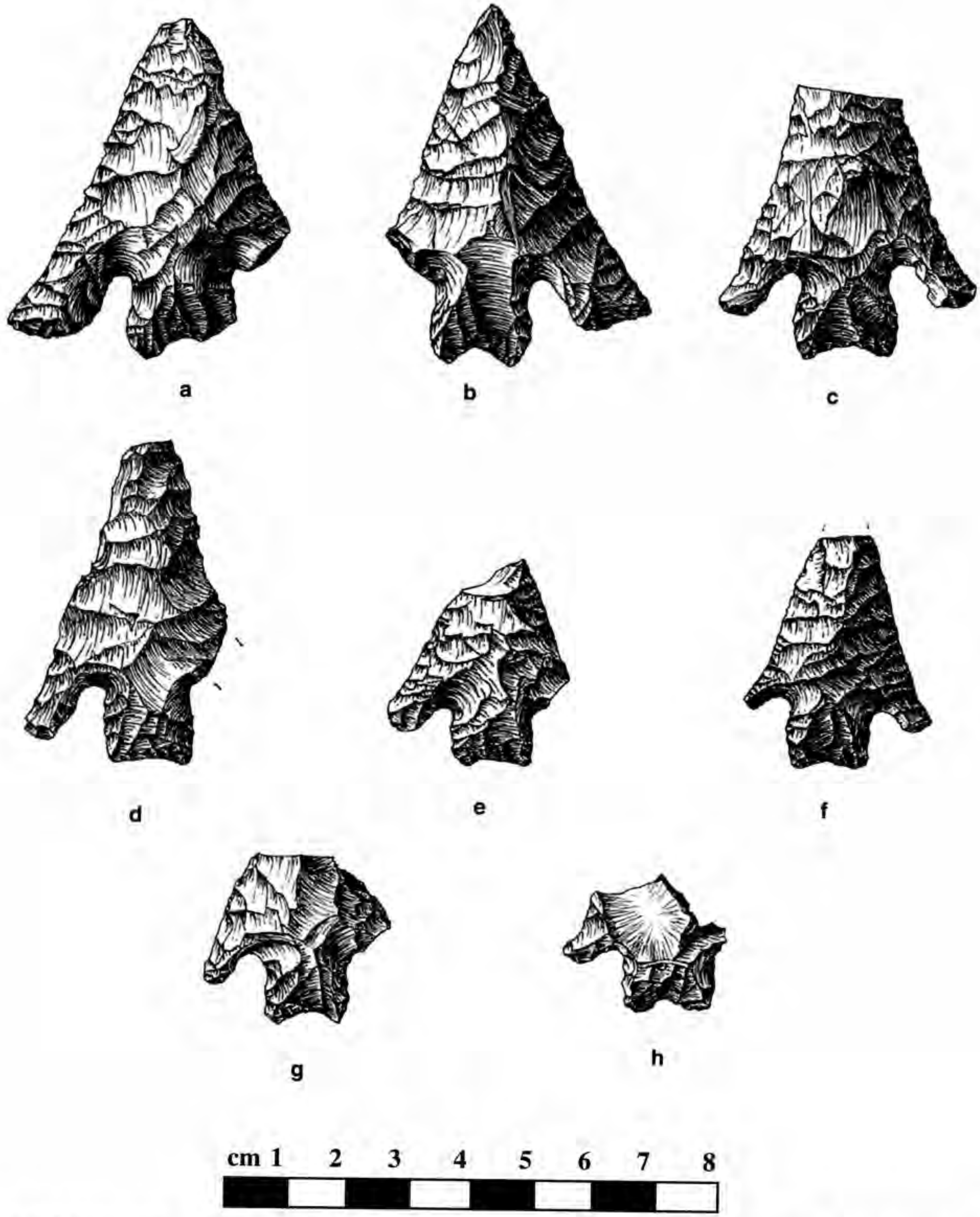

Figure 4. Laguna points. a, Williamson County; b, Kerr County; c, Fair Oaks Ranch, Cibolo Creek, Bexar County; d, Bandera County; e-h, Fair Oaks Ranch, Cibolo Creek, Bexar County.

Notches

Laguna points are corner-notched, while Calf Creek Horizon points are basal-notched. Notches of Laguna points are generally V-shaped, with the widest part of the notch being the notch entry at the base, and the narrowest part of the notch being the notch termination. Notches of Laguna points are wide in comparison to those of Calf Creek Horizon points. The wide notch entry (mean 10 mm) approximates the length or depth of the notch (mean 10.1 mm). Inside barb corners of Laguna were often rounded, intentionally widened to accentuate the flared barbs, which is opposite of Calf Creek Horizon points, in which great care was taken to keep the inside barb base and stem corners as close/narrow as possible (4-7 mm). Also, notches in addition to the two forming the stem are uncommonly found on Calf Creek Horizon points, while Laguna points with multiple notches are unknown to the writer.

Figure 5. Known geographic distribution of Laguna projectile points in Texas.

Stems

The stems of Laguna points are highly variable in shape and relative size, often resembling diminutive Pedernales or Marshall stems, many of which are "bowlegged" in appearance, whereas the shapes of Calf Creek Horizon points are distinctively incurvate parallel or parallel, subtle in variation (slightly contracting or expanding), and relatively consistent in width while being highly variable in length. Stems of Calf Creek Horizon points are wider, averaging almost 18 mm while Laguna points generally have narrower stems as a group (mean 15 mm). The manner in which the stem widths vary in the two is also different. The mean stem width of Calf Creek Horizon points at any location is very consistent regardless of stem length and blade size, while the stem width and length of Laguna points are generally proportioned in length and width to the size of the blade. The maximum stem width of 66% of Laguna points, particularly those of Pedernales-shaped and bowlegged stems, is between the base and the notch terminations. This is not an attribute of Calf Creek Horizon points. The stem faces of Calf Creek Horizon points are generally wedge-shaped (76%), while a minority of Laguna point stem faces are wedge-shaped (31%) and not conspicuously so.

