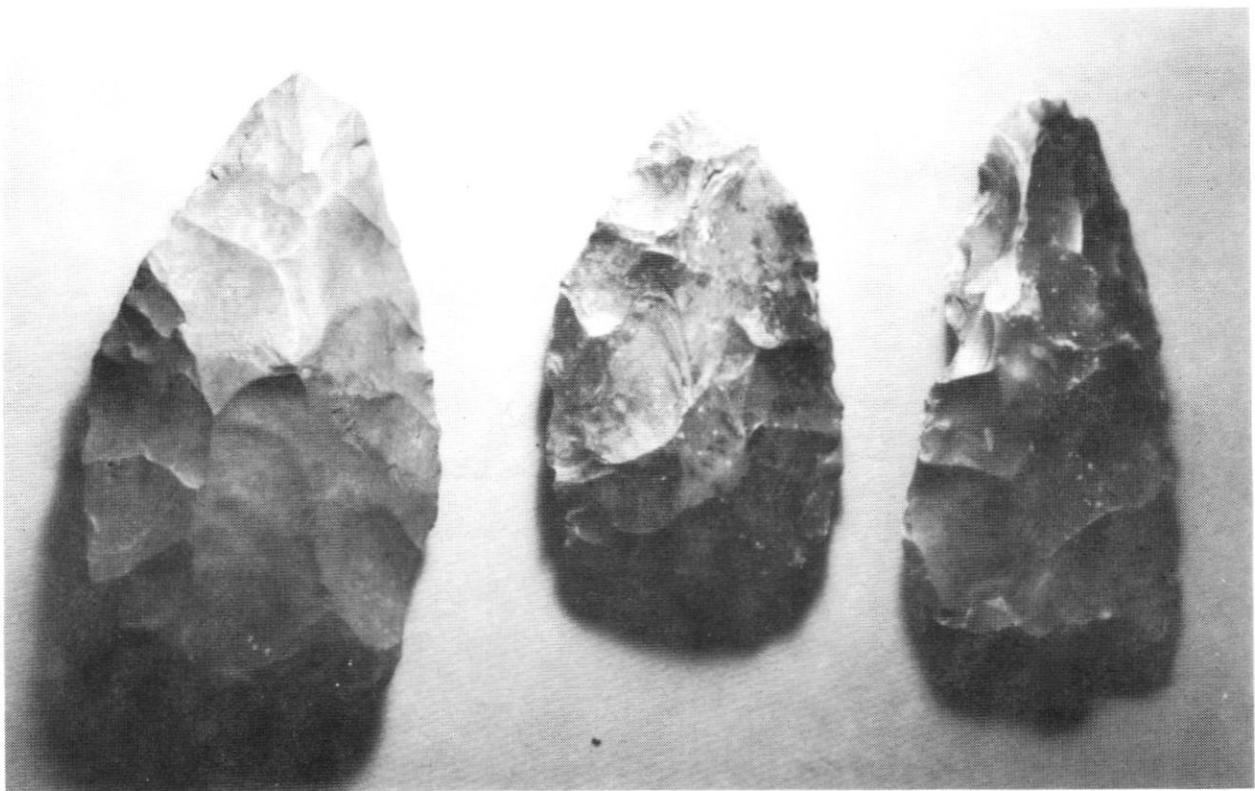




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Large Bifaces from the Koehl Site, Colorado County, Texas

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Houston Archeological Society

P.O. Box 6751, Houston, Texas 77265-6751

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Vertebrates of Site 41CH161

W. L. McClure

Introduction

Site 41CH161 is a *Rangia* shell midden on Cotton Lake, which is on the west side of the former channels of the Trinity River in Chambers County, Texas. Limited test excavations were conducted by members of the Houston Archeological Society in 1992. Some of the results of the excavations were reported in the Houston Archeological Society Journal (Kindall and Patterson 1993; May 1993a, 1993b).

The site was occupied during all or part of the time from A.D. 290 until Europeans arrived.

The vertebrate remains are reported here.

Laurie Zimmerman was of considerable assistance in helping make sense out of fish bones and in supplying copies of reference materials. Manipulation of data was facilitated by use of the vertebrate faunal analysis coding system of Shaffer and Baker (1992).

Methods

Excavated material was water screened through 1/4-inch screens at the site. In addition, some of the matrix from Pit A was water screened through finer mesh screens at the site. Samples from walls of Pits A and E were bagged and were dried and washed through screens by McClure using screens as fine as 30 openings per inch (0.595 mm opening size) for some of the material. Some items were collected at the edge of the lake and others from the surface. Vertebrate remains were identified by direct comparison with known material. A binocular microscope was an absolute necessity for examining the smaller bones.

During the identification process, it became apparent that the volume of small material was such that some method of reducing the time involved was desired. Therefore, after several varieties of fish, including both freshwater and marine species, were identified, some shortcuts were employed. Subsequently, fish dentaries, premaxillae, maxillae, vertebrae, spines, ribs, and pterygiophores were classified as being from unidentified fish without attempting to indicate the species. In some instances, the vertebrae, gar scales, and fragments were tabulated by volume based on a counted number of the items in a known container. Because of the dominance of fish remains in the assemblage, this action should not change the conclusions relative to economic activities of the people.

Condition of the bones is good but nearly everything had been fragmented to a large extent. Many of the bones had been exposed to heat. Only a few had indications of gnawing by rodents.

Results

Modified Bone: In addition to the bone tool reported by Kindall and Patterson (1993), another bone was recovered that has indication of deliberate modification. Three views of the item are shown in Figure 1. The midshaft of a radius of a deer had been grooved and snapped after an original spiral break. Two other incomplete grooves are near the snapped end. The posterior part of the bone had been ground off at an angle to the extent that there is a slight overlap of openings so that a thong could have been passed through. Grinding had been in various directions as indicated by striations. The snapped end had been beveled from the interior and exterior. All edges and

surfaces of breaks had been smoothed. The item could have served as a clothing fastener or as a shuttle, but the intended use is not apparent. Maximum length is 44.5 mm.

Vertebrate Remains: Nearly 125,000 remains of vertebrates were examined. Of that number, 55% were classed as unidentified fragments. Fish remains comprise 93% of the fragments that were classified to some taxonomy. Reptiles are 3%, mammals are 4%, and amphibians and birds are less than 1% of the bones.

