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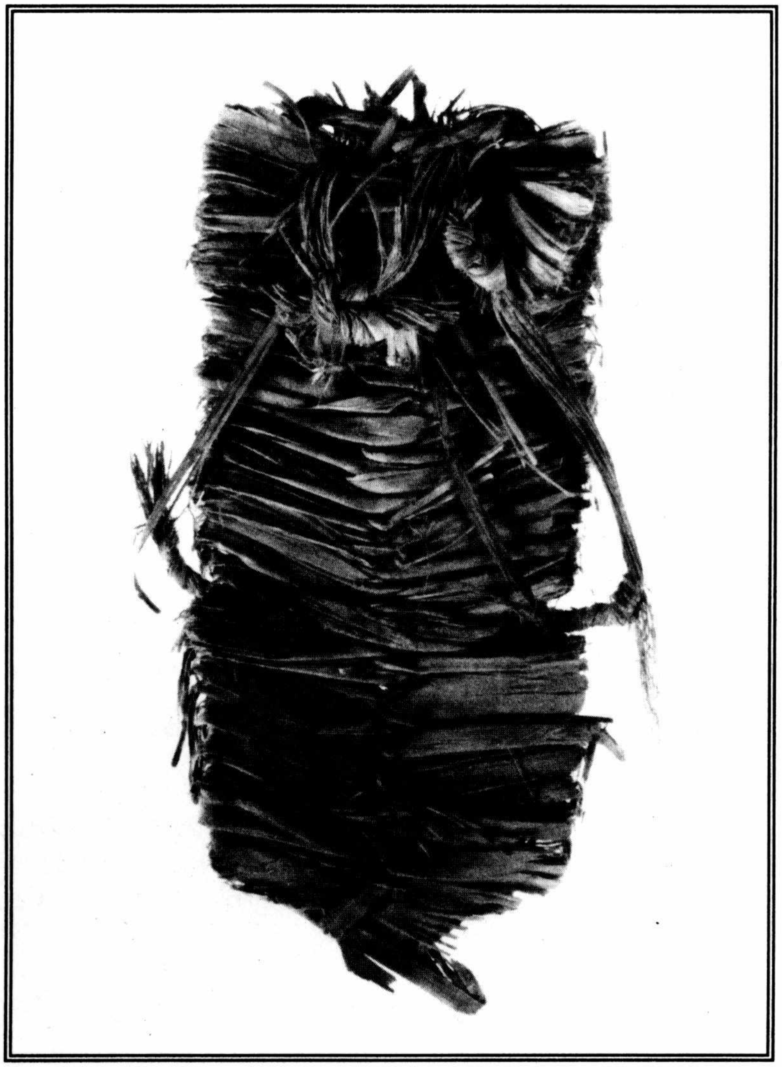

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LA TIERRA

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Manuscripts for the Journal should be sent to: Evelyn Lewis, Editor, *La Tierra*, 9219 Lasater, San Antonio, Texas 78250. Past issues of the Journal and Special Publications available by requesting an order form from STAA (Jim Mitchell), P. O. Box 791032, San Antonio, Texas 78279. Dr. T. R. Hester may be contacted at the Texas Archeological Research Laboratory, BRC 5, 10100 Burnet Rd, Austin, Texas, 78712-1100.

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The Contexts of Trade Between the Brownsville Complex And Mesoamerican Cultures: A Preliminary Study

Thomas R. Hester

Due largely to the efforts of A. E. Anderson, a Brownsville civil engineer, sites and artifacts of the lower Rio Grande delta in Texas and Mexico were recorded and documented in the period from before World War I through the 1930s (Anderson 1932). In the late 1940s and early 1950s, additional surveys were done, principally on the Mexican side of the lower Rio Grande, by Richard S. MacNeish (1947, 1958). These, and later researchers, have defined a Late Prehistoric cultural pattern noted for its manufacture of shell artifacts, especially large numbers of shell ornaments. These hunters and gatherers, peoples of what we term the Brownsville Complex, remain poorly known and the details of their lifeway are still unclear. Aside from the production of shell ornaments, they used marine shell extensively for tools. They also utilized clay dunes for occupations, and a number of cemetery sites have been studied and attributed to this complex (e.g., Hester, et al. 1969; Prewitt 1974).

Anderson himself, very early on in his research, noted the occasional discovery of artifacts from "the South"– what he termed the "Huaxtec" (notes on file at the Texas Archeological Research Laboratory [TARL]). In 1917, he recorded a conch whorl ornament with an engraved human face–it was clearly not of local manufacture and was attributed to "the South." He also found several large pottery vessels, or portions thereof, and knew enough about Mexican cultures south along the Gulf Coast to link these to the "Huaxtec." These identifications were confirmed and the vessels partially illustrated in an article by a professional archaeologist, J. Alden Mason (1935; Hester 1988:3). In 1944, when Gordon Ekholm published what is still the definitive study of archaeology in the Huasteca region, he also noted the presence of vessels from this Mesoamerican culture in the Brownsville delta. In MacNeish's survey in Tamaulipas, along the coastal plain south of Brownsville, he revisited some of Anderson's sites and found additional Huastecan pottery (MacNeish 1958). We will return later to this pottery amd what it can tell us.

In addition to the Mesoamerican ceramics, Anderson also collected several bits of obsidian and some pieces of jadeite and serpentine. These, too, were items of material culture exotic to the lower Rio Grande Delta. Later studies, such as excavation of the Floyd Morris cemetery site in Cameron County (Hester et al. 1969) uncovered a large tubular jadeite bead with Brownsville Complex materials. Surveys by Robert J. Mallouf yielded two additional obsidian flakes in Willacy County, and archaeologists from Prewitt and Associates excavated several obsidian flakes also in Willacy County.

There are many fascinating aspects of the Brownsville Complex, but as these comments indicate, I want to focus on where these exotic artifacts came from and what mechanisms were responsible for their importation into the Rio Grande Valley.

First, we must establish the origins of these items. The ceramics include ollas, bowls, and many fragments of vessels and sherds. Some have black-on- white decoration, while others are polychrome. These are clearly from the Huasteca and appear to date to Periods V and VI of Ekholm's sequence. This is the Early and Late Postclassic, from ca. 1000-1520 A.D. (Willey 1966:90). In terms of context, they come from at least 16 sites. Most of the complete vessels occurred with burials, though Anderson and MacNeish both collected Huastecan sherds from delta sites with no apparent burial associations. One of the ollas came from a site known as Tanque Salado, eroded out by the 1933 hurricanes. Anderson's notes (TARL) say it was likely associated with a female burial. On it is a motif almost identical to one illustrated on a Huastecan vessel in Ekholm (1944:Figure 13,l; Figure 1). Another olla was found with a child's burial (Cayo) Atasocoso clay dune site in 1928, in Cameron County. Three other vessels, all from the Mexican (Tamaulipan) side of the delta with or near burials included a Huastecan bowl, and substantial portions of two unrestored ollas, from the Loma de la Pesca and La Loma Atravasada sites.

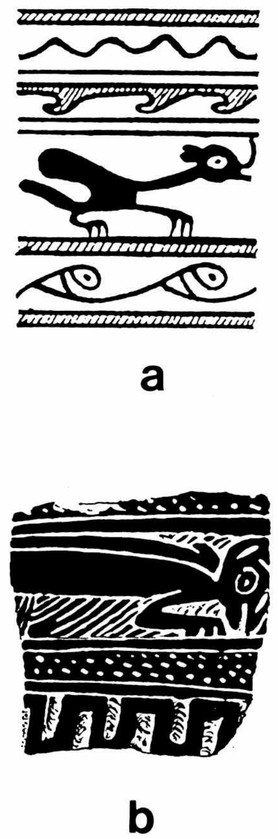

Figure 1. Decoration on Huastecan olla (see Ekholm, 1944).

The polychromes, described as Tancol Polychrome by Ekholm (1944:433) and the Huasteca Black-on-White are probably all from Period VI, between 1200-1520 A.D. However, a corrugated sherd may date to the Las Flores phase, or Period V, the Early Postclassic ca. AD 1000-1200, again based on Ekholm's study (ibid.:395, q).

The several obsidian flakes from the delta can also be pinned down with precision, based on techniques of nuclear chemistry used by the Texas Obsidian Project in recent years. For example, a tiny flake of black opaque obsidian found by Anderson in Cameron County is linked to the Zacualtipán source in the state of Hidalgo. Seven obsidian flakes excavated at site 41WY72 by Prewitt and Associates are all of green obsidian. Visually, these appeared to be from the Pachuca, or Cerro de las Navajas source, one of the most famous in ancient Mexico. X-ray fluorescence analysis confirmed this. Finally, two flakes found by Robert J. Mallouf at 41WY40, have also been identified as to source, although when we first analyzed them in the late 1970s, their source was unknown. Recently, however, Dr. David O. Brown of Austin, brought me some obsidian samples from a source known as Ojos Arcos in Querétaro state not far from Guanajuato. I sent these to my Berkeley colleagues, Frank Asaro, Fred Stross and Robert Giauque, to have the samples analyzed and to see if it was indeed a new source. Not only was it a new source, but they excitedly told me that it was an identical match for the two flakes from 41WY40! Patience and a lot of luck are major contributors to scientific discoveries.

The jadeite and serpentine artifacts found in the delta area include a tiny celt-like specimen and a piece of worked serpentine. There is also the tubular bead noted earlier from the Floyd Morris site in Cameron County, along with what Anderson described as a spherical or globular jade(ite) bead no longer available for study. The geologic sources of these are unknown. They would have to come from beyond the Huasteca, perhaps in Oaxaca or any number of other areas where jadeite and serpentine are known in central and southern Mexico. What is important here is their occurrence; though they are not true jade, they are "green stone" of the type of great importance in Mesoamerican cultures.

With this brief review of the imported material culture, let us look at what mechanisms might have been involved in trade or contact between the Brownsville Complex and ancient Mesoamerica. First of all, I think it is safe to say that the main conduit was the Huastecan culture, the northern edge of which is about 300 miles down the Gulf Coast from the delta (Figure 2). The relatively large number of Huastecan ceramics clearly pins down this source. Late Postclassic Huastecan culture interacted, or better put, fought with, the expanding Aztec empire. Some Huastecan towns paid tribute to the Aztecs (Hosler and Stresser-Pean 1992) but others stayed largely independent, especially in the northern part of its territory (Ekholm 1944; MacNeish 1958). However, the region was closely linked with central Mexico. During the Early Postclassic, the Huasteca clearly had trade relations with the Toltec empire. In the Late Postclassic, it is equally clear that the well-known Aztec traders, known as the pochteca, interacted with the Huastecan area. Indeed, it is said that the markets of the Huasteca competed with those of Aztec Tenochtitlán (Fagan 1984:66). Throughout the Postclassic, then, the Huastec merchants could have obtained obsidian and jade from Toltec or Aztec

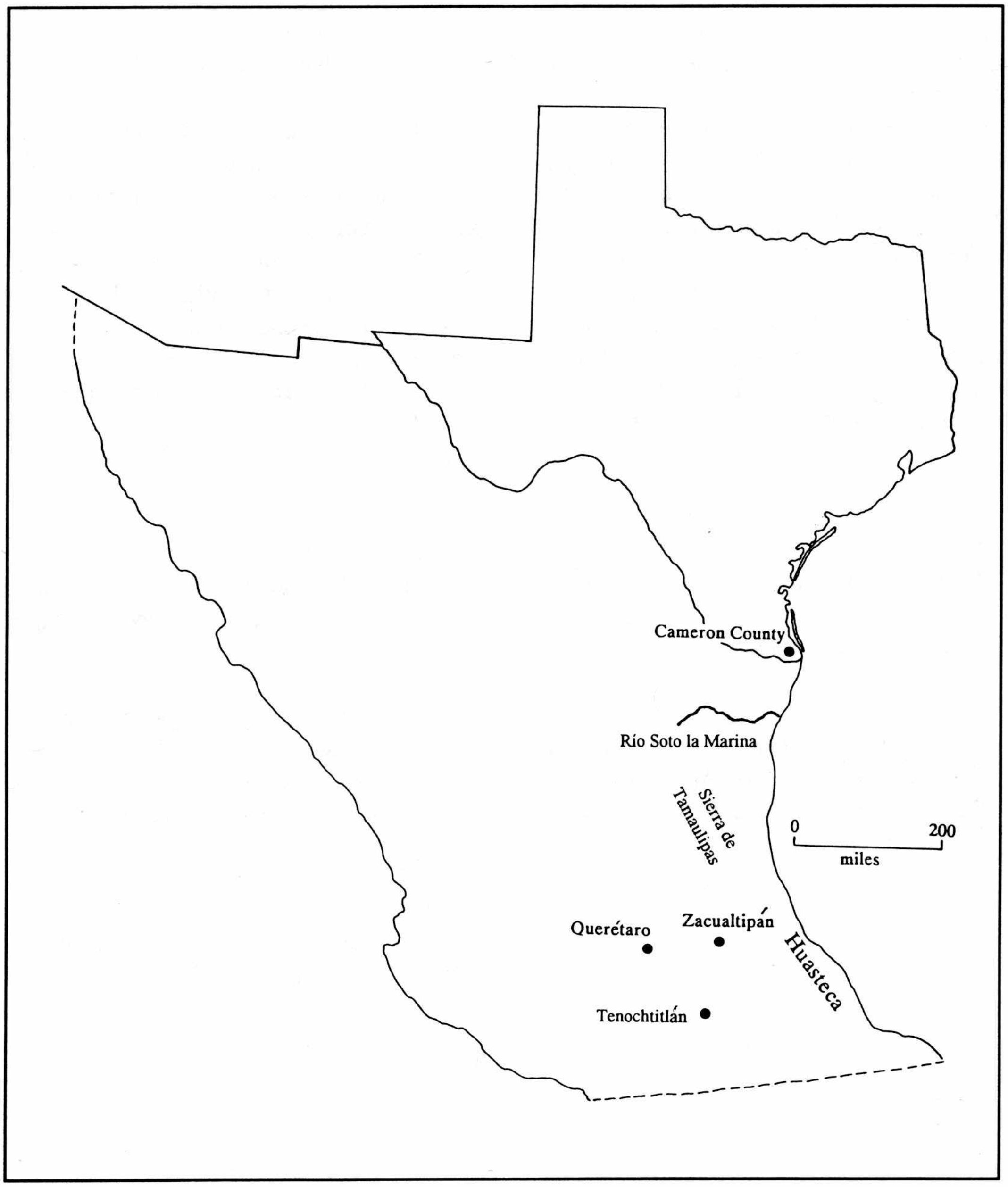

Figure 2. Map of Delta area, lower Rio Grande down Gulf Coast to Huastecan area discussed in text.

trade. The Zacualtipán source of obsidian, however, was heavily used by the Huastecan peoples, and Mexican archaeologists have only recently excavated a major Huastec site near that source. The green Pachuca obsidian was favored throughout Mesoamerica and was doubtless eagerly acquired and redistributed by Huastecan merchants.