Technology

The late stage manufacturing steps for Laguna points differ from that of Calf Creek Horizon points. The general steps for Laguna points are basal thinning, notching, and final lateral blade flaking, while those for Calf Creek Horizon points are lateral blade pressure contouring, basal large pressure contouring and finally, notching. Calf Creek Horizon points show evidence of extension curation, including reflaking for use as points and knives, scraping, gouging and practice notching, while Laguna points appear to have been occasionally reflaked to repair minor damage and rarely used for other tasks that necessitated curation and repeated blade reflaking.

Blade

The blade edges and widely flaring barbs of Laguna points appear to have been intentionally created during manufacture. Recurved blade edges in Calf Creek Horizon points occur most commonly in almost expended short-stemmed forms in the middle to late stages of reflaking, and they represent less than 1% of the sample (472). Approximately 85% of the blades of Calf Creek Horizon were reflaked, and 64% reached moderate and late degrees of reflaking. Of these, approximately 27% overall (mostly in moderately reflaked forms) have twisted blades, ridges above the notches, blade shoulders, asymmetrical blades, and thinned blades relative to stems and barbs that are attributes of repeated removal of long flakes alternately from left blade edges. 24% of Laguna points were reflaked, all but 2% of which are minor.

Barbs

Barbs of Laguna points appear to be intentionally made to have a flared appearance. The features that enhance the flared appearance are recurved blade edges with acuminate tips, wide, angled barb bases (often wider than the rest of the barb), wide V-shaped corner notches, rounded inside barb corners and relatively small stems. Barbs of Calf Creek Horizon points tend to be parallel to the stem, with shape and width determined by overall point size and the amount of barb and blade edge reflaking.

Notches

Notches of Laguna points are begun by removing large pressure flakes from relatively wide notch entries and finished with a combination of hand pressure and indirect percussion. Indirect percussion is not started until the notch is well above the base, while on Calf Creek Horizon points it is often begun just after the notch entry has been formed. Notches of Calf Creek Horizon points are made with meticulously precise hand pressure and indirect percussion flaking designed to minimize notch width. These produce well- ordered flake scars that vary alternately from barb/stem faces/edges in about 27% of Calf Creek Horizon points (Weber 1994), while notching flake scars on Laguna points are random in size, shape, orientation and pattern. In terms of ease of production, the two are exact opposites. 46% of notches on Laguna points are made after basal thinning, but before final blade flaking. Notches of Calf Creek Horizon points are made last, after basal thinning and earlier blade flaking.

Stems

The outline shape of basal thinning scars of Calf Creek Horizon points is parallel, while that of Laguna points is triangular when reduced by notching and final blade flake scars. Basal thinning on Calf Creek Horizon points is a combination of percussion thinning, followed by precise removal of large, thin pressure flakes and hand pressure flakes to form a very well contoured, wedge-shaped stem cross section with a thin, sharp base. Far less attention was paid to producing stems on Laguna points, although long flakes and short flakes were also used. Bases show good alignment, but they are not precise, thin and sharp like those on Calf Creek Horizon points. 42% of Calf Creek Horizon points showed stem edge abrading, while only 8% of Laguna point stem edges showed abrading, which was usually light and confined to basal corners or lower lateral stem edges.

Breakage

As shown in Table 3, the most significant difference in breakage form between Laguna points and Calf Creek Horizon points is the frequency of barb damage. 69% of Calf Creek Horizon points are missing both barbs, 23% have one barb and 8% have one barb, as compared to 35%, 41% and 24%, respectively, for Laguna points.

DISCUSSION

Decker et. al. (2000) proposed that Laguna points were the prototypes for Calf Creek Horizon points, and that Southwest Texas is the epicenter of development for Calf Creek Horizon points, rather than the plains margin woodlands of Oklahoma and Missouri. The writer sees no clear evidence of this based on distribution in time and space, attributes or manufacturing and use technology. There are a number of attributes that points produced by similar techniques and a similar tool kit can share. Barbs are only one feature. Choosing stems and geographical distribution, Laguna points could just as easily be interpreted as the prototype for Bulverde, Marshall and Pedernales points.

Within the Early Archaic pressure flaking tradition, the manufacturing technology of Calf Creek Horizon points produces more shared attributes with Bandy points, while Laguna points share more attributes with Baker, Martindale, Uvalde, Gower and Jetta points. In use technology Calf Creek Horizon points are unique, being most similar to Taylor points, except that long flake blade edge reflaking on Taylor is usually from the right and probably not made with a long hafted tool. The positioning of Laguna points as an ancestor of Calf Creek Horizon points would fit nicely in Carpenter and Paquin's (2010) "genealogy" of Texas stone projectile points; however, the danger of such schematics without consideration of technology, which may be analogous to DNA in this case, is the implication of cultural relationships where none may exist and the separation of artifacts where cultural relationships do exist.

CONCLUSION

Laguna points, commonly known as Early Barbed points, are a distinctive projectile point type and one of several styles that occur within the Early Archaic pressure flaking tradition in Texas. Laguna points were made in a similar manner as other projectile points that were made by removing large pressure flakes to contour the faces, and they share various attributes and overlapping geographic distribution. Occurring earlier in time, Laguna points are distinguished from Calf Creek Horizon points by different geographic distribution, manufacturing and utilization techniques.

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