Vertebrates that were identified are:

<i>Atractosteus spatula</i>		<i>Storeria</i> sp.	brown snake
and/or <i>Lepisosteus</i> sp.	gar	<i>Thamnophis</i> sp.	ribbon snake
<i>Amia calva</i>	bowfin	<i>Virginia striatula</i>	rough earth snake
Teleostei	unidentified fish	<i>Agkistrodon</i> sp.	copperhead or cottonmouth
<i>Ictiobus bubalus</i>	smallmouth buffalo fish	Aves	unidentified birds
<i>Ictalurus punctatus</i>	channel catfish	Ardeidae	unidentified heron
<i>Pylodictis olivaris</i>	flathead catfish	<i>Anas</i> sp.	duck
<i>Lepomis</i> sp.	sunfish	<i>Anas crecca</i>	teal
<i>Lepomis gulosus</i>	warmouth	<i>Anas americana</i>	wigeon
<i>Lepomis cyanellus</i>	green sunfish	<i>Anas platyrhynchos</i>	mallard
<i>Lepomis macrochirus</i>	bluegill	<i>Anser albifrons</i>	white-fronted goose
<i>Lepomis megalotis</i>	longear sunfish	<i>Colinus virginianus</i>	bobwhite
<i>Micropterus salmoides</i>	largemouth bass	<i>Meleagris gallopavo</i>	turkey
Sciaenidae	drum family	<i>Fulica americana</i>	coot
<i>Aplodinotus grunniens</i>	freshwater drum	<i>Grus americana</i>	whooping crane
<i>Pogonias cromis</i>	black drum	<i>Charadrius vociferus</i>	killdeer
<i>Micropogon undulatus</i>	Atlantic croaker	<i>Bubo virginianus</i>	great-horned owl
<i>Sciaenops ocellata</i>	red drum	<i>Parus carolinensis</i>	Carolina chickadee
<i>Cynoscion arenarius</i>	sand seatrout	<i>Thryothorus ludovicianus</i>	Carolina wren
<i>Mugil cephalus</i>	striped mullet	Mammalia	unidentified mammals
<i>Ambystoma texanum</i>	smallmouth salamander	<i>Didelphis virginiana</i>	opossum
Anura	unidentified frog or toad	<i>Blarina carolinensis</i>	short-tailed shrew
<i>Hyla</i> sp.	treefrog	<i>Cryptotis parva</i>	least shrew
<i>Bufo</i> sp.	toad	<i>Dasypus novemcinctus</i>	nine-banded armadillo
<i>Rana catesbeiana</i>	bullfrog	<i>Sylvilagus aquaticus</i>	swamp rabbit
<i>Rana sphenoccephala</i>	leopard frog	<i>Sylvilagus floridanus</i>	eastern cottontail
<i>Alligator mississippiensis</i>	alligator	Rodentia	unidentified rodents
Testudinata	unidentified turtle	<i>Sciurus niger</i>	fox squirrel
<i>Chelydra serpentina</i>	common snapping turtle	<i>Geomys breviceps</i>	Louisiana pocket gopher
<i>Kinosternon subrubrum</i>	Mississippi mud turtle	<i>Reithrodontomys fulvescens</i>	fulvous harvest mouse
<i>Sternotherus odoratus</i>	stinkpot	<i>Baiomys taylori</i>	pigmy mouse
<i>Chrysemys</i> sp.	slider turtle	<i>Peromyscus gossypinus</i>	cotton mouse
<i>Terrapene carolina</i>	box turtle	<i>Oryzomys palustris</i>	marsh rice rat
<i>Trionyx</i> sp.	softshell turtle	<i>Sigmodon hispidus</i>	hispid cotton rat
<i>Anolis carolinensis</i>	green anole	<i>Microtus ochrogaster</i>	prairie vole
Serpentes	unidentified snake	Carnivora	unidentified carnivore
Colubridae	non-poisonous snake	<i>Procyon lotor</i>	raccoon
<i>Coluber</i> sp.	racer snake	<i>Mustela vison</i>	mink
<i>Diadophis punctatus</i>	ring-neck snake	<i>Mephitis mephitis</i>	striped skunk
<i>Elaphe</i> sp.	rat snake	<i>Lutra canadensis</i>	river otter
<i>Farancia abacura</i>	mud snake	<i>Urocyon cinereoargenteus</i>	gray fox
<i>Heterodon platyrhinus</i>	hognose snake	<i>Canis latrans</i>	coyote
<i>Lampropeltis</i> sp.	kingsnake	<i>Odocoileus virginianus</i>	white-tailed deer
<i>Nerodia</i> sp.	water snake	<i>Bison bison</i> or <i>Bos taurus</i>	bison or cow
<i>Ophedrys</i> sp.	green snake		

The limited amount of excavation that was performed also limits the degree to which the data can be used for conclusions about some cultural practices. The following discussion will consider the remains of the entire assemblage as a unit. The number of animals usually would be more if each of the excavation units were considered individually. The number of bones of particular animals is sometimes indicated in parenthesis.

Osteichthyes – Fishes:

Nearly 21,000 elements from at least 26 gars are in the assemblage. Almost 19,000 are scales. This is an undercount of scales since many fragments were included in the unidentified list. Since a gar can have 2000 scales, at least 10 are in the count. The 536 vertebrae would also come from at least 10 gars since each has about 51 of them. However, there are 22 basioccipitals and 26 parasphenoids of which there is only one each per fish. Various other bones of the cranium and pelvic area include isolated teeth, maxillae, ceratohyals, cleithra, dentaries, other tooth-bearing elements, epihyals, frontals, hypohyals, interoperculars, nasals, operculars, palatines, parietals, postparietals, prootics, pterotics, suboperculars, suprapreoperculars, ribs, and sculptured head plates. The size of the fish involved varies from very large to very small. Some are of the alligator gar (*Atractosteus spatula*) but some may be of other gars (*Lepisosteus* sp.).

More than 300 bones of at least 5 bowfins were recovered. This includes 75 isolated teeth, 94 vertebrae, 9 dentaries, and 8 operculars. In addition there are cleithra, tooth-bearing bones, parietals, postorbital, supratemporals, tabular, and sculptured head bones.