But how and why did these Huastecan commodities reach the Brownsville Complex? There are a series of frontier Mesoamerican villages in the Sierra de Tamaulipas dug by both MacNeish (1958) and Stresser-Pean (1977). At first glance, they look to be likely intermediaries. Their Huastecan affinity had earlier been suggested by Ekholm (1944) based on the presence of round structures. MacNeish (1958) notes Huastecan Period VI "trade ware" in late sites in the Sierra de Tamaulipas, and Stresser-Pean's (1977) monumental volume on the site of San Antonio Nogalar in the southern Sierra de Tamaulipas also illustrates late Huastecan ceramics.

There is also the broad flat coastal plain east of the Sierra de Tamaulipas that could have been rather easily traversed by Huastec merchants, or perhaps travel was by boat along the coast. MacNeish (1947) found what he termed Huastecan campsites north of the Río Soto la Marina and near the Laguna Madre, only 150 miles south of the Rio Grande, and he indicates they continue northward. What drew the Huastecans north to the delta? I believe it was the marine shell ornament production of the Brownsville Complex. I have speculated on this in earlier papers and cannot yet resolve the "chicken-or-the-egg" dilemma of which came first—the shell beads or the Huastecs? Doubtless the hunters and gatherers making the prodigious numbers of shell ornaments were after more than a few pots, obsidian flakes, and poor quality jadeite! There were surely other commodities that have not been preserved. And were the Huastecs only interested in the shell beads for themselves? Brownsville-style Oliva bells or tinklers occur in Huasteca sites (Ekholm 1944) and are depicted on Huasteca stone sculpture, and MacNeish (1947) argues that Brownsville Complex shell ornaments are common in Huasteca sites. But are these from the delta or made by the Huastecs themselves from Gulf coast shell in their region? We cannot answer this question with the paucity of modern excavation data from the Huasteca. It is interesting to note that one commodity greatly favored by the Aztecs for their Tenochtitlán markets were marine shells and marine shell ornaments. Research on this early version of NAFTA will continue and further results will be incorporated in a later paper.

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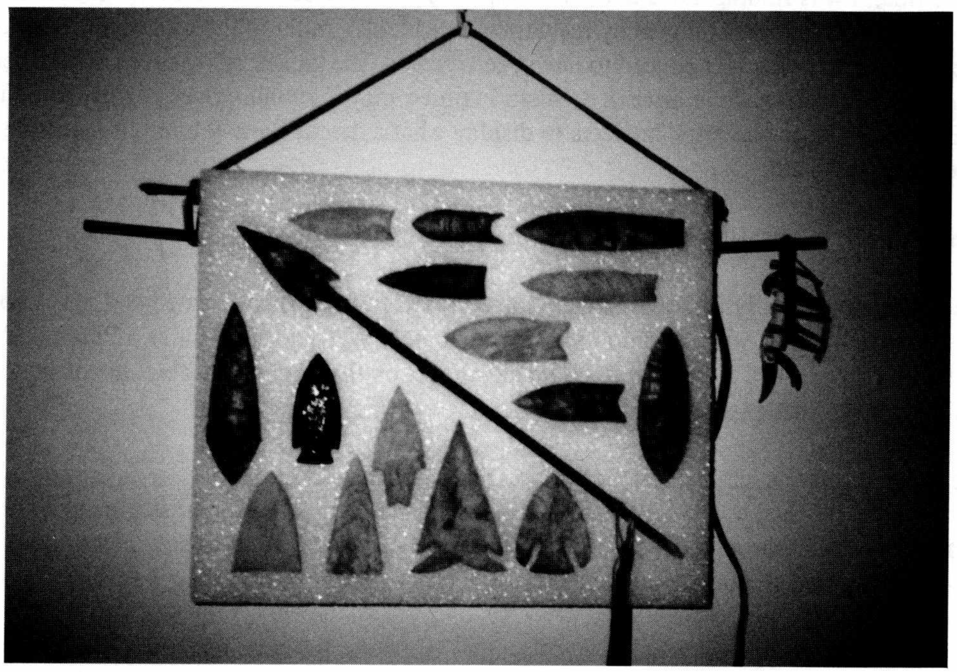
A TRIBUTE TO SOLLY

EDITOR'S NOTE: Upon receiving a congratulatory letter from J. B. Sollberger pertaining to the STAA in general and a few names in particular I sent copies to those mentioned. The response from T. C. Hill MUST be shared:

"The Sollberger letter brought back fond old memories. Stricken with misfortunes of almost biblical magnitude, Ol' Solly STILL found use for his two hands, besides earning awards for flintknapping and flaking .. he took a moment to APPLAUD his old buddies .. that's pretty rare in my book, but it's just simply ol' Solly. He don't know any other way to operate.

"His address is not his OLD home address, so I'm guessing he's in some old nursing home .. hope they appreciate him.

"The photo depicts some points he made hanging on a wall in my house .. 16 of 'em! Why ME? I really don't know, but he offered them with a bashful manner, like he doubted their VALUE.



"I saw him make the point on lower right at a STAA meeting in San Antonio one time. He was a natural showman, could have cleaned up in vaudeville. He smashed rocks with absolutely all his force, scattering flakes all over the place. The sounds were a lot like listening to somebody smash big old plate glass windows. He laid down his cigar for a minute (after nearly drooling it to flickering DEATH in his intensity to put his points over to a crowd of idiots), snapped a flat hard stone across the edge of his preform for a couple seconds (to prepare a platform .. a 'platform'? What on earth FOR, Solly? He took pains to explain the purposes of his actions to those of us who seemed half-way intelligent, a total of about 3 out of the 100 in attendance) .. We sat in breathless awe, to explode into wild applause when exactly the reaction occurred which he predicted .. he leaned back, picked up his soggy cigar and put another match to it, laid down the big ol' tool and selected a smaller one and went on to the next step. I tell you true, it was a SHOW by a topnotch showman, and the line at the resrooms was always ZERO when Solly was performing!

We worked (worked? Ha .. me and ol' Solly never worked at anything, we PLAYED!) at producing a Region 8 Newsletter (the final number, actually) describing as best we two could ol' Solly knocking out a pretty good South Texas Angostura, the steps, the ancient thinking required (Solly could explain for HOURS what an OLD ONE needed to ponder to create artistic, useful BEAUTY in stone .. he had the direct LINE back to the old folks' brains, and I reckon that stirred ME about as much as his truly magnificent skill at the game.)

The point we described (as he actually made it in Dallas and mailed the sketches and descriptions, in short bursts) is the one at top right in the photo .. he had to insure that the ribbons ran from upper ? to lower ? to exactly reproduce the "Texas" artifact, see? You may rediscover all this exciting news in "Hill's South Texas Newsletter," (Texas Archeological Society, Special Issue No. 1, September 1973). I recall that we had to go into a small reprint to satisfy all the calls and cards asking for a copy, which was satisfactory to the both of us. I never told ol' Solly that I have, to this day, never seen the paper used in any manner as a reference unless maybe ol' Hester stooped to use us, as he sometimes WOULD, but we had OUR fun out of it, anyhow!

At the time, I was finding some diamond-shaped, alternately beveled skinning knives, or whatever they call 'em nowadays, finally fashioned by resharpening a blank similar to the tool on far right of the photo, around these pottery sites which I deduced to have been created (the knives AND sites) by northern people who followed the big ol' bison down here in prehistoric times, maybe running over slightly into historic .. ol' Solly MADE me the 'before and after' artifacts to display what a dental-flake-job might resemble on the thing, the used tool at far left.

Is this guy REAL, or what?

The others were mostly S. Texas. styles, some Plainviews both heat-treated and not, a couple of Golondrinas because I had taken the stump to declare that there WAS no such cat as a Plainview golondrina, as was popular at the time. (Ol' Tom Campbell bailed me out on that argument, bless his ol' heart .. I was just shooting in the dark, but with some hope of victory.)

So I better prepare a letter for ol' Solly .. I'm delighted that some of his friends are taking their time to visit and read to him. If I thought he could still afford one o' them gigantic Cuban stogies and still had the energy to smoke one down through the drool, I might find some and mail 'em to him .. Boy, he could squint through that dank fog, take deliberate aim and SMASH a rock all to PIECES.

T C"

PREHISTORIC SANDALS FROM THE SIERRA DE LA ENCANTADA, COAHUILA, MEXICO

Solveig A. Turpin and Stephen M. Carpenter

ABSTRACT

Fourteen sandals collected from the Sierra de la Encantada in northern Coahuila are described and sorted into three categories based on construction methods. Two groups conform to types previously defined as plaited and checker-pad in large assemblages of fiber artifacts from the Cuatro Ciénegas region. Plaited or twined sandals are also found in the Lower Pecos River region of Texas. The third group, four specimens of V-weft construction, are manufactured in a manner never before reported in this region.

INTRODUCTION

Fourteen sandals, unsystematically collected from a rockshelter in the Sierra de la Encantada, demonstrate variability in the prehistoric fiber industry of northern Coahuila (Figure 1). Although this collection is small, three different methods of sandal construction are represented by two or more specimens. One of these types has not been previously recognized here or in adjacent areas of Texas or Mexico where sandal technology has been more thoroughly researched. Northern Coahuila is one of the most poorly understood areas of the *frontera* but, due to the arid climate and the preservation afforded by dry rock shelters, one with great potential for the study of hunting and gathering adaptations over a long period of prehistory.

PHYSICAL SETTING

The Sierra de la Encantada is a northwest-southeast trending outlier of the Sierra Madre Oriental that borders the Bolsón de Mapimí on the east central edge of the Chihuahuan Desert. The mountains are composed of uplifted lower Cretaceous limestone interspersed with Tertiary igneous intrusions, a mosaic surface geology revealing a complex history of tectonic episodes.

Geographically, the area is 75 km east of the southernmost extreme of the Rio Grande's Big Bend, 225 km north of Cuatro Ciénegas, and 175 km southwest of the confluence of the Pecos and Rio Grande rivers. The Sierra del Fuste, source of a collection of basketry, sandals, and other artifacts previously reported in *La Tierra* (Turpin, Powell, and Carpenter 1993; see also Turpin and Carpenter, in press) parallels the Sierra de la Encantada on its southwestern front. Still farther west, the arid expanse of the Bolsón de Mapimí, with its dry lake beds and vast waterless stretches, once constituted a formidable barrier to Spanish colonial ambitions and now inhibits economic development of the area. On the east, the Encantada valley and range lie just across the Sierra del Carmen from the Valle de la Babia (Smith 1970: Figure 4), the historic route from Múzquiz (Santa Rosa Sacramento) to San Vicente, the ford at the tip of the Big Bend, and eventually on to Presidio del Norte (Ojinaga). A tunnel now leads from the main La Babia highway to the central basin, Valle de la Encantada, so that the fluorspar mined from the surrounding mountains can be transported to market.

The highest point in the Sierra de la Encantada is 2400 meters AMSL (Above Mean Sea Level), contrasting with intermontane expanses of Quaternary alluvium that drop below 1000 meters AMSL. The topographic extremes are so dramatic that even 19th century Mexican troops accustomed to the rugged mountainous terrain of the Sierra Madre described Encantada as "notable por su aspereza y elevación" (notable for its harshness and height) (Flores 1881).

Elevational differences translate into variable temperatures and precipitation, as well as the biotic communities they support. Climatological stations in the Trans-Pecos region of Texas show that mean temperature decreases by 2 to 3 degrees Fahrenheit and annual precipitation increases by 2 to 3 inches per 100 meters increase in elevation between selected sites at the same longitude (Deal 1976:28). Presumably, the Encantada area resembles the Trans-Pecos, with an annual precipitation of 11 to 13 inches, a mean temperature of 63 degrees Fahrenheit, and historical extremes reaching slightly over 100 degrees in summer and below 0 degrees in winter.

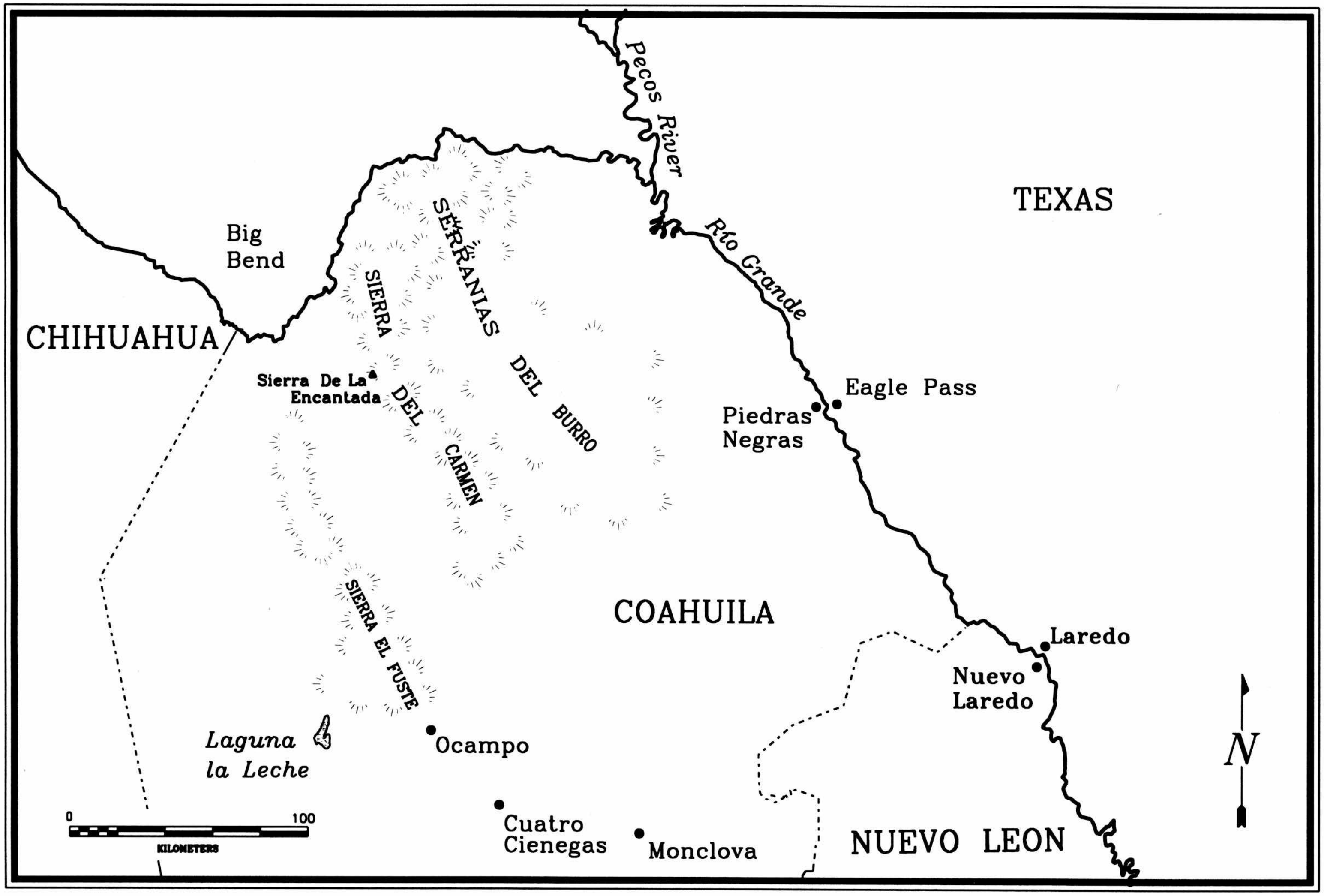


Figure 1. Map of Coahuila showing location of the Sierra de la Encantada.