The smallmouth buffalo is the only large member of the sucker family living in Chambers County. More than 50 bones of that species are in the collection. At least 11 individuals are represented. The bones include articulares, basioccipitals, basipterygia, branchiostegals, exoccipitals, maxillae, nasals, opercular, otolith, quadrate, supraoccipitals, and vomer.

At least two genera of freshwater catfish are included in the 153 bones of the family. The pectoral spines are distinctive, and when complete enough can be used to separate the species. At least 75 individuals are in the assemblage and most are of the channel catfish. One is of the flathead catfish, and some may be of other species of the genus *Ictalurus*. None can be assigned to the marine catfish of the Ariidae family, although they may be present. In addition to pectoral spines there are articulares, basioccipitals, cleithra, coracoid, dentaries, opercular, parasphenoids, and supraoccipital.

The Centrarchidae family includes the sunfishes, crappies, and basses. More than 350 bones are of this family, with a slight majority being of the largemouth bass. Slight differences in some of the bones allowed the identification of the four species of sunfish, but most of the material was lumped under "sunfish." Based on otoliths, dentaries, premaxillae, and vomers, there are at least 14 sunfish (warmouth, green sunfish, bluegill, and longear sunfish) and 25 largemouth bass. Other bones include articulares, atlas, ultimate vertebrae, basioccipital, metapterygoid, cleithra, ethmoids, epihyal, maxillae, parasphenoids, metapterygoid, pharyngeal, postorbital, quadrates, and rostral.

In Texas, the drum family includes a freshwater genus and several marine genera. This assemblage includes nearly 200 bones from at least 2 freshwater drums, 3 red drums (redfish), 5 croakers, 1 black drum, and 3 sand seatrouts (sand trout). Identification is based primarily on otoliths. Other elements include 167 isolated teeth, atlas, articulares, basioccipital, dentaries, maxillae, opercular, premaxillae, and pterygiophores. It is possible that some of the teeth are of sheepshead (*Archosargus probatocephalus*) of the Sparidae family.

At least 23 striped mullets are in the collection based on 46 otoliths and 5 basioccipitals.

An explanation: The fishes currently inhabiting Texas waters are divided into two classes, the Chondrichthyes and the Osteichthyes. The Chondrichthyes have cartilaginous skeletons and include the sharks and rays. The Osteichthyes have bony skeletons and are further divided into three infraclasses, the Chondrostei (paddlefish and sturgeons), the Holostei (gars and bowfins), and the Teleostei (all others). In this discussion, a fish labeled as teleost will be some fish other than shark, ray, gar, bowfin, paddlefish, or sturgeon.

The assemblage includes more than 30,000 bones and scales of fish that are not identified. There are 314 tooth-bearing bones, 4400 ribs, and 2200 pterygiophores that could be of any of the fishes

listed above. The 2500 scales could be of any of the above except gars. Vertebrae that can only be of teleosts vary in size from very small to large. Some of the 15,000 centra have diameters as small as 0.5 mm and others as large as 15 mm. Only 3% of these were large enough to be retained on 1/4-inch screens. A largemouth bass, which can be considered a typical teleost, has 31 vertebrae. Thus there are about 485 fish whose remains became incorporated into the part of the midden that was excavated. There are 3600 spines, articulars, basioccipitals, dentaries, epiphysals, maxillae, operculars, otoliths, parasphenoids, premaxillae, preoperculars, and vomers from teleosts. There is nothing about this group of bones to suggest species other than those that were identified by other elements.

Amphibia – salamanders, frogs, and toads:

Four vertebrae of 1 smallmouth salamander were recovered together in one level of one pit.

Treefrogs are represented by 18 bones. Since there are 6 humeri, there are at least three individuals. Other bones include vertebrae, sacrum, scapula, ulna, ilia, tibiofibula, and urostyles.

A toad is represented by 3 vertebrae, 2 ilia, sacrum, scapula, and tibiofibula.

A bullfrog is represented by a mandible and a vertebra. At least 3 leopard frogs are included based on 11 vertebrae, 3 urostyles, humeri, radioulnae, and tibiofibula.

Additional anuran (frog or toad) bones include vertebrae, humeri, and urostyle. These are probably not of any taxa other than the ones listed above.

Reptilia – reptiles:

The collection includes 1900 bones of reptiles.

Nearly 100 bones of alligator were recovered. There are 12 cranial fragments including pterygoid and jugal. Other bones are mandibles, teeth, caudal vertebrae, precaudal vertebrae, ribs, scapula, metapodial, phalanges, and 47 dermal bones. All of these could be from one individual, but variable sizes of the dermal bones suggest that at least two are included.

Nearly 1250 bones of turtles are in the collection. These are of four varieties. There are at least 1 common snapper, 3 mud turtles, 2 sliders, 2 eastern box turtles, and 1 softshell. The bones include various elements of the carapace and plastron. Some of the box turtles may be the ornate box turtle (*Terrapene ornata*), which is sometimes found in the eastern part of the state, but most are probably from the eastern box turtle (*T. carolina*). The 500 unidentified turtle bones include carapace, plastron, vertebrae, scapulae, humerus, pelvis, femur, tibiae, and phalanges. Some of these may be of the diamondback terrapin (*Malaclemys terrapin*), which is found in nearby estuaries.

There are 280 bones of the common green anole that include various cranial elements as well as vertebrae and appendicular bones. Maxillae with teeth number 38 and mandibles with teeth number 72, so at least 36 lizards are represented.

More than 300 snake caudal and precaudal vertebrae were recovered. These are from 13 different species. The majority of the bones are too fragmentary to identify but they are probably of the same species that were identified. The green snake is probably the rough green snake (*Opheodrys aestivus*) since it is much more common than the rare smooth green snake (*O. vernalis*). One of the few specimens of the smooth variety that have been verified in collections from Texas was from Chambers County (McClure 1969; Worthington 1973). The Texas specimens of the smooth green snake are from coastal prairie habitats and thus can not be eliminated from possibility.

Aves – birds:

Nearly 200 bones are of birds, with half of them being from at least eight individuals of five sizes of unidentified species. The identified birds include at least two individuals each of an uncertain

species of duck (10), wigeon (8), and coot (14). There is at least one individual each of teal (7), mallard (6), white-fronted goose (2), bobwhite (1), turkey (12), killdeer (1), great horned owl (11), chickadee (7), wren (4), probable whooping crane (4), and an uncertain genus of the heron family (6). It is possible that the ducks herein called teal, wigeon, and mallard could be of other species of comparable sizes. The whooping crane identification is based on the elements being the same shape as those of the sandhill crane (*Grus canadensis*), but one-third larger. Bird bones that were recovered are beaks, quadrates, vertebrae, furculum, sternum, pelvis, coracoids, scapulae, humeri, ulnae, radii, carpometacarpi, femora, tibiotarsi, tarsometatarsi, and phalanges of wings and feet.

Mammalia – mammals:

More than 2100 bones are of 22 kinds of mammal. Nearly half of these bones can not be assigned to particular mammals. They are of various sizes of animals and are probably from some of the identified species.

The opossum bones (62) are from all parts of the body of at least four individuals. The bones are occiput, maxillae, mandibles, teeth, vertebrae, scapula, humeri, ulna, femora, calcaneus, and phalanx.

One short-tailed shrew is represented by a maxilla with 3 teeth plus 1 other tooth. The least shrew bones (22) are from at least three individuals and are maxillae, mandibles, and teeth.

The armadillo bones include a tibia and 7 dermal bones.

Leporid bones are from at least 4 swamp rabbits (65) and 3 cottontails (38), and there are 38 that are from either of the two species. Bones from all parts of the body include nasals, maxillae, mandibles, teeth, vertebrae, sacra, scapula, humeri, ulnae, pelvis, femora, tibiae, astragali, calcanei, and phalanges.

Nearly 200 bones are from eight kinds of rodent. A femur and a tibia are from fox squirrel. A molar tooth is from a pocket gopher.

The other rodent bones are from cricetid mice and rats. The bones of at least 4 fulvous harvest mice (56), 5 pigmy mice (41), 1 cotton mouse (6), 1 rice rat (3), 4 hispid cotton rats (51), and 1 prairie vole (18) are included. In addition, there are 5 bones that may be from another species of *Peromyscus* and more than 100 bones that could not be assigned to any of the above with confidence. Cricetid bones include maxillae, mandibles, teeth, vertebrae, scapulae, humeri, ulnae, pelvis, femora, tibiae, astragali, calcanei, and phalanges.

The prairie vole remains include 2 mandibles, one of which has all cheek teeth. This allows separation of the species (*Microtus ochrogaster*) from other species of the genus (Dalquest and Shultz 1992, pp. 152-156). Previous reports (McClure 1989, 1991) had shown the genus in sites in Fort Bend County and Wharton County in the coastal prairies of the upper Texas coast. Excavations at 41BO138 during the 1994 Texas Archeological Society Field School showed the vole to have been in Brazoria County. This now confirms that the extinct species is the animal involved. The vole bones include a right and left mandible, astragalus, calcaneus, and isolated teeth, which combined could be from a single individual. However, these bones were recovered in each of seven 5-cm levels of Pit A from 25 to 60 cm, which suggests that several voles are involved.

Carnivore bones from at least six species are in the collection. There are 43 bones of at least 2 raccoons. These bones include cranial fragments, maxillae, mandibles, teeth, scapulae, humerus, ulna, and astragalus. Three mustelids are indicated by 5 teeth of at least 1 mink, 1 tooth of a skunk, a metatarsal that is probably from a skunk, and teeth, mandibles, and humerus of otter. A gray fox is represented by a cranial part, a coyote by a humerus, and another canid by 2 teeth.

More than 500 bones are from deer. Bones are antlers, nasal, petrosals, maxillae, mandibles, teeth (74), axis, vertebrae, ribs, scapula, humeri, radii, ulnae, pelvis, femora, patellae, tibiae, malleoli, metacarpals, metatarsals, trapezoid magnum, scaphoids, lunars, cuneiforms, pisiforms,

centroquartals, tarsals, astragali, calcanei, and phalanges. From this list, it appears that whole animals were brought to the site for butchering. Based on the calcanei, the bones represent a minimum of nine individual animals.

A cow or bison is represented by 3 vertebrae and a calcaneus.

More than 1000 bones are of unidentified mammals of sizes from small rodents to deer. These bones are probably from the same varieties of mammals that were identified.

Discussion

Less than one-half of one percent of the site was excavated and processed with 1/4-inch screens. If it is assumed that the pits which were excavated, including the three which yielded only a small amount of material, are representative of the whole site, the number of larger animals would be 200 times as many as indicated above. One percent of the soil in the two productive pits was processed through finer-mesh screens. So, even if similar samples from the other three pits had yielded nothing, the number of smaller animals for the whole site would be 20,000 times as many as shown above. That is a lot of small fish and numerous frogs, lizards, snakes, shrews, and rodents which were processed at the site.

The presence of such a variety of animals and in particular the small vertebrates in every excavation unit in which there was a substantial number of bones requires some search for the accumulating agent. The fish, both large and small, are in such a preponderance that there can be little doubt that humans brought them to the site, processed whole fish at the site, and consumed them on the spot. The larger fish may have been caught with hooks, spears, or arrows, but the smaller ones could only have been acquired by other means. Flood waters often strand many fish in ponds where they can be gathered easily. Weirs or nets would also have been a potential means of collection.

Alligators and turtles could have been caught in these same pools and when the females sought a place on land for egg laying. Water turtles are easily captured at night with a light. The box turtle, which is the most numerous turtle in the assemblage, is a land turtle and would have been encountered at times when people walked anywhere in the neighborhood. They are particularly easy to locate when the vegetation has been burned. The proportion of mud turtles is unusually large compared to that for other sites in the area.

Lizards, treefrogs, and frogs are common in the area and are easily caught by hand. The salamander and toad remains may be natural inclusions rather than from human activities.

Birds are in small numbers but most of them are migratory and usually associated with water. Some of the duck bones may be from the mottled duck (*Anas fulvigula*), which is a year-round resident of Chambers County, but most are of other varieties that are absent from the area during the summer months. The whooping cranes, coots, and geese are also absent in the summer. Chickadees, wrens, owls, some herons, killdeers, turkeys, and bobwhites are common in fields and wooded areas along streams in the area during all seasons. The great horned owl bones all came from the 35-cm level in two pits and may represent some event or resource other than food supply.