Five vegetational communities characterize the region: desert shrub, grasslands, transitional grasslands, montane chaparral and montane mesic forest (Muller 1947; Smith 1970:61-62). The Chihuahuan desert shrub, a biotic community typified by shallow, rocky, poorly developed soils that supports succulents such as lechuguilla, ocotillo, prickly pear and varieties of yucca, as well as low shrubs, including creosote bush, tarbush, leather plant, candelilla, and rubberplant, occupies the lower arid zone. Grasslands now prevail only on the deep soils of the high valleys; transitional grasslands are a mixture of grasses and desert plants, often found on the lower slopes and adjacent valley floors. Mid-level montane slopes trend from a community dominated by sotol, lechuguilla, agave, beargrass, various cacti, and several grasses on the toe slopes to chaparral-like woodland communities at higher elevations. The latter is dominated by scrubby pine, oak, and juniper. The high Sierras support open conifer forests of pinyon, ponderosa pine, cypress, and fir, as well as oaks, remnants of the vast woodlands that once covered the area.

CULTURAL SETTING

The Encantada collection has not been dated to any specific period in prehistory by radiocarbon assay or temporally diagnostic artifacts. Therefore, the most appropriate cultural context is Taylor's (1966) broad series of complexes, derived largely from his excavation of Frightful and other caves in the Cuatro Ciénegas Basin, south of the Sierra de la Encantada.

Taylor saw the prehistory of the northeastern Mexican states as a continuum, a single cultural tradition, but one where changes in artifact types could be used to discern three stratigraphically distinct complexes. The earliest of these he called the Ciénegas complex. Based on his interpretation of radiocarbon dates from Frightful Cave, in the Cuatro Ciénegas Basin, he placed the abandonment of the Ciénegas complex sometime between 4000 and 5000 B.C. or 6,000 to 8,000 years ago, generally contemporaneous with the the Early Archaic period of Texas.

The major cultural matrix from earliest to latest times Taylor named the Coahuila complex, a rough analogue of the Archaic period in Texas. However, the Coahuila complex was dated to the range from 7300 to 7600 B.C. (9300 to 9600 B.P.) to A.D. 1200 (750 B.P.) or as recent as historic times (Taylor 1966: 63). Variations during this long span are partially attributed to environmental change, a gradual dessication that affected both humans and their habitat. As a result, cultural integration and stability decreased, craftsmanship declined, and mobility and typological variability increased. Effects visible in the archaeological record include a shift from animal to plant foods and possibly increasing mortuary ceremonialism. During the middle of the Coahuila complex, outside influences are detected in the lithic types and increased nomadism is evidenced by an increase in the number and extent of occupied sites.

At the very end of the Coahuila complex, cultural integration is restored, perhaps by foreign influence, marking the inception of the Jora complex, equivalent to the Late Prehistoric period in the Texas chronology. Shared attributes are the adoption of the bow-and-arrow, small snub-nosed scrapers, rock midden circles, ceramics, and possibly petroglyphs.

SANDAL RESEARCH

The Encantada sandals are most effectively analysed in the context of typologies developed by Taylor (1988) for his Cuatro Ciénagas materials and by Schuetz (1956) for the Witte Museum collections from the Lower Pecos River region of Texas. Williams-Dean (n.d.) later tried to correlate earlier Lower Pecos sandal typologies, collections acquired after Schuetz' analysis, and classificatory systems from the Southwestern U.S. and Mexico but Taylor's work was not yet available to her.

In Coahuila, Frightful Cave alone produced 958 sandals from three gross stratigraphic units that were later dated by radiocarbon assay. Manufacturing techniques were used to classify 661 of these into six groups, F1a-f. Of interest here are the groups Taylor designated as F1a, plaited sandals, and F1c, checker-pad.

Schuetz (1956) classifed the Lower Pecos sandals into four groups, A through D, also based on construction methods. Based on her written descriptions and illustrations, Schuetz' types A, C and D are subsumed under Taylor's type F1a in which he placed all the plaited or twined sandals from the Cuatro Ciénegas sites.

SANDALS OF SIERRA LA ENCANTADA

The sandals in this collection can be divided into three groups based on method of construction (Figure 2). Two of these are comparable to types described by Taylor (1988) or Schuetz (1956), the third is apparently a new addition to the catalogue. The following discussion is a description of the groups in the Encantada assemblage and their implications for regional prehistory, not an exercise in typology.

Eight of the 14 sandals compare to Taylor's (1988: 40-75) plaited category (F1a), the dominant sandal type in the Cuatro Ciénegas collections, and Schuetz' Type D, a subdivision within that overall class (Figure 2a). These specimens are constructed of two parallel elements that form the warps, the toe ends turning inward and across the opposite warp. Weft elements are woven in figure eights across, over, and under the warps towards the heel. Padding is interwoven longitudinally through the weft elements, first on one side, then folded and continued in similar manner down the opposite surface. Technically, this process is not plaiting, as defined by Adovasio (Andrews and Adovasio 1980:27), because not all the elements are active (Adovasio 1977: 99). Twining, with its passive warps and active wefts (Adovasio 1977:15), would more accurately describe these sandals but Taylor's nomenclature has precedence until the entire typology is reworked.

Only one plaited sandal retains a complete set of tie strings and two others have small remnants. The complete tie strings match Shuetz' (1956:134) description of her type C method: "employs two strings knotted under the sole at the toe, crossed on top, caught through the sides, twisted, and tied at the heel with a square knot." As is most common, the strings are attached to the sides from the inside to the outside. The two pairs of remnant ties can not be fully reconstructed but it is evident that they were made differently.

Four specimens can not be assigned to any previously described sandal type. Their basic structure is a two warp frame of parallel elements that are turned in at the toe (Figures 2b, 3). The warp elements are split at the toe end and one-half of each element contributes to the toe loop while the other half lays across the top of the sandal, perhaps as padding for the ball of the foot. The body is formed by weaving the wefts over and under, back and forth around the warps. The most distinctive attribute of this sandal is the way in which the weft elements are twisted 180 degrees at the latitudinal midpoint of the body and turned at a 30 to 45 degree angle to create a V-shaped pattern, opening towards the toe (Figure 3). The toe loops are similar on all four, but the three that have toe and heel straps vary slightly. On two of the sandals, toe straps are attached to the longitudinal midpoint by passing to the outside of the sandal, under the warps, and interwoven through the wefts (Figure 3). On a third, the tie strings are first connected by piercing the warps, then twisted.

Two dark carbonized fragments, one over 90% complete and the other approximately 20% complete, represent a type that has only been found in Coahuila (Figure 2c). Neither retains tie strings. Taylor (1988: 96) called the seven examples he recovered from Frightful Cave "checker-pad" sandals, type F1c. The Sierra el Fuste collection, from the small mountain range that parallels the Encantada on the west, contained 16 specimens of this type (Turpin and Carpenter, in press). Checker-pad sandals are constructed "by sewing reinforcing and padding elements through the sides and across the ground side of a checker-plaited fabric" (Taylor 1988:96). The Encantada specimens were apparently burned in a reducing atmosphere that charred them but did not result in a loss of detail or form.

DISCUSSION

In an area where virtually no systematic archaeological research has been done, even a collection as small as the Encantada sandals can contribute useful information about prehistoric technology and culture. Plaited (twined) sandals, the most common method of construction at Encantada and the dominant type at Frightful Cave, are also found in the Lower Pecos region of Texas. According to Taylor (1988:43)

> ". . . the basic materials and the technique of making plaited sandals remained identically the same for more than 7,000 years, from sometime before 7000 B.C. to at least the first centuries of the Christian era and probably later!"

Obviously, this method of sandal manufacture remained in favor over such a broad area and for such a long time because it was expedient, durable, and functional. Experimentally, the body of this sandal

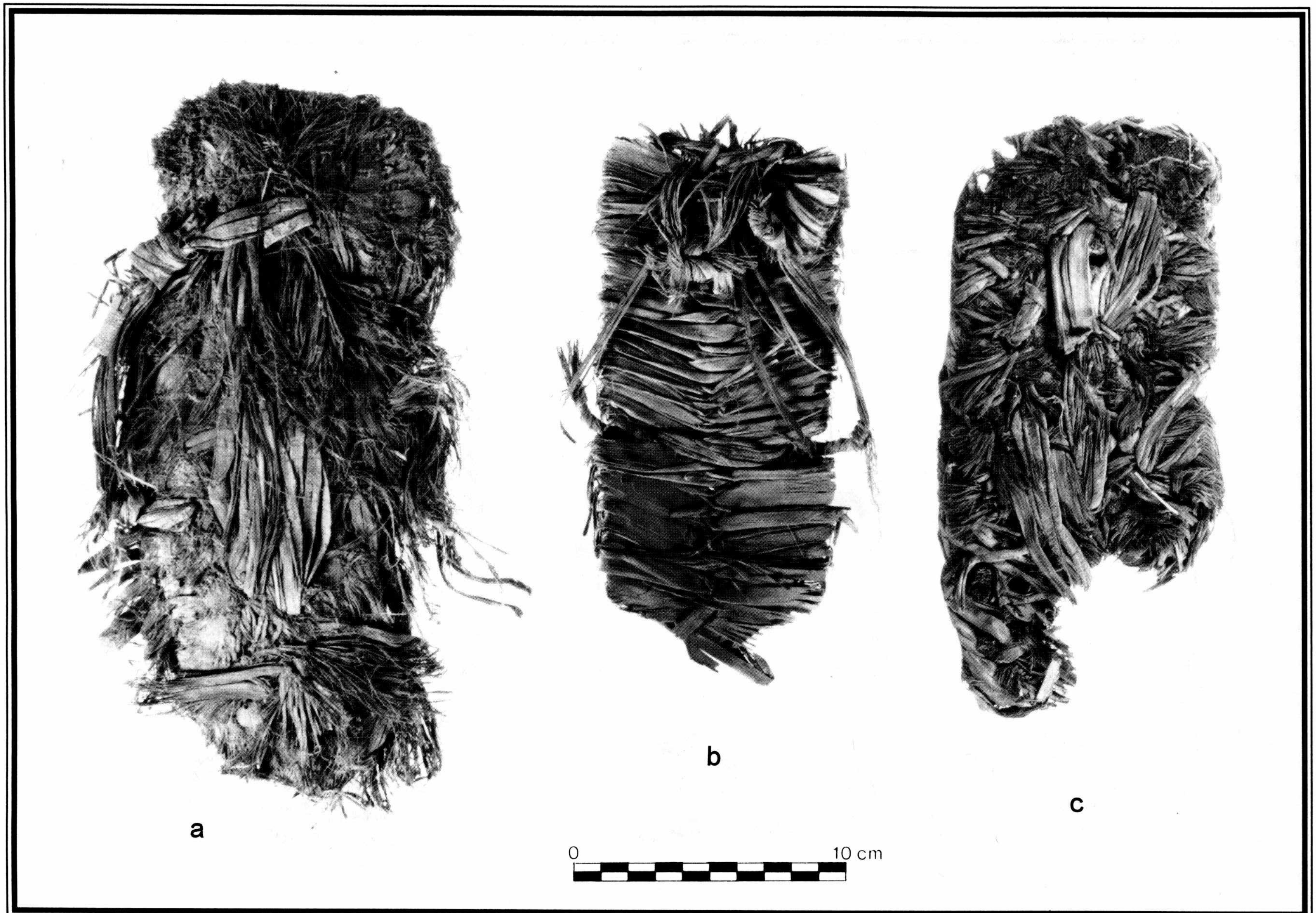


Figure 2. The three sandal types represented in the Encantada collection. Photos by Carole Medlar.

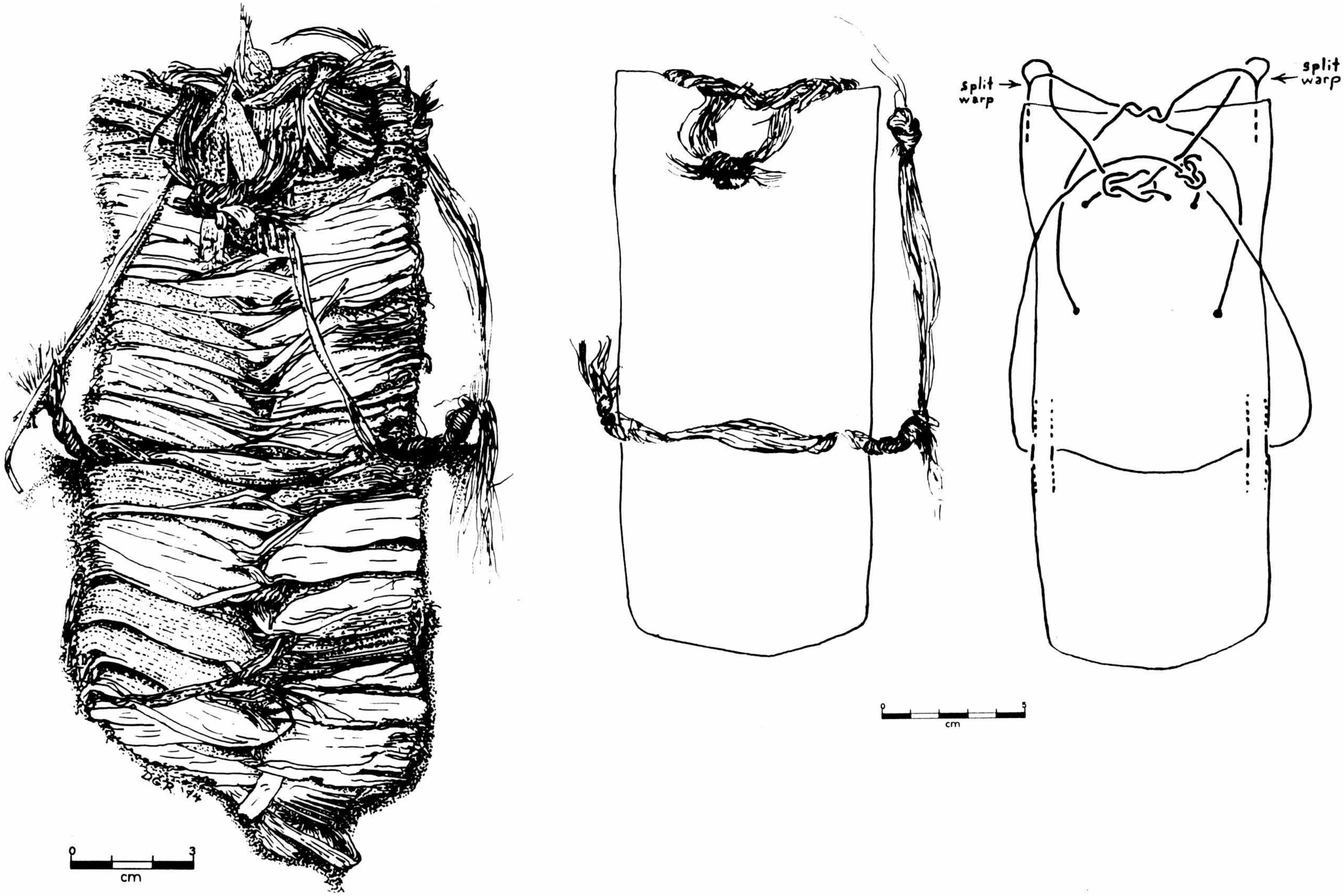


Figure 3. Line drawing of the V-weft method of sandal construction and tie strings. Drawing by David G. Robinson.

type was replicated using dried hesperaloe leaves in five minutes; experience would improve on this.

Checker-pad construction is much more labor intensive, requiring finer material preparation and skill. To date, this manufacturing technique is found solely in Coahuila. Sixteen from the Sierra el Fuste collection, seven from Frightful Cave, and the two fragments discussed herein constitute the total reported population of this type. The Frightful Cave specimens concentrated horizontally in the upper segment of the middle and lower levels which date to approximately 2000 B.C. and 5000 B.C. respectively. Their provenience, as well as their structural affinity to the earlier twill pad type, suggested to Taylor that the checker-pad technique developed from the twill pad sandals of the Ciénegas Complex, "the earliest cultural expression of which we have record in the state" (Taylor 1988:92; see Taylor 1966 for discussion of Ciénegas Complex).

The third group in the Encantada collection adds a new dimension to the fiber industry of Coahuila. Given the paucity of formal archaeological research in this area, such serendipitous findings are to be expected until some level of redundancy in data is achieved. Variability is a feature that characterizes most highly mountainous areas where traits could develop, flourish, and fade in relative isolation. Discerning patterned variability requires a much larger and better dated sample, but the Encantada collection has contributed to bridging the spatial gap between the Cuatro Ciénegas and Lower Pecos sandal industries.

ACKNOWLEDGEMENTS

Patrick Kelly of San Antonio and Eagle Pass first brought this collection to our attention and obtained the loan of it for analysis at the Texas Archeological Research Laboratory. Carole Medlar produced the map and photographic plates at TARL; David G. Robinson drew the illustration of the V-weft sandal and schematic of the tie strings.

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Rock art is the most visible aspect of the prehistoric hunter-gatherer archaeological record. Covering cave walls, cliff sides and boulder faces with painted and engraved designs, it challenges the archaeologist to address the symbolic, aesthetic, and religious sides of the past. Though traditionally marginalized in mainstream archaeology, recent advances in chronometric dating and interpretive techniques, along with the development of cognitive archaeology, have brought rock art studies to the substantive and methodological forefront of the discipline.

The contributors to this volume discuss a series of these technical, methodological and substantive issues in the analysis of hunter-gatherer rock art. Principally emphasizing North America, the contributions provide summaries of advances in the dating of pictographs and petroglyphs, and interpretations of the art using ethnohistorical, iconographic, stratigraphic, and comparative data, with approaches informed by symbolic, semiotic, and gender studies.

DAVID S. WHITLEY conducts rock art research in California and the Great Basin. He has taught at UCLA and University of the Witwatersand and is currently the United States representative to the I.C.O.M.O.S. International Rock Art Committee.

LAWRENCE L. LOENDORF is former Professor of Anthropology at the University of North Dakota, and current Adjunct Professor at the University of Arizona. His rock art research emphasizes the northern and southern Plains and the Southwest.

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A LARGE BIFACE ECCENTRIC FOUND NEAR COLHA, BELIZE

Thomas C. Kelly

ABSTRACT

A large chert longitudinally symmetric biface eccentric which had been found near the Colha site in Belize is described in detail and compared with other Belize lithic eccentrics. Similarities in workmanship to eccentrics known to be from the Late Preclassic in Belize strongly suggest that this artifact is from that same time period.

INTRODUCTION

While serving as consultant during the 1993 field season at Colha (Hester 1993; see Figure 1), I met a woodsman a few miles south of Colha. He showed me the unusual eccentric shown in Figure 2 and agreed to loan it to me long enough for Richard McReynolds to make the line drawing in Orange Walk, Belize. McReynolds specifically made this drawing for John Masson, a strong supporter of archaeology in Belize for over 20 years. Despite meager knowledge of its provenience, and that it is also a bit far afield from South Texas archaeology, it may still be of some interest to those who admire fine examples of the flintknappers' art.

ECCENTRICS

Most of us have seen so called "eccentric" lithics such as fishhooks, eagles, thunderbirds, and other oddities in this country. Those that I have seen are all rather poor modern fakes. These bear absolutely no resemblance to Maya eccentrics that are often the finest examples of the Maya flintknappers' art. They have been excavated in good context from ca. 1100 B.C.-900 A.D., which covers the Maya Preclassic and Classic periods.

The total found has not been tabulated, but common eccentrics probably run well into the thousands. However, fine macro-eccentrics, like that in McReynolds' illustration (Figure 2), are comparatively rare.

Maya eccentrics are made primarily of chert and obsidian and are quite commonly found in ceremonial, burial, and dedicatory contexts. They vary in size from a few centimeters to more than 75 centimeters in length. The most spectacular and massive ones are more often found in Late Preclassic context.

Eccentric forms are extremely variable. They include anthropomorphic, zoomorphic, geometric and imaginative shapes. Unifacial flakes are often the raw material for the smaller eccentrics while macro-eccentrics are usually bifacially worked.

ARTIFACT DESCRIPTION

The eccentric biface (Figure 2, pp 20-21), is 45 cm long by 9.3 cm wide. The central "grip" is 7.5 cm long and varies from 6.1 to 6.3 cm wide. Its edges are sharp and would require wrapping or hafting to protect the hands if used as a tool. The few contemporary Maya men I know have small hands that would fit this "grip." Wear patterns are absent, however, indicating that it was never used as a utility tool. It has been broken exactly in half, although not shown in the drawing. The break is at a right angle to the longitudinal axis and appears to have been deliberately made. The break took place in antiquity as the nearly pure white patina evenly covers all surfaces on both pieces.

Flaking is very skillfully executed with the large primary thinning scars running consistently to the middle, leaving distinctive but irregular median ridges on each face. Eccentrics were the largest lithic artifacts manufactured at Colha (Shafer 1991: 38). Massive tools such as this one were most probably knapped with the biconical limestone hammerstones ("sweet potatoes") commonly found in the debitage mounds at Colha. They served very well as rather hard "soft" hammers (Shafer 1991:38). Soft hammer billets were not found in the archaeological record at Colha before the Early Post Classic period or ca. 900 A. D. (Hester and Shafer 1991:155). These were small deer antlers and would not have been adequate for bifacing the large flakes or blades that served as blanks for the larger eccentrics. Thus it is probable that the Colha knappers had no other choice than to use the abundant limestone tools. Richard Dobie, an excellent modern flintknapper from Three Rivers, accompanied me to Belize on the 1991 Colha Project Regional Survey.

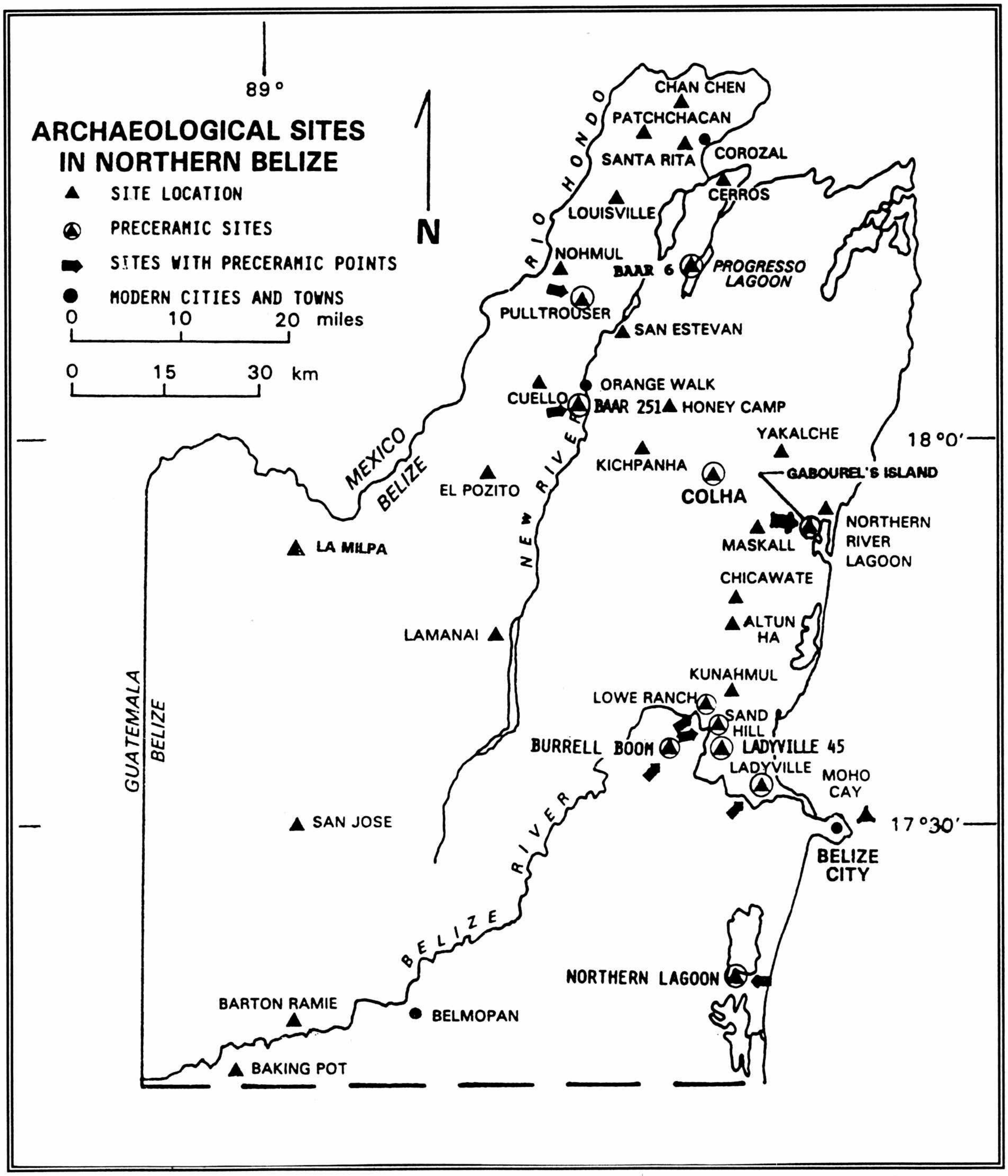

Figure 1. Map of northern Belize showing most of the archaeological sites. Colha, El Posito and Lamanai are of primary interest in this paper. Map from Kelly (1993).

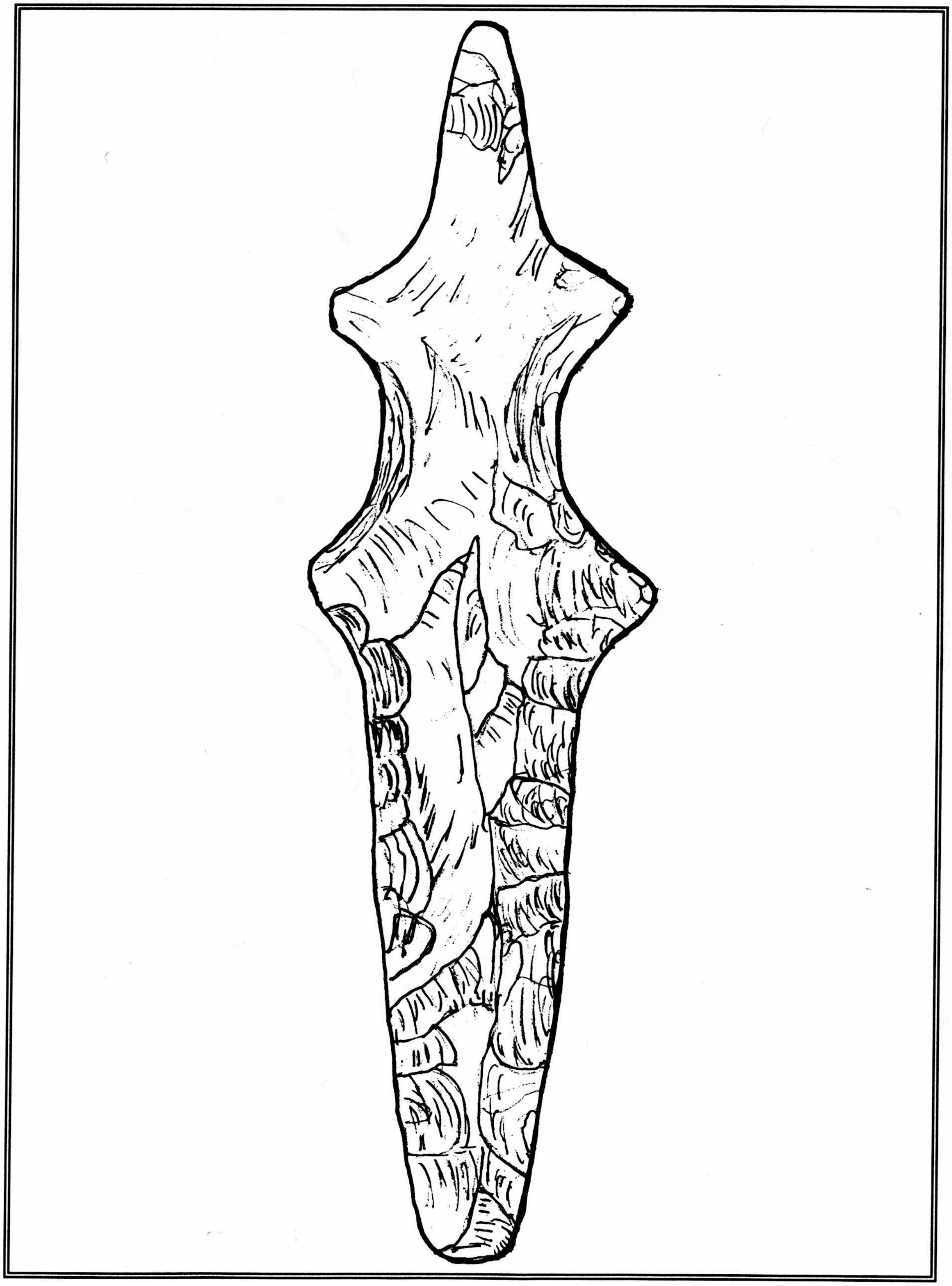

Figure 3. Late Preclassic eccentric from Colha, Operation 2012 (Potter 1982:109). Not drawn to scale. Artifact is 250 mm long and 60 mm wide. See text.