The armadillo represents an intrusion some time during the last 100 years, since the animal arrived in Texas no earlier than 1900 A.D. (Schmidly 1983, p. 103). All of the bones came from Pit C at 10 to 20 cm depth.

Rabbits, tree squirrels, carnivores, and deer could have been acquired by hunting and trapping, and their bones are commonly found in other sites in the area. The squirrels and carnivores are in relatively small numbers.

The bones of rats and mice, as well as the tree frogs, small snakes, shrews, and small birds, are in such a variety and numbers and in all levels that there is greater uncertainty about how

these animals became included in the matrix. The species that are in the assemblage would have been available from the edge of the lake and river and out on the nearby prairie. As food items of some of the other animals found at the site, they could have arrived there within the digestive tracts of such. Snakes can be eliminated since bones are completely digested in passage. Hawks and mammalian carnivores and scavengers can be eliminated as sources since the bones of small mammals that are ingested by these groups are usually partially digested and are fractured to a greater extent than is evident on the recovered material.

Owls may have been involved with delivery of the shrew and small rodent bones to the site. Owls ingest their prey without much fracturing of the long bones and these are regurgitated at roost sites. The presence of owl bones in two pits at the same depth may support such activity at least at one time when the site may not have had human occupants. However, that particular level in the two pits does not have nearly as many rodent bones as do some of the other levels. The bones below an owl roost are much more concentrated than in this instance. If an owl roost was present, it would have been at some distance away from the pits that were excavated. Lizards and treefrogs are not food items of local owls, but the distribution of their bones throughout the soil column is comparable to that of the small mammals. It is not logical that nonhuman actions be deemed responsible every time fine screening at a prehistoric site yields quantities of small animal bones.

Although some of the animal bones may have come to the site via other vertebrates, it is likely that the majority were there as residue from what must have been a regular supplement to the nearly all-fish diet of the human occupants. The small vertebrates would have been more readily available after fire burned the grasses and forbs in the prairie.

Pit A yielded the greatest number of identified bones and was chosen for further analysis. Comparison was made of several different taxa, each with itself for change with depth below surface, rather than between taxa. This indicates the change in importance of the particular species through time and avoids comparisons of rodents to fish or something even less useful.

Figure 3 in the Kindall and Patterson report (1993) shows that 66% of the weight of bones in Pit A came from 25 to 45 cm. Figure 2 in this report shows graphically the changes in percentage of bones of particular animals with depth in Pit A. The plots for unidentified vertebrates and for fish are almost superimposed. The plots of percentage of unidentified bones, fish, alligators, turtles, birds, large mammals, and deer each show the same characteristic between 25 and 40 cm. In addition, the plots for unidentified bones, fish, and birds show a minor peak at 45 to 55 cm. However, the plot for rodents shows a reverse condition, with a major peak at 50 to 55 cm and a minor peak at 30 to 40 cm.

Conclusions

There was apparently a time during which the occupation was less intense than at other times. For some unknown reason, more rodents were incorporated in the midden prior to that period. It is suspected that little disturbance occurred other than the isolated clandestine digging and the shallow armadillo burrowing. The only items that suggest a contrary conclusion are the two glass beads at lower levels.

The occupants of 41CH161 can be labeled "Fish Eaters" without doubt. They relied on deer and turtles for regular items of diet. They also added variety to the menu by including just about any kind of amphibian, reptile, bird, and mammal that existed in the neighborhood. The people were at the location at least during periods when migratory birds were present.

Bailey (1905) reported that the prairie vole population survived prairie fires. Lowery (1974) showed that the vole became extinct after European settlers started suppressing fires in the prairie.

These support the possibility that many of the animals whose bones were recovered in this project were acquired by the human occupants through the opportunistic or deliberate use of fire in the grasslands.

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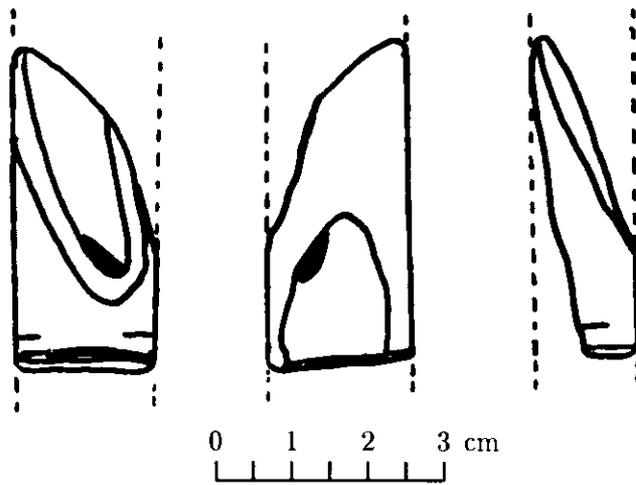