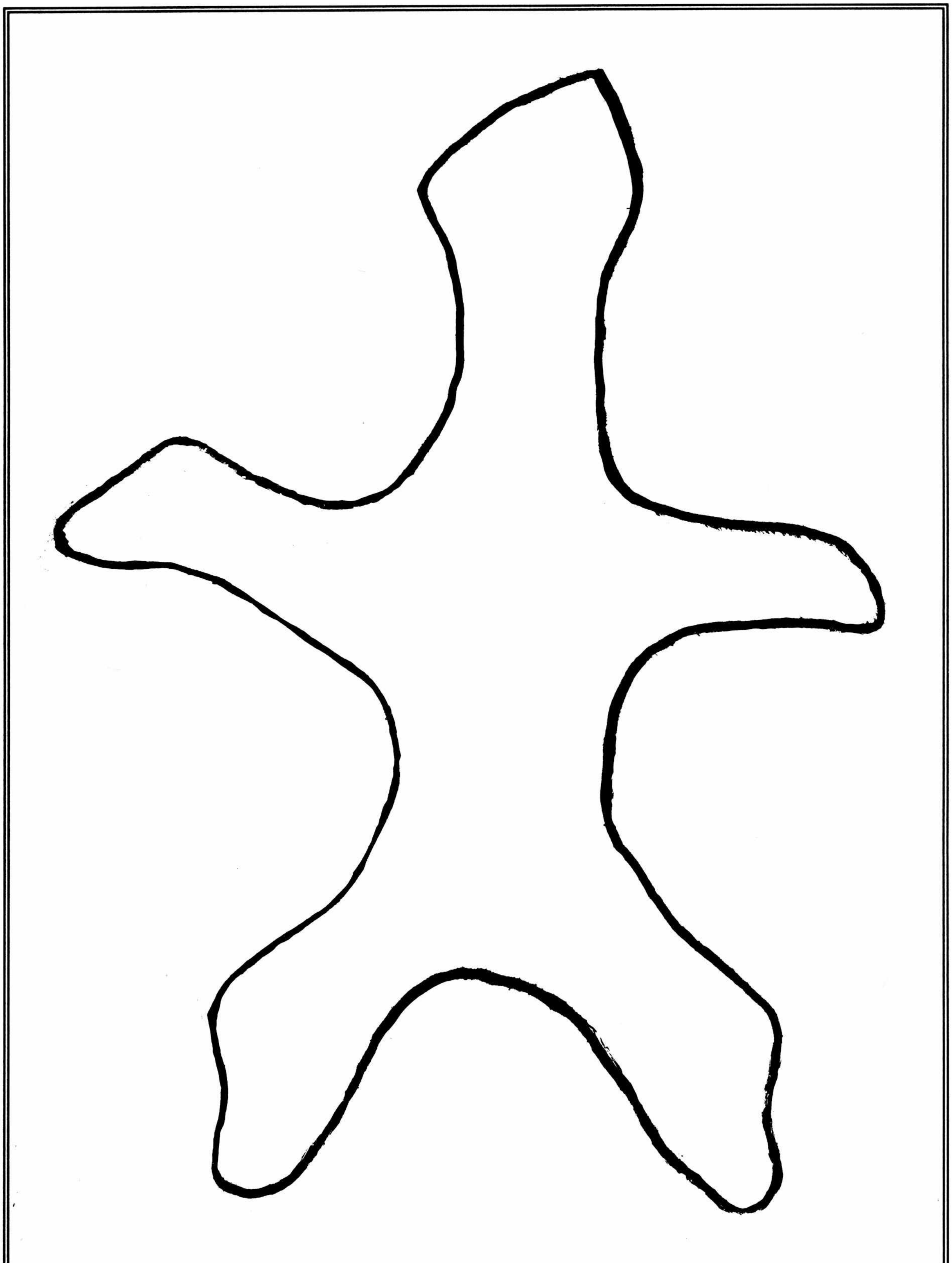

Figure 4. Anthropomorphic eccentric from El Posito (Hester, Shafer and Berry 1991:81). Not drawn to scale. Artifact is 295 mm long and 233 mm wide at the arms. See text.

Figure 5. John Masson holding the Lamanai eccentric, Lamanai 1983. Courtesy of David and Elizabeth Pendergast. Photo by Fred Valdez.

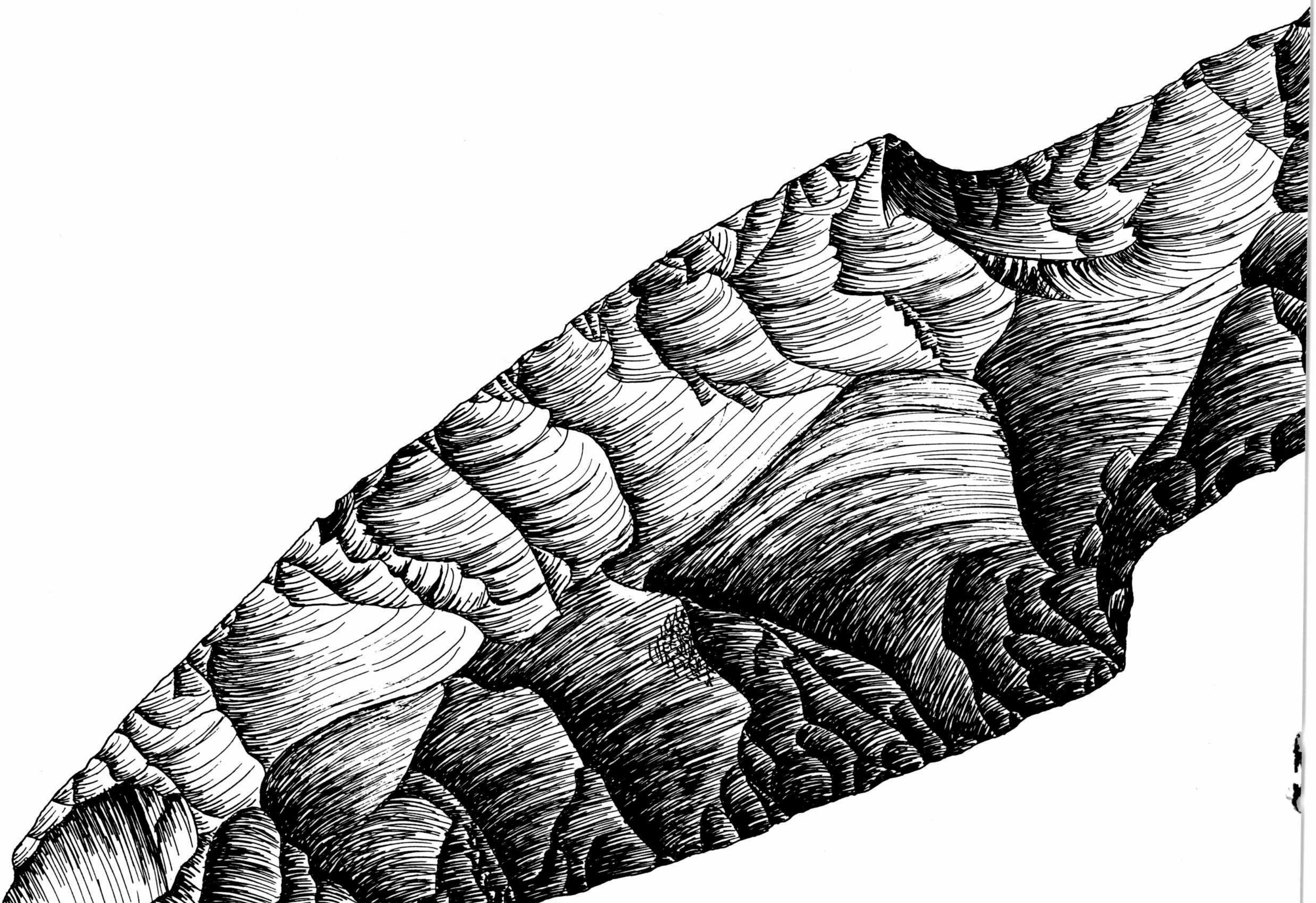

Figure 2. Eccentric from Colha vicinity, 1993. This example measures 450 x 93 millimeters. Drawing by Richard McReynolds.

He rather well demolished a theory of mine that hardwood billets might have been used to biface macro-eccentrics. The attrition rate using them was just too high and results were poorer than those that Dobie obtained by using limestone, elk or moose billets. He successfully removed initial flakes from large chert boulders using a heavy hardwood post. His preference however, was to hurl down a large boulder onto the target (Kelly 1991).

A somewhat similar eccentric is shown in the tracing (Figure 3). It is an eccentric excavated from Late Preclassic Feature 15 in Colha, Operation 2012 by Dan Potter (Potter 1982:109). It is 250 mm long by 60 mm wide and the workmanship is identical to that of Figure 2. Shafer (1991:38) described this form as "a common Colha type shaped like an elongated scepter with a pointed distal end and two or more distal projections."

An example of anthropomorphic eccentrics (Figure 4) is a tracing of one from El Posito, a Northwestern Maya site (Hester, Shafer and Berry 1991:81). It is 295 mm long and 233 mm wide at the arms. These authors suggest that it is probably Late Preclassic in time, but context is not certain.

Probably the largest eccentric found so far is the one held in John Masson's hands in the photograph, (Figure 5). The picture was made from a 1983 slide taken at Lamanai by Dr. Fred Valdez, courtesy of David and Elizabeth Pendergast. It was found in good context at Lamanai (Pendergast 1981) and is 780 mm long. It can be seen at the Department of Archaeology, Belmopan, Belize. Its great size, fancy lace work and beautiful workmanship place it among the world's finest lithic artifacts. I have yet to find a modern flintknapper who will even try to replicate it for me. Just in case you are a bit shy of the metric system, 780 mm equals 30.73 inches, compared to our Figure 2 illustration of 450 mm or 17.73 inches.

This short paper has only touched on the subject of Maya eccentrics. They were the product of professional highly skilled flintknappers. They must have been highly prized by the Maya elite since those found in good context are found with *elite* burials and in dedicatory caches. They must also have been expensive because of the skill and personnel it took to make them. Thousands may have been manufactured over the nearly 2,000 years of the Maya Preclassic and Classic periods. The Colha knappers certainly produced great numbers of them (Hester, Shafer and Berry 1991:75). Eccentrics can be found over the entire Maya area that visually appear to be Colha type cherts. Theoretically it would be possible to trace the distribution of Colha eccentrics using neutron activation analysis (see Tobey 1986). It will probably never happen because of the high cost of analysis and the extreme difficulty of getting the collections assembled.

ACKNOWLEDGMENTS

I am deeply indebted to two fine ladies for their financial support of my last four expeditions to Belize, Mrs. C. D. (Winni) Orchard and Mrs. Laura Revitz. Dr. Thomas R. Hester has always been my mentor and supported my struggling archaeological efforts. Harriot Topsey, the Archaeological Commissioner, has been most helpful with permits, guidance, and research at Belmopan. Richard McReynolds is making his third trip with me to Belize and his extremely fine line drawings have contributed greatly to this paper and to some 13 others. My friend, John Masson, has helped me through all of my 16 years of archaeology in Belize. Norma Masson has graciously put up with me whenever I dropped by.

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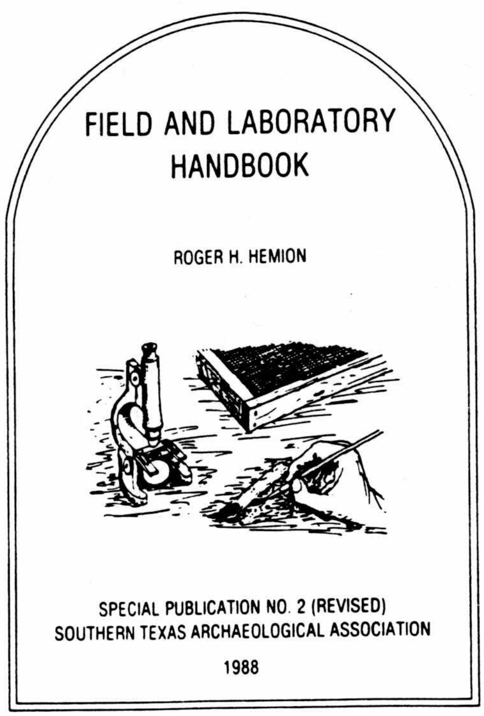

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FOUR CLOVIS POINTS FROM SAN AUGUSTINE COUNTY, TEXAS[*]

Kenneth M. Brown

ABSTRACT

Four surface-collected Clovis points (two complete, two fragmentary) from the northeastern valley margin of the Angelina River in San Augustine County are described. One specimen is made from Manning fused glass and is the oldest artifact known to have been made of that rock type. The others appear to be made of chert from the Edwards Plateau.

INTRODUCTION

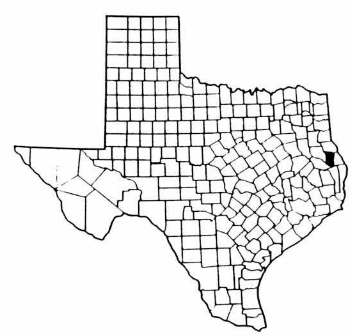
Four Clovis points found on the surface in southern San Augustine County, Texas, are described here. These specimens are in the collection of Dr. Russell Long, a resident of Beaumont, and the specimen numbers used here are those assigned by him. Dr. Long has kindly made the points available for study, although I have not had the opportunity to visit the collection localities in his company. All four came from a relatively restricted area at the south edge of San Augustine County and were found on high ground forming the northern valley margin of the Angelina River, well above the Quaternary terrace deposits that now lie drowned by Sam Rayburn Reservoir. The bedrock here consists of the Cadell Formation (Eocene). One specimen (number 19) came from a ridge (now known as Cadell Island) projecting into the Angelina River valley; according to Dr. Long, a large spring existed here, and the former river channel lay about 2.5 km to the south. The other three were found nearby in the Lucas Creek drainage, about 4 km north of the river; a large spring reportedly existed here, also. There are no sites recorded in either of these localities at the Texas Archeological Research Laboratory (TARL), although the nearby W. W. Carroll site (41SA90) was recorded by R. L. Stephenson in 1948; several springs were reported below that site, also. One tract south of Lucas Creek and east of Cadell Island has been surveyed by Forest Service archeologists (Ippolito 1983:Figure 17). According to Dr. Long, both the Cadell and Lucas Creek localities are unreported multicomponent sites.