Figure 1. Modified Bone

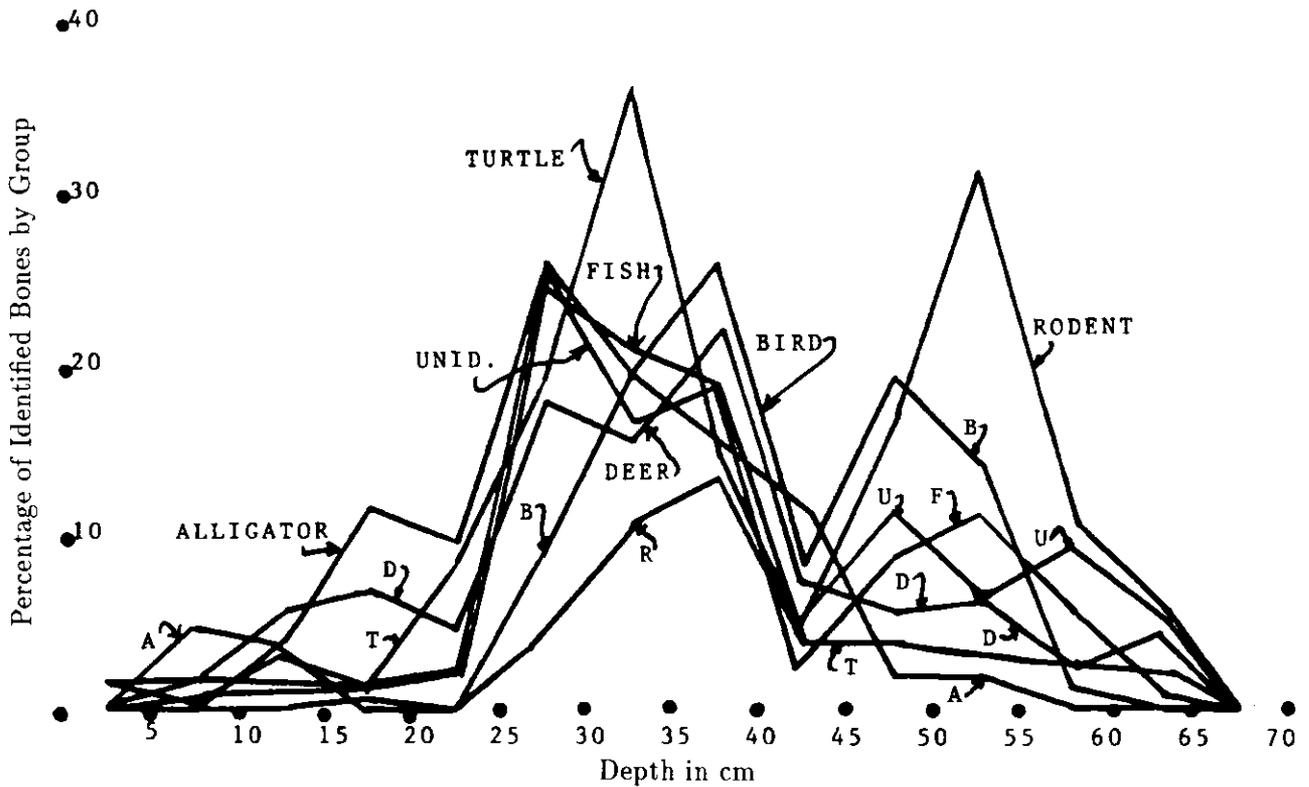


Figure 2. Faunal Variation with Depth in Pit A. Each ordinate value represents the amount of identified bone for a faunal group (e.g., fish) at the given depth level, expressed as a percentage of the total amount of identified bone for that group.

The Koehl Site, 41CD127, Colorado County, Texas

L. W. Patterson, J. D. Hudgins, and S. Sebesta

Introduction

This article describes surface collections from site 41CD127 in Colorado County, Texas. The collections include materials collected by the landowner, Kenneth Koehl, and additional materials collected during a site visit in January 1994. Arrangements for the site visit were made by Steve Sebesta, and the site was recorded for state records by Joe Hudgins. The site visit was made by HAS members Joe Hudgins, Ray McCausland, Lee Patterson, and Steve Sebesta. This work was made possible through the courtesy of the landowner.

Artifact types from site 41CD127 indicate a long occupation sequence, from the Late Paleo-Indian through the Late Prehistoric time periods, in an interval from about 10,000 to 500 years ago. Sites with long occupation sequences are fairly common in adjacent Southeast Texas (Patterson 1983). Other sites with long occupation sequences in the general area of the southeastern part of Central Texas where 41CD127 is located have been reported (Patterson and Hudgins 1992; Patterson et al. 1989).

Site 41CD127 has chert resources available in the immediate area. Lithic procurement and manufacturing strategies were somewhat different at this site, compared to campsites that were remote from lithic sources.

Site description

Site 41CD127 is located on the east side of the Colorado River near Alleyton, Texas. The site is on the first high terrace, about 150 yards from the river bank. There are three adjacent areas (east, central, and west) where artifacts have been found, with each area about 200 feet in diameter. There are two draws that separate the three areas. Artifact density increases at the edge of the terrace, toward the river. Flooding does not occur on this high terrace. This is a wooded area where acorns and nuts would have been available, as well as a variety of faunal resources, such as deer. Deer hunting is still done on the property. Most of the diagnostic artifacts from this site have been found by Mr. Koehl in the central site area. This may not be a deeply stratified site, judged by the variety of artifacts of different ages that are found on the surface.

Projectile points

A summary of projectile points found at site 41CD127 is given in Table 1. The time range for occupation of this site is judged mainly by types of projectile points. The Late Paleo-Indian period (8000-5000 B.C.) is represented by 3 Plainview-like lanceolate-shaped projectile points (Figures 1A,B,C), and 2 Early Side-Notched points (Figures 1E,F). Both of these point types have been found in the Late Paleo-Indian period at site 41WH19 in Wharton County (Patterson et al. 1987). The base of a possible Angostura point from the Late Paleo-Indian period was found during the site visit. Several preforms in the Koehl collection appear to have been intended for the manufacture of lanceolate-shaped Paleo-Indian points.

Although a few Early Stemmed points have been found from the Late Paleo-Indian period (Patterson 1980; Patterson et al. 1987), this point type is most common in the Early Archaic period (5000-3000 B.C.), such as at sites 41WH19 (Patterson et al. 1987) and 41FB223 (Patterson et al. 1994). There are 2 Early Stemmed points (Figure 1H,I) and 3 probable Early Stemmed points

(Figures 1D, 3D,E) in the Koehl collection. The specimens shown in Figure 3D,E are stemmed points, but the stems are missing. The specimen shown in Figure 1D is only a blade fragment, but it has fine parallel flake scars like the specimen shown in Figure 3D. These two specimens with the same flaking patterns may have been made by the same individual.

The Middle Archaic period (3000-1500 B.C.) is represented at this site by a Bulverde point (Figure 2A) and a Travis-like point (Figure 2H). A large Kent point (Figure 2C) might be from the Middle or Late Archaic. There are several dart point types from 41CD127 that are found in both the Late Archaic (1500 B.C. - A.D. 100) and Early Ceramic (A.D. 100-600) periods in adjacent Southeast Texas. These dart point types include Yarbrough (Figure 2B), small Gary (Figure 2D), Ensor (Figure 2E,F,G), Ellis (Figure 3A), and Palmillas (Figure 3B). Due to the slow diffusion of the use of pottery into Central Texas, this site may not have an Early Ceramic period. In this case, the Late Archaic period would continue until about A.D. 600 to the start of bifacial arrow points. The Late Prehistoric period (A.D. 600-1500) is represented at this site by 4 Scallorn and 1 Perdiz arrow points shown in Figure 4.