Few Clovis points have been reported from San Augustine County. Meltzer (1987:Table 3) reports one specimen. Story et al. (1990:Table 44) report one specimen from Harvey Creek, which is the next major south-draining tributary entering upstream from the Cadell Island locality, about 3.3 km to the northwest. According to the sketch in the TARL files, it is a complete point about 10.4 cm long. Another specimen was reportedly collected from 41SA57, near the mouth of Attoyac Bayou (Bob Skiles, personal communication).

At least three Clovis points have been found at sites along the southwest valley margin, in Angelina County. One was recorded in 1948 by Stephenson from a private collection made at 41AG37; the sketch in the TARL file indicates it is also a complete point, about 10.3 cm long, with a blunt tip. This locality is about 14.6 km south-southeast of the Lucas Creek locality and at about the same elevation as the Cadell Island locality. Another was found at 41AG56, due south of the Cadell locality and also at about the same elevation; it is made of grayish brown chert. Another specimen, made of fossilized wood, was collected farther upriver at 41AG75 (Bob Skiles, personal communication).

Specimen 759, found at the Lucas Creek locality, is of special interest because it is made of fused volcanic glass from the Manning Formation, and is the oldest artifact known to have been made of this kind of lithic material (previously, the oldest known artifacts made of Manning fused glass were San Patrice points). The surface exposure of the Manning Formation trends east-west in this area, and ends on the opposite side of the Angelina River valley, about 8.5 km southwest of the Lucas Creek locality.

Manning fused glass is a natural glass, formed when combustion of lignite beds in the lower Manning Formation fused and partially melted the overlying silica-rich tuff and tuffaceous siltstone deposits. The temperature of fusion is estimated to be more than 1125° C (King and Rodda 1962). It is similar to the Fort Union fused glass and porcellanite found in south-central Montana and north-



San AugustineCounty (darkened)

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ern Wyoming (Fredlund 1976) and to fused rock termed "clinker" from the Smoking Hills Formation on the Cape Bathurst Peninsula in Canada's Northwest Territories (Le Blanc 1991). All of these were prehistoric sources of knappable stone, and both the Fort Union and Smoking Hills varieties were heavily used in their respective regions (95% of lithic material in south-central Montana, according to Fredlund 1976: 210; 74.2% of tools and 70.3% of modified flakes from sites on the Cape Bathurst Peninsula according to Le Blanc 1991:272). A Goshen point made of porcellanite, found at the Carter/Kerr-McGee site in Wyoming, indicates this rock type was known by early Paleo-Indian knappers (Frison 1991a:45-46, Figure 2.18, a). The Fort Union source is especially widespread on the northern Plains. Fissures or vents are associated with these formations, providing an important source of oxygen to the combustible substrate. Fused glass from the Manning Formation however, although transported rather widely on both sides of the linear Manning outcrop, was apparently never used in quantity except in the immediate vicinity of the exposures. Manning fused glass accounted for about 60-70% of chipping debris from the surface of the Chalk Creek #1 site, but little more than 2% of the surface and excavated sample from the George C.Davis site (Brown 1976:Figure 3; 196, 201). Many of the sites where fused glass artifacts have been found have only one or two small flakes of the material in the collection.

So far as I am aware, the only known outcrops of fused rocks in the Manning Formation remain the seven localities originally reported 30 years ago by King and Rodda. These localities extend from Fayette County in the southwest to Trinity County in the northeast. The latter is about 94 km west-southwest from the Angelina River localities discussed here (Figure 1). Banks (1990:54) reports finding some of the material at Eagle Hill, on Peason Ridge in Sabine Parish, Louisiana (roughly 87 km to the east-northeast), although no mention is made of it in Heinrich's (1987) extensive petrologic study. According to Banks (personal communication), the material was not abundant, and occurred as flakes and small chunks with heavy hydration rinds, evidently introduced from some other locality. Manning fused glass is therefore a rather cryptic and esoteric kind of raw material, highly restricted in distribution (although since the Manning Formation crops out on the opposite side of the Angelina River valley, the possibility exists that unreported sources of fused rocks might exist not far away).

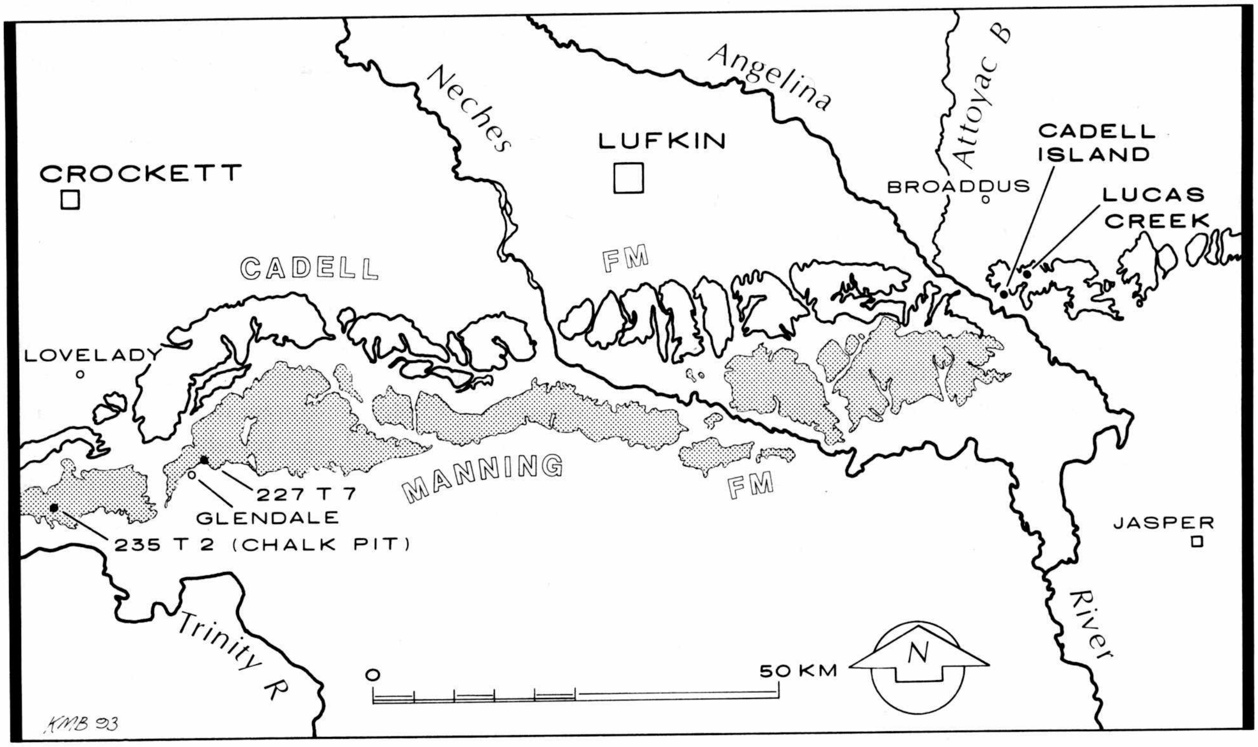

Figure 1. Regional Geology. Outcrops of the Cadell Formation (on which the Clovis points were found, unshaded) and the Manning Formation (shaded) are shown. The Cadell Island and Lucas Creek localities appear at the right side of the figure, while the nearest known sources of fused rocks in the Manning Formation are shown at the left side of the figure. Locality T7 is in Trinity County; the Chalk Pit, locality T2, is in Walker County.

All four of these specimens were checked under ultraviolet light by Michael Collins (shortwave, 254 nm, and long wave, 366 nm). The Manning fused glass specimen fluoresces a deep salmon or terracotta color. The three chert specimens fluoresce a light yellowish-orange color that is characteristic of Edwards Plateau chert from central Texas (Hofman, Todd, and Collins 1991). Of these three, specimens 19 and 760 show fluorescence that is, according to Collins, "classical" for Edwards chert, while specimen 758 has a weaker response, especially under shortwave radiation, but is still probably Edwards chert.

DESCRIPTION OF THE SPECIMENS

Conventions for orientation and measurement

The face bearing the catalog number is arbitrarily designated the obverse face. Note that this differs from the procedure of Callahan (1979). When a particular face is described, the terms "left edge" and "right edge" are used as they would apply with that face toward the viewer; where no face is specified, the terms apply as if the obverse face were being viewed. Note that for complete specimens, flute lengths are measured from a line tangent to the basal corners. For fragments, only the longest surviving length of the flute can be measured. "Maximum flute-to-flute thickness" is a measurement that has not been applied to fluted points before. It is simply the maximum thickness of the point measured with the caliper points placed in the flutes at their deepest concavity. Since the flute on one face is generally longer than that on the other face, this location is usually at the end of the shortest flute. If Clovis points were hafted in split wooden mainshafts or split foreshafts similar to the Archaic examples that have been recovered from dry rockshelters, this dimension corresponds to the thickness of the hafting notch on the distal end of the foreshaft. If, as some people think, Clovis points were hafted in composite bone foreshafts, then the flute-to-flute thickness is probably irrelevant. This dimension is not quite the same as the "hafting flute thickness" measured by Judge (1973:Figure 20), because his measurement was taken at an arbitrary location defined as half of the basal width. Edge angles were measured with a goniometer ruled in 1° increments. Because there is so much variation in sectional shape at different places along an edge, and even at different distances from the edge at a single location, I do not regard these measurements as very representative.

Specimen 19 (Cadell Island; Figure 2, A, B, C)

This complete point is the largest of the four. The distal end has been reworked, and the original length was undoubtedly greater. On the obverse face, reworking of the right edge extends to within 33.0 mm of the proximal end and to within 31.7 mm on the left. The flute on the reverse face extends beyond these limits of reworking, so if the foreshaft extended as far as the flute termination, it might have been removed when the point was reworked. The specimen is made from chert with a fairly glossy, light grayish tan (approximately 5YR 7.5/1.5) surface patina, but inspection of two small, recent edge nicks shows that the underlying chert is a medium gray, fine-grained but non-vitreous chert, probably from the Edwards Plateau as indicated by ultraviolet fluorescence. The patina is thick and the core color cannot be accurately recorded. Patina is homogeneous over both the original and reworked parts of the point. It is noteworthy that even deeply patinated Edwards chert will readily fluoresce (Michael Collins, personal communication).

This specimen has the blunt tip and maximum width forward of the midpoint typical of resharpened specimens (Howard 1990:257). The un-reworked segments of the lateral edges are straight to very slightly concave. Both lateral edges and the base are moderately ground. Grinding can be felt and seen under magnification, and stops where resharpening begins, but the transition is neither abrupt nor obvious.

Obverse face (Figure 2, A)

The original lateral thinning scars are mostly expanding in shape; some are parallel-sided or contracting. Their length ranges from 2.30-8.75 mm (truncated by a flute), maximum width 1.6-6.05 mm. They are parallel and transversely oriented. Some scars left by reworking are larger and less rippled, oriented obliquely (although still at right angles to the modified edge). These are up to 15.30 mm long and 9.50 mm wide. The obverse face was fluted last, and has what appear to be two successive, overlapping central flute scars. The first flute was apparently well-centered, but the knapper then moved slightly to the left and removed another channel flake slightly to left of the center. A small nick in the basal edge may correspond to this removal, perhaps from removing a basal nipple. Both flute scars are about the same length and both end in a shallow step fracture.

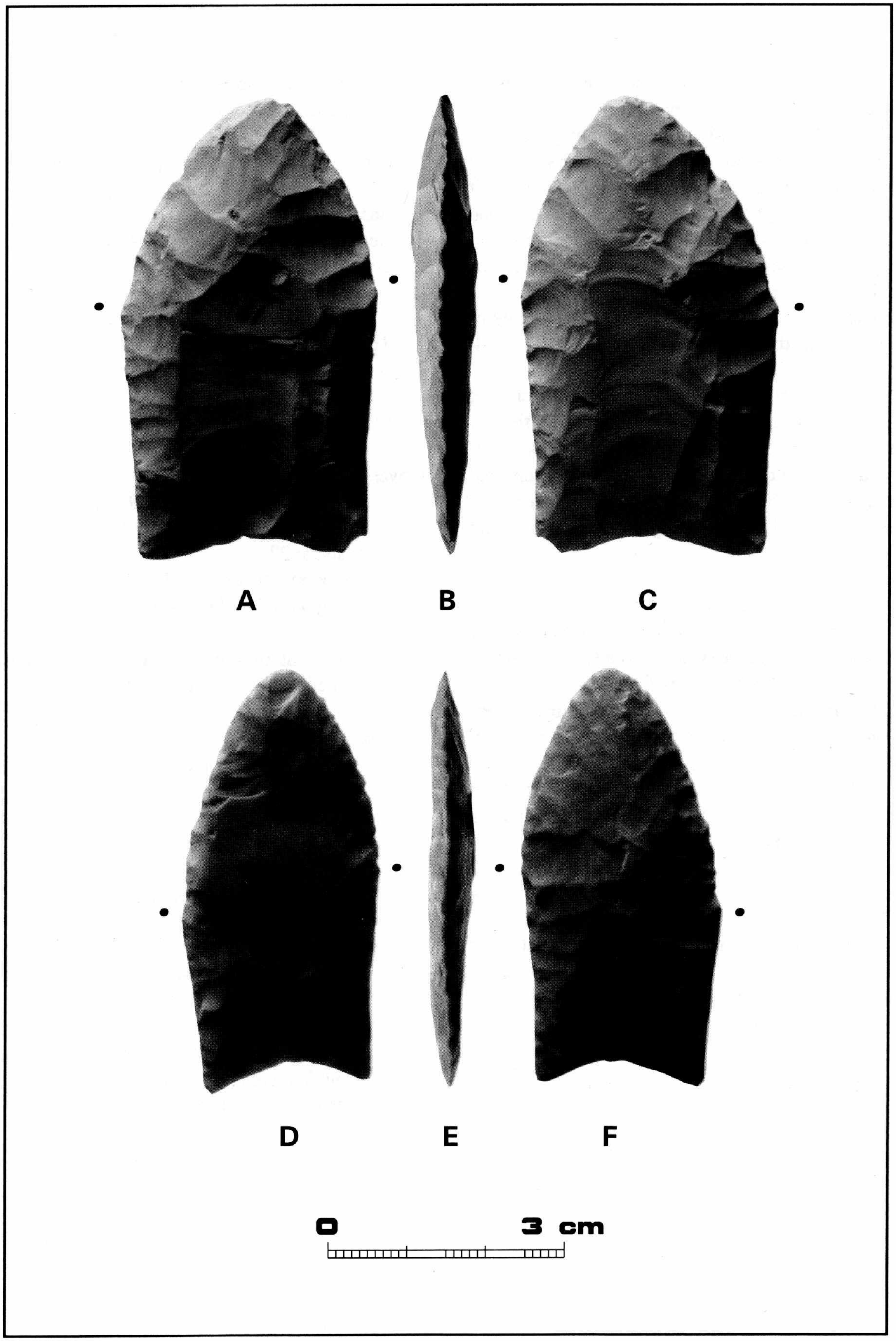

Figure 2. Clovis Points from Cadell Island and Lucas Creek. A, Specimen 19 obverse; B, Specimen 19 profile (obverse face to left); C, Specimen 19 reverse; D, Specimen 758 obverse; E, Specimen 758 profile (obverse face to left); F, Specimen 758 reverse. Dots indicate extent of edge grinding.