It has previously been observed (Patterson 1983,1990b) that Southeast Texas is an interface between technological traditions of the Southeast Woodlands and the Southern Plains (Central Texas), with mixing of projectile point types from the two traditions most evident in a western zone between the Brazos and Colorado Rivers. Although slightly west of the usual defined area for the Southeast Texas region, site 41CD127 falls within this zone between the two major rivers. This zone continues to the northwest of Southeast Texas. The mixture of projectile point types at site 41CD127 is typical of the mixture of technological traditions found in this geographic zone. For example, Early Side-Notched points represent a technological tradition of the Southeast Woodlands, and lanceolate points, such as Plainview, represent a tradition of the Southern Plains.

General lithics

Many projectile point preforms (Table 1) have been found at this site in various stages of completion or failure, indicating that points were manufactured here. Chert flakes and pieces also demonstrate that much lithic manufacturing activity took place at this location. Large chert cobbles occur in this immediate area, so that a good supply of lithic raw material would have been available. Large chert cobbles were observed during the site visit in a gravel mining area next to the site. Quartzite cobbles, which also occur in this area, were used as hammerstones for lithic reduction. Two quartzite hammerstones and three hammerstone fragments have been found in the central site area, and one hammerstone fragment was found in the western site area.

Two chert cores were found in the eastern site area, both with some surface areas of the original chert cobble. One core specimen has a flat platform with the edge used as the location of force application for removal of flakes from the core face. This specimen is a highly reduced portion of the original cobble, with a length of 72 mm, a width of 44 mm, and a thickness of 45 mm. The other core specimen is the intact middle section of a chert cobble with flake removals from both ends. This specimen has a diameter of 66 mm, and it is estimated that the original length of the cobble would have been about 120 mm.

Chert from the Colorado River drainage system is generally tough and difficult to work, but knapping quality can be greatly improved by heat treatment (Patterson 1981). There is evidence that heat treatment of chert was done at site 41CD127. Many specimens have waxy luster and/or reddish coloration that indicate heat treatment. Heat-treatment was not always successful here. There were 43 pieces of thermally damaged chert found in the central site area, 10 pieces in the western area, and 7 pieces in the eastern area. Thermally damaged specimens usually have rough surfaces and many potlid surface fracture scars.

Aside from projectile points, not many formal types of stone tools were made at this site. The Koehl collection has a stemmed scraper (Figure 1G) that may be from the Late Paleo-Indian period, and a bifacial drill (Figure 3G). As is common in this geographic area, the dominant stone tool type at site 41CD127 was the utilized flake. There were 18 chert flakes found during the site visit that have a unifacial edge wear pattern characteristic of scraping, and 1 flake with a bifacial edge wear pattern characteristic of cutting (Tringham et al. 1974). Scrapers would have been used for woodworking and hide preparation. Five large chert bifaces, some shown in Figure 5, were found in the central site area. Judged by the uniform edges of these specimens, and large size, they may represent tools used for chopping and cleaving functions.

At this site, the manufacturing sequence for bifacial dart points would have been (1) primary reduction of chert cobbles, including production of flake blanks, (2) heat treatment of flake blanks, (3) initial biface shaping, (4) final biface thinning to produce finished preforms, and (5) pressure flaking to finish dart points. Sixteen thick pieces of chert, all with remaining cortex, were found in the central site area, representing the primary reduction process. The irregular flake size distributions shown in Table 2 indicate that both primary reduction and bifacial reduction were done at this site. Bifacial reduction alone would tend to give a uniform exponential flake size distribution with progressively larger percentages of smaller size flakes (Patterson 1990a).

There were 39.5% of flakes from the central site area and 43.5% of flakes from the western area that had remaining cortex. A high proportion of flakes with remaining cortex would be expected from the mixture of reduction stages done at this site. It is perhaps possible to see the early stage bifacial shaping and the final biface thinning stage from the distribution of flake size thicknesses shown in Table 3 for flakes from the central site area. There seems to be a somewhat bimodal distribution of flake thicknesses, with flakes thicker than 6 mm perhaps representing initial biface shaping.

One large flake of Edwards Plateau chert is in the Koehl collection from site 41CD127, which may represent down-the-line trade along the Colorado River south of the Edwards Plateau from chert sources on the Edwards Plateau.

Ceramics

Two Leon Plain bone-tempered potsherds were found during the site visit, one in the eastern area and one in the central area. This type of pottery is found in small amounts in the Late Prehistoric period along the Colorado drainage system in Central Texas (Suhm and Jelks 1962:95) and farther to the southeast in Wharton County (Patterson and Hudgins 1989). Mr. Koehl states that pottery has previously been found in the eastern site area.

Mussel shell

During the site visit, 13 pieces of mussel shell were found in the eastern site area and 1 piece of shell was found in the central area. Mr. Koehl has previously observed a concentration of mussel shell in the eastern site area at the edge of the draw between the eastern and central areas. There is probably a shell midden at this location. Freshwater shellfish meat is not a rich food source, but was utilized by prehistoric Indians in this general area. There are a number of shell midden sites farther south in Wharton and Fort Bend Counties, such as 41WH12 (Patterson and Hudgins 1989).

Summary

Surface collections from site 41CD127 show that this site has a long occupation sequence from the Late Paleo-Indian period through the Late Prehistoric. Artifact types found here are typical of those from sites in this southeast part of Central Texas, representing seasonal campsites by Indians practicing a hunter-gatherer lifestyle. Large chert cobbles were locally available, and all stages of lithic manufacturing are represented at this site. Data from site 41CD127 are especially important in demonstrating a long occupation sequence for a geographic area that is not well documented.