The right margin of the first flute has been removed by a narrow converging scar (maximum width 5.18 mm, length 15.18 mm) originating from the base. The left side of the second flute has a small basal thinning scar with a converging shape, but it appears to predate and to be intruded by the second flute. Its place in the fluting sequence is unclear, except that it seems to precede the second flute. The basal edge has a series of very small (about 0.6-1.5 mm wide, 0.4-1.5 mm long) pressure flake scars of petaloid shape, their origins truncated by basal grinding.

At the end of the flute on this face is the remnant of a lateral thinning scar that reached from the left edge past the midline of the point, to perhaps 4/5 of the way toward the right edge. It has been truncated by the flutes and by reworking scars. This scar was at least 26.5 mm long, plunging toward the opposite edge.

Reverse face (Figure 2, C)

The lateral thinning scars on this face are mostly expanding, some parallel-sided, and a few contracting in shape. Their length ranges from 2.85-11.15 mm, maximum width 2.40-8.50 mm. Scars left by reworking are larger, up to 13.75 mm long and 8.55 mm wide. This face has the initial flute, which is well centered and has a feathered termination that has been truncated by reworking. The basal end of the flute has been removed by a series of basal trimming scars about 4.7-6.2 mm long, created either to set up a platform for the flute on the opposite face, or to even the basal edge. This flute is flanked on either side by long (19.8 mm), narrow (2.5-6.2 mm) parallel-sided to contracting basal scars that were produced after the flute and have removed the proximal halves of its left and right margins.

Modification

Both faces show moderate polishing, both on the unaltered and reworked areas. Polish occurs both in flake scar hollows and on ridges. The un-reworked edges are ground. Reworked edges are fairly heavily step-fractured, and show moderate rounding, probably from edge scrubbing. One basal corner has been removed by a recent break:

Maximum length: 57.94 mm
Maximum width: 33.15 mm
Maximum thickness: 8.70 mm
Maximum flute-to-flute thickness: 6.42 mm
Length from base to point of maximum width: 31.30 mm
Length from base to point of maximum thickness: 36.45 mm
Basal width: 29.76 mm
Depth of basal indentation: 1.40 mm
Left edge angles
original: 50°
reworked: 40°
Right edge angles
original: 71°
reworked: 46°
Weight: 17.6 g

Obverse face
Maximum length of flute: 25.95 mm*
Maximum width of flute: 15.58 mm
Flute scars: 2?
Grinding on left edge: 31.10 mm from base
Grinding on right edge: 34.15 mm from base

Center point of flute origin is 13.6 mm from left edge, 15.4 mm from right.

Reverse face
Maximum length of flute: 36.80 mm (end removed by reworking)*
Maximum width of flute: 14.83 mm
Flute scars: 3?

* Flute lengths measured from a line tangent to the basal corners, not from the basal indentation.

Specimen 758 (Lucas Creek; Figure 2, D, E, F)

This small Clovis point is made from a light gray (4Y 6.5/1), fossiliferous chert with a fairly vitreous luster. Abundant small diatoms or other poorly preserved fossils (most 0.4 mm or less in diameter) are visible. Like the previous specimen, this one also appears to have been reworked. The basal parts of the lateral edges are straight to slightly concave. Reworking of the distal end has left it slightly asymmetrical, so that the present tip is now oriented slightly away from the original long axis of the point. It is well thinned, but somewhat blunt in outline. This specimen is nearly identical in size and shape to a specimen of brown chert from Kincaid Rockshelter (Collins et al. 1989:Figure 1, f).

On the left edge (obverse face up), grinding is continuous and well developed, ending abruptly where reworking begins. On the right edge grinding is less pronounced and is almost discontinuous; it is well developed only on edge projections, nearly disappearing in reentrants. As a result the transition to the reworked edge is not so abrupt. Basal grinding is also present.

This point illustrates a characteristic of Clovis points addressed by Howard (1990:257), the retention of large facets on finished points (see also specimen 760). The obverse face has a large, smooth, slightly concave facet that actually covers most of the face (see Figure 4). Ripple marks are so indistinct that the direction of wave propagation cannot be determined with certainty—possibly the distal end of the point may correspond to the distal end of the fracture (?). On the reverse face reworking and lateral thinning are much more extensive, but a small remnant of a smooth facet with no discernible ripple marks lies at the distal end of the flute. The origin of this facet is unknown.

Obverse face (Figure 2, D)

On this face, both lateral edges are rather steeply beveled at an angle of about 45° from the horizontal axis; beveling extends about 4 mm from the edges. These lateral trimming scars are fairly deeply concave. Scars are generally converging in shape; a few are parallel-sided or expanding. Maximum scar length and width are both about 4 mm. Reworking scars are similar to the original trimming scars at the juncture between the original and reworked edges, but they become larger and flatter toward the distal end as the edge angle becomes more acute. The largest reworking flake scar is 9.2 mm wide and about 10 mm long and is oblique, with a stepped termination. Others are up to 4.7 mm long and 2.7 mm wide. Sanders (1990: 47; Figure 32, C) discusses a point from the Adams site that has similarly beveled edges.

On the left side of the proximal area of this face is the remnant of a basal thinning scar removed by the flute, which is well-centered and ends in a shallow step fracture. The right edge of the flute has been removed by a long, narrow, basal thinning scar that curves to the left and expands, ending in an oblique shallow step fracture continuous with, and indistinguishable from, the flute termination. This flute was probably made after the flute on the reverse face. This face shows very little evidence of basal pressure flaking after fluting. Only a few discontinuous, very small (0.4 mm wide, 0.3 mm long) pressure flake scars are visible.

Reverse face (Figure 2, F)

This face lacks the lateral beveling seen on the other. Lateral trimming scars become progressively longer toward the midpoint of the specimen (the longest scar is 16.25 mm long and actually overreaches the midline). Maximum width of these is about 1.9-5.8 mm, and they are oriented transversely. Scars left by reworking of the distal end are laterally to obliquely oriented. Three narrow, parallel, oblique ribbonlike scars originate from the left edge (these are about 1.6-3.4 mm wide and up to 14.8 mm long, partly truncated by scars originating from the right edge).

The flute on this face was probably the initial one. This is based chiefly on the fact that the center of the basal edge has a section about 2.0 mm wide, minutely beveled by pressure flaking (or edge-raking) that extends 0.5 mm back from the edge. This is flanked on either side by heavily pressure-beveled edges with scars extending 2.0 mm back from the edge. This central section is thought to be the remnant of a basal protrusion or nipple set up for fluting the obverse face (compare with Sanders 1990:Figure 30, C and Storck 1983:Plate 1, a, b). The reverse-face flute itself is shallow and quite symmetrical, with parallel lateral edges unaltered by subsequent flaking. The termination is feathered and slightly oblique.

Modification

The flat facet on the obverse side bears many fine striations in seemingly random orientation (longitudinal, transverse, and oblique). These are mostly straight, of varying length and depth, with a few appearing sinusoidal to slightly curved. They are easily visible at magnifications of 10X and above. Only a few striations appear on the surface of the flute or other obverse flake scars, whereas on the facet they are abundant, suggesting they predate the actual manufacture of the point. Width of the striations was roughly estimated (using a microscope scale) at less than 0.03 mm. Their origin is unknown, but is not believed related to use of the point. Similar striations are visible on the reverse face, on the small facet remnant, on the flute, and on a few other flake scar surfaces.

This specimen shows only slight polishing on flake scar ridges and hollows; it is less well developed than on specimen 19, probably because that specimen has a less vitreous luster. On the reworked edge sections, edge projections show moderate rounding at 50X, while reentrants are much more acute, usually showing only light rounding.

Maximum length: 53.05 mm
Maximum width: 25.65 mm
Maximum thickness: 6.56 mm
Maximum flute-to-flute thickness: 4.50 mm
Length from base to point of maximum width: 22.66 mm
Length from base to point of maximum thickness: 27.50 mm
Basal width: 21.95 mm
Depth of basal indentation: 3.30 mm
Left edge angles
original: 60°
reworked: 48°
Right edge angles
original: 55°
reworked: 45°
Weight: 10.0 g

Obverse face (beveled)
Maximum length of flute:
14.70 mm (to end of scar 2)*
16.40 mm (to end of scar 3)
Maximum width of flute: 9.72 mm (widest remaining part of scar 2)
Flute scars: 3?
Grinding on left edge: 22.75 mm from base
Grinding on right edge: 26.72 mm from base

Reverse face
Maximum length of flute: 15.73 mm*
Maximum width of flute: 14.00 mm
Flute scars: 1

* Flute lengths measured from a line tangent to the basal corners, not from the basal indentation.

Specimen 759 (medial fragment, Lucas Creek; Figure 3, D, E, F)

This specimen is made of light gray Manning fused glass. Because the material has a typically thick, gray (5Y 6/2) patination rind, flake scar and edge details are hard to see. The surface has the characteristic matte luster of Manning fused glass, and microscopic voids and gas bubbles pit the surface.

This small medial fragment has a transverse snap fracture at the distal end. The edges of this break show no modification except for extensive rounding, presumably by chemical weathering, and several small flake scars that originate from this snap facet as a platform, extending toward the proximal end on the reverse face, most of them ending in shallow step terminations. The proximal end has an oblique snap fracture. At least three small flake scars originating from the reverse face have removed part of the snap facet. Conceivably, these might have derived from pressure against a haft if the point broke while hafted but remained in the haft.

Obverse face (Figure 3, D)

The obverse face appears to have at least one flute scar that, on its left side, runs the length of the fragment. On the right side is an obliquely oriented, shallow step termination that either may be part of the same flute or a remnant of an earlier or later one. Because of the heavy weathering rind its origin is ambiguous. Lateral trimming scars are converging to expanding in shape, up to 6.6 mm long, 3.7 to about 8.1 mm wide, and oriented transversely.

Reverse face (Figure 3, F)

The reverse face has a well defined single flute with a shallow step termination that ends 11.20 mm short of the distal break. Just beyond the flute termination is a lateral thinning scar that originates at the left edge(viewed with the reverse face up), passing well past the midline, to end in an oblique step termination (width of this scar is 5.05 mm, length 24.2 mm).

The lateral edges of this fragment show some crushing and only moderate rounding, less rounding than would be expected considering the raw material.

Modification

Because of the weathering rind, no meaningful observations can be made.

Maximum length: 27.20 mm
Maximum width: 31.47 mm
Maximum thickness: 6.34 mm
Maximum flute-to-flute thickness: 5.00 mm
Left edge angle: 42.5° *
Right edge angle: 58° *
Weight: 6.5 g

Obverse face
Remaining length of flute: indeterminate
Maximum width of flute: 15.65 mm (?)
Flute scars: 1?
Grinding on left edge: yes, discontinuous
Grinding on right edge: yes

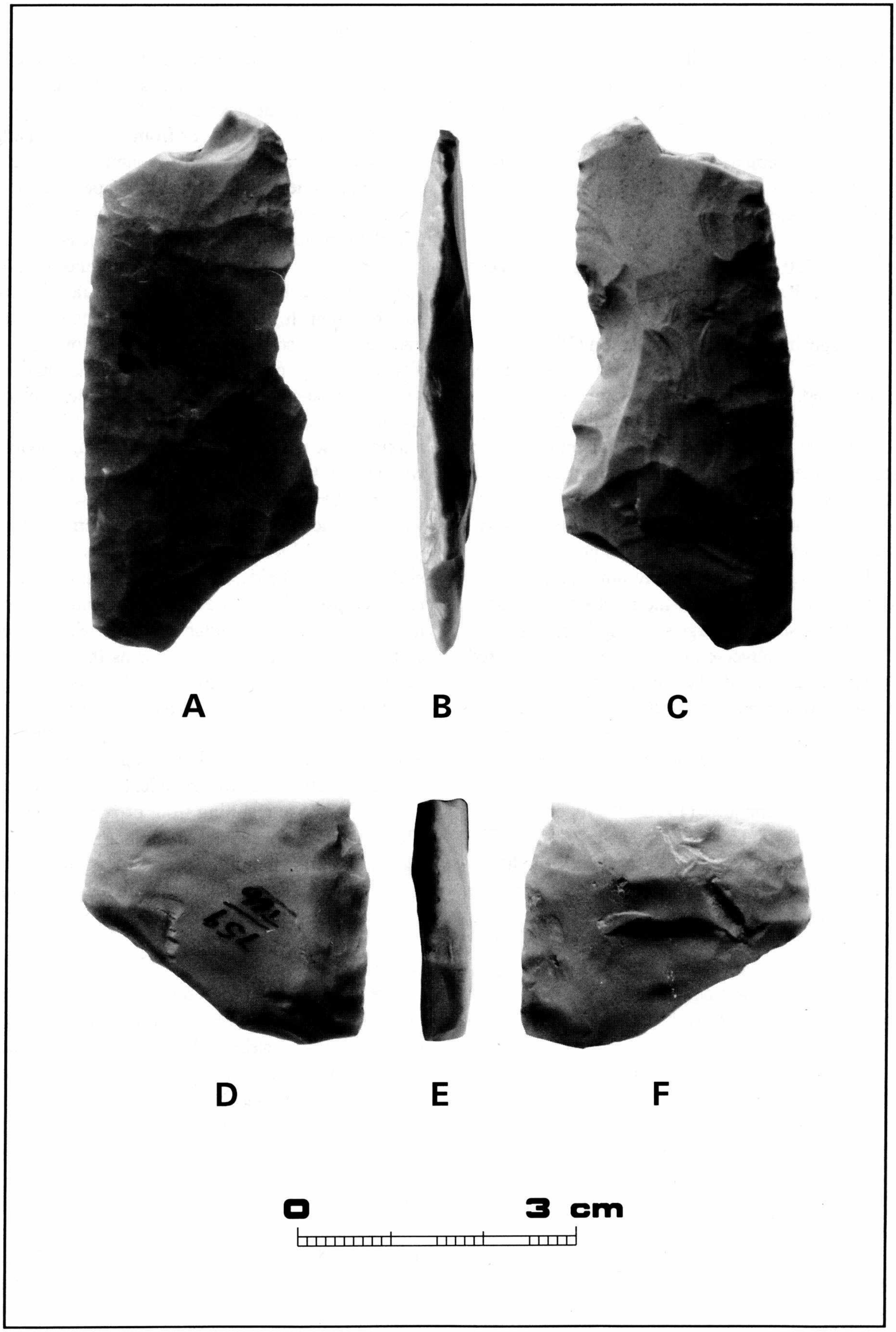

Figure 3. Clovis Point Medial Fragments from Lucas Creek. A, Specimen 760 obverse; B, Specimen 760 profile (obverse face to left); C, Specimen 760 reverse; D, Specimen 759 (Manning fused glass) obverse; E, Specimen 759 profile (obverse face to left); F, Specimen 759 reverse.

Reverse face

Remaining length of flute: 13.00 mm
Maximum width of flute: 7.00 mm
Flute scars: 1

* Note: both edges are beveled and edge angle measurements are accurate by comparison to the other specimens.

Specimen 760 (medial fragment, Lucas Creek; Figure 3, A, B, C)

This specimen is made of medium (10YR 5.5/1) to light (2.5Y 7.5/1) gray chert with a vitreous luster and scattered, small, round, poorly preserved fossils (diatoms?). It is a badly damaged medial fragment of a Clovis point. The distal end has been removed by a crenated fracture, the proximal end by an oblique fracture with a sinusoidal cross-section. Crenated fractures are usually thought to be due to excessive heating (Johnson 1979:25), but this point shows no potlidding, color change, or any other indication of heating. A large section of the right edge has been removed by a series of large shearing fractures originating from the obverse face. This irregular sheared edge has small, often stacked, invasive scars (varying from shallow to deep and notchlike) that may represent damage created by using the sheared edge for cutting. Most of these lie on the sheared face, but a good many small flake scars also lie on the opposite (obverse) face. Chandler (1990a:27) reports similar damage on a point from Comanche County. The snapped edges of specimen 760 show little modification, but a very short (1.0 mm) section of proximal edge shows heavy grinding under magnification. Judging by the shortness of the flutes, this cannot be a remnant of the original basal edge. Perhaps it represents scrubbing of the snapped proximal edge as part of a failed attempt to rework the broken base of the point.

The reverse face has a large, curving facet with no ripple marks, similar to that on specimen 758; the same kinds of randomly oriented striations are also visible at 50X. This facet extends to within 1.8 mm of the left edge. Michael Collins (personal communication) suggested this might be a remnant of an *outrepasse* flake scar (Tixier 1974:19), but the facet seems too vestigial for positive recognition. The obverse face has a much smaller remnant of what may be a similar facet, near the distal end, plus a larger remnant where the catalog number is written. It too has a few microscopic striations.

Obverse face (Figure 3, A)

The obverse face of this specimen is quite unusual; the right side of the face is mostly covered by five very large, flat flake scars that either originate from the sheared-off edge or from the original edge. Two of these scars are widely expanding, two others converging, one of indeterminate shape. One of the scars intrudes one of the others. The largest of these five flat (presumably soft-hammer percussion) scars has a maximum width of 14.09 mm and length of 13.66 mm. The left edge of the obverse face is markedly different. It is covered with a series of parallel transverse flake scars, weakly converging or occasionally expanding in shape. These are deeper and more strongly ripple-marked than the ones on the right side, and are presumably the result of pressure flaking. The maximum length of these is 8.93 mm, maximum width about 6.9 mm, average width about 2-4 mm.

The obverse flute is quite shallow, with a somewhat oblique, shallow step-fractured termination. It intrudes one of the large thinning scars on the right side. On the left side, a narrow ribbonlike scar has removed part of the left edge of the main flute (plus most of an earlier, similar scar that also traveled distally); it does not reach as far as the main flute, however (the surviving length is 14.35 mm).

In the center of the proximal end, a large flute-like scar with a shallow stepped termination intrudes the main flute scar. This probably represents a second attempt at fluting the obverse side, but it conceivably could be damage resulting from proximal breakage. This scar has removed part of another that lies on the right side of the main flute scar. These parallel scars to the left and right of the main flute represent multiple flute removals (see Howard 1990:258).

Reverse face (Figure 3, C)

On the reverse face all but a short (4.5 mm) section of the left edge has been removed by the shearing break mentioned earlier. The remaining edge section has fairly heavy edge grinding. Most of the reverse face is covered by large soft-hammer thinning scars that reach to the midline or beyond. The longest one that is visible originates from the left edge and extends to within 7 mm of the opposite edge.

The right edge has many parallel, transverse, small trimming scars reaching on average less than 8 mm from the edge (range, 2.0-8.2 mm in length). Many of these are converging in shape, some expanding, a couple ribbonlike (widths are 0.9-4.7 mm). These are presumably pressure flaking scars.

There is a remnant of a single flute with a shallow step termination, intruded on the right side by two shallow flake scars originating from the proximal end. Since the base of the point is missing, it is not clear whether these represent multiple flute scars.

Maximum length: 58.86 mm
Maximum width: 25.31 mm
Maximum thickness: 6.42 mm
Maximum flute-to-flute thickness: 4.23 mm
Left edge angles
proximal: about 57°
distal: about 38°
Right edge angles
proximal: about 51°
distal: about 38°
Weight: 11.1 g

Obverse face
Remaining length of flute: 21.68 mm
Maximum width of flute: 10.09 mm
Flute scars: 3-4?
Grinding on left edge: yes
Grinding on right edge: yes

Reverse face
Remaining length of flute: 16.54 mm
Maximum width of flute: 12.42 mm
Flute scars: 1?

Figure 4. Lustrous Facet on Obverse Face of Specimen 758. This photo is similar to Figure 2, D, except view is slightly oblique to emphasize luster of remnant facet.

CONCLUSIONS

These four specimens illustrate some of the characteristics of Clovis points that have been addressed by several previous investigators. All four are finished points or, in Callahan's (1979:Figure 67) terms, Stage 9 bifaces. Two are complete, but reworked distally. The other two are medial fragments; of these, one (specimen 759) has a transverse snap just forward of the reverse face flute, similar to the impact break achieved by Frison (1989:Figure 9) while testing experimental Clovis darts on African elephant carcasses (see also Meltzer 1987:49). It also has an oblique basal snap fracture. The other medial fragment (specimen 760) has unusual snap, crenated, and shearing fractures that do not look like impact damage, but may be due to crushing, or loading of one face. None of these points appears to be heat-treated, although heat-treated Clovis points are occasionally seen (see Chandler 1990a:27, 1990b; Mitchell and Chandler 1990:21; Dragoo 1973:10-11, 14; Titmus and Woods 1991: 129). Johnson (1989:120-121) on the other hand, maintains that intentional heat treatment of Clovis artifacts is uncommon, at least in the eastern United States. Better evidence for intentional heat treatment probably appears in later Paleoindian contexts (see Pavlish and Sheppard 1983).

The two complete points are rather short, 5.31 and 5.80 cm long, compared with an average length for unbroken Texas Clovis points of 7.42 ± 2.13 cm (5.29 to 9.55 cm; Meltzer 1987:Table 9 footnote); for comparison, Oklahoma Clovis points average 6.37 cm long (Hofman and Wyckoff 1991:30) .This is undoubtedly a result of at least one episode of reworking on each point. Complete, or nearly complete, points that have not been reworked are often considerably longer (see Anderson and Tiffany 1972; Gramly 1993:51; Kelly 1988; Stanford and Jodry 1988; Wilson 1979:138). As an example, the points found at the Miami site were 7.6 and 11.6 cm long, respectively (Sellards 1938: 1007). According to Collins (1990:74), five centimeters is approximately the threshold at which unbroken, resharpened Clovis points were discarded as unworthy of further use at knapping localities near raw material sources. Reworking can be recognized by inflections in the edge outline, or contrasting flake scar orientation, size, or degree of rippling; reworked edges can be detected by decreased edge angles, and sometimes the removal of previous edge grinding is suggested by an abrupt juncture between ground and unground edges.

Two of the specimens (758 and 760) retain remnants of facets from the original blank; these lack ripple marks, and are randomly striated. Howard (1990:257-258) attributes remnant facets to "various early processes, such as original cortex removal and preparation of large cores for large primary flake/ blade removals...or, more frequently, the initial stages of reduction of bifacial preforms" and indicates they are characteristic of Clovis points, although Judge (1973:Table 15) reports them present in only five out of his 26 New Mexico Clovis points. The striations are not exclusively confined to the facets but are more abundant there, suggesting they were mostly produced before reduction of the preform to final form. It is tempting to view these striations as evidence of abrasive contact between flake blanks during extended transport. However, it is more likely that prepared blanks would be carefully padded for transport, just as the Alyawara of Australia wrap blanks in bark pouches for transport from the quarry (Binford and O'Connell 1989:135-136). Fagan (1988:394) reports "scratches in the flutes on both faces" of three basal fragments of obsidian Clovis points from Oregon. Frison (1991a:Figure 2.13b; 1991b:Figure 19.6, b) reports an obsidian Clovis point from the Fenn Cache with longitudinal scratches on both flutes. Apparently these flute striations on obsidian Clovis points are a deliberate hafting feature, not to be confused with the random striations left from early reduction stages, as described above.

Flutes characteristically have very shallow stepped terminations. It is also common for the edges of the flute to be widened by small secondary flanking scars that originate at the base but do not extend as far as the end of the flute (Howard 1990:248). This is reminiscent of what Witthoft (1952:481-482) identifies as "triple channel flaking" at the Shoop site, but on the specimens reported here the secondary flakes clearly were removed after the principal channel flake, not before. Previous investigators have suggested that two different methods were used to flute Clovis points: 1) percussion (perhaps direct) from a beveled base (Collins 1990:73), or 2) indirect percussion from a central basal protrusion (similar to but less acute than the central nipple used to flute Folsom points). This method is perhaps most clearly illustrated by an aborted specimen from Alabama described by Gustafson (1972:Figs. 1, 2), which follows the pattern proposed for the Shoop site. I suspect that the latter method was used on specimens 19 and 758, except that flanking "guide flakes" did not precede the removal of the flute.

I suspect that many of the Clovis points described in the literature as having *hinged* flute terminations really have shallow *stepped* terminations like the ones reported here. As the channel flake is driven off, it will terminate if the driving force for crack propagation falls below a critical value; the final crack that completes the step fracture is caused by bending (Cotterell and Kamminga 1987:700), perhaps by lateral pressure as the tip of the indirect percussor kicks the platform of the channel flake aside. On specimens 19 and 758 there are tentative hints that the initial flutes had feathered terminations, while the face to be fluted last had a stepped termination.

Three of the points are of raw material probably derived from the Edwards Plateau. The nearest source of this chert would either be the Balcones Escarpment or old terrace gravels fringing major river drainages immediately downstream from the escarpment. In any case, a minimum transport distance of perhaps 290 km may be implied. Fields et al. (1991:9) report Uvalde Gravels (late Miocene/Pliocene) of about 2-15 cm diameter, including some chert clasts, can be found in the Jewett Mine area, about 185 km due west of Lucas Creek-Cadell Island. Pleistocene Angelina and Neches River terrace gravels in the general vicinity of the Lucas Creek and Cadell Island localities are chert-poor and of small caliber. Chert gravels from the Neches drainage near the George C. Davis site (100 km to the west) are no larger than "very large pebbles" (32-64 mm) on the Wentworth scale (Brown 1970:Tables 2-4). By late prehistoric times, a well-established system for importation of chert was in place at that site; Shafer (1973:57) suggests that some chert in nodule form was being imported from the Blackland Prairie zone. The Keven Davis blade cache, from Navarro County (Young and Collins 1989) might suggest that export of Edwards chert toward the east was already being practiced by Clovis times (the cache is undated but specimens are morphologically similar to large Clovis blades). A group of Paleoindian artifacts (including two whole Clovis points), many of them made of Edwards chert, from the Neches River drainage at Lake Palestine (Perttula 1989:20 and personal communication) may be another indicator. What is not clear yet is whether Edwards chert was specifically sought through trade or deliberate long-distance quarrying expeditions, or whether chert collection was embedded in routine long-term mobility. For mobile foragers in the ethnographic record, as Binford (1980:Table 1) has shown, 290 km is well within the circuit distance covered in a single year, though not necessarily within the limits for the maximum radius of movement. For recent Nunamiut hunters, "a typical Nunamiut male will have traveled over more than 300,000 square kilometers in the normal course of hunting for game" (Binford 1983:115). That is equivalent to a circle with a radius of about 310 km. In the eastern United States, Tankersley (1991:Table 17.1) has documented Clovis points made of Knife River chert and Hixton quartzite transported anywhere from 730 to 2,050 km from the source areas.

By Folsom times, artifacts made of Edwards chert routinely appear as much as 360 km to the north and 575 km to the northwest of the source area (Hofman 1991:Table 20.1). Although his discussion pertains to Folsom rather than to Clovis hunters, Hofman offers the most perceptive commentary published yet on the relationships between stone economizing, planning depth, and mobility. He argues that for specialized, highly mobile Folsom hunters, rates of lithic reduction and resharpening were heavily influenced by *anticipated mobility*. Do these concepts apply to the earlier Clovis tool users? Collins (personal communication) suggests that Clovis and Folsom economies were considerably different, and that Clovis hunters may have been significantly less mobile. If so, the instances of long-distance stone transport that we do see in Clovis assemblages may indicate something other than embedded procurement.

The Manning fused glass specimen is perhaps better regarded as made of"local" raw material. Although there are no known sources of fused glass closer than about 90 km away, the Manning Formation extends to the other side of the Angelina River valley, only about 8.5 km away, and it seems quite possible that there are unreported sources of fused rocks somewhere in this intervening area of Trinity County or Angelina County. According to Frison (1974), natural glasses are amenable to sourcing through neutron activation, although no one has tried it yet for Manning fused glass. While this fused glass has excellent chipping qualities, provided a large enough blank free of voids, folds, or impurities can be found, it is as brittle as other glasses, and it is not surprising that only a small medial fragment remains of what presumably was once a completed Clovis point.

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