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Table 1. Projectile Points from 41CD127

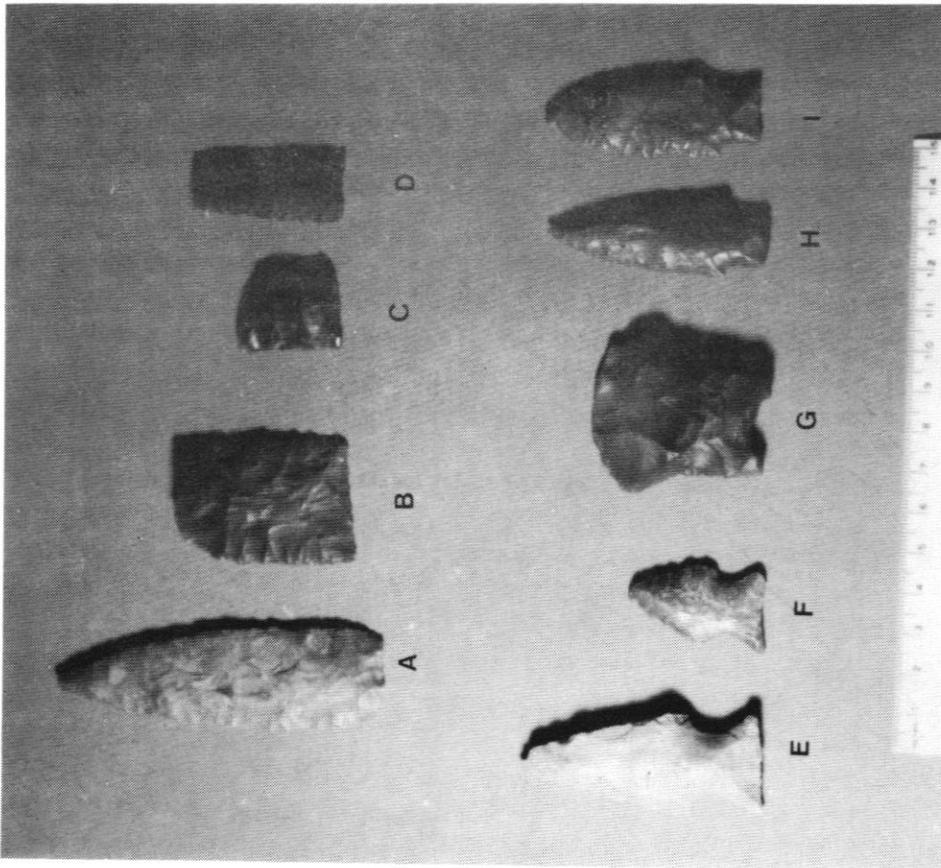
type	Koehl collection	site visit collection		
		east	central	west
Plainview-like	3			
Early Side-Notched	2			
Angostura (?)				1
Early Stemmed	5			
Bulverde	1			
Ensor	3			
Travis-like	1			
Kent	1			
Gary	1			
Yarbrough	1			
Palmillas	1			
Ellis	1			
Scallorn	4			
Perdiz	1			
unclassified	2			
dart point preform	44	1	3	
arrow point preform			1	

Table 2. Flake Size Distributions

flake size, mm square	central area		western area	
	no.	%	no.	%
under 15	5	4.2	7	23.4
15-20	21	17.6	4	13.3
20-25	25	21.0	7	23.4
25-30	18	15.2	4	13.3
30-35	20	16.9	4	13.3
35-40	11	9.2	1	3.3
40-50	16	13.4	2	6.7
50-60	3	2.5	1	3.3
	<u>119</u>	<u>100.0</u>	<u>30</u>	<u>100.0</u>

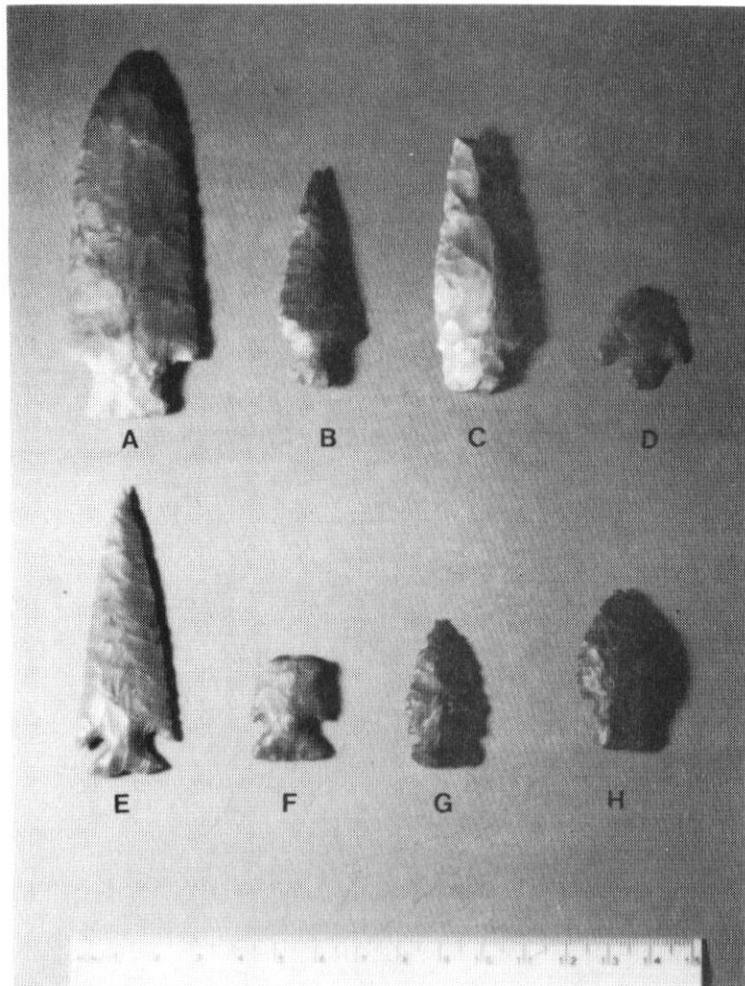
Table 3. Flake Thickness Distribution

flake thickness, mm	no.	%
2	13	10.9
3	27	22.7
4	18	15.1
5	18	15.1
6	8	6.7
7	6	5.0
8	12	10.2
9	3	2.5
10	3	2.5
11	2	1.7
12	2	1.7
13	2	1.7
14	3	2.5
15	2	1.7
	<hr/> 119	<hr/> 100.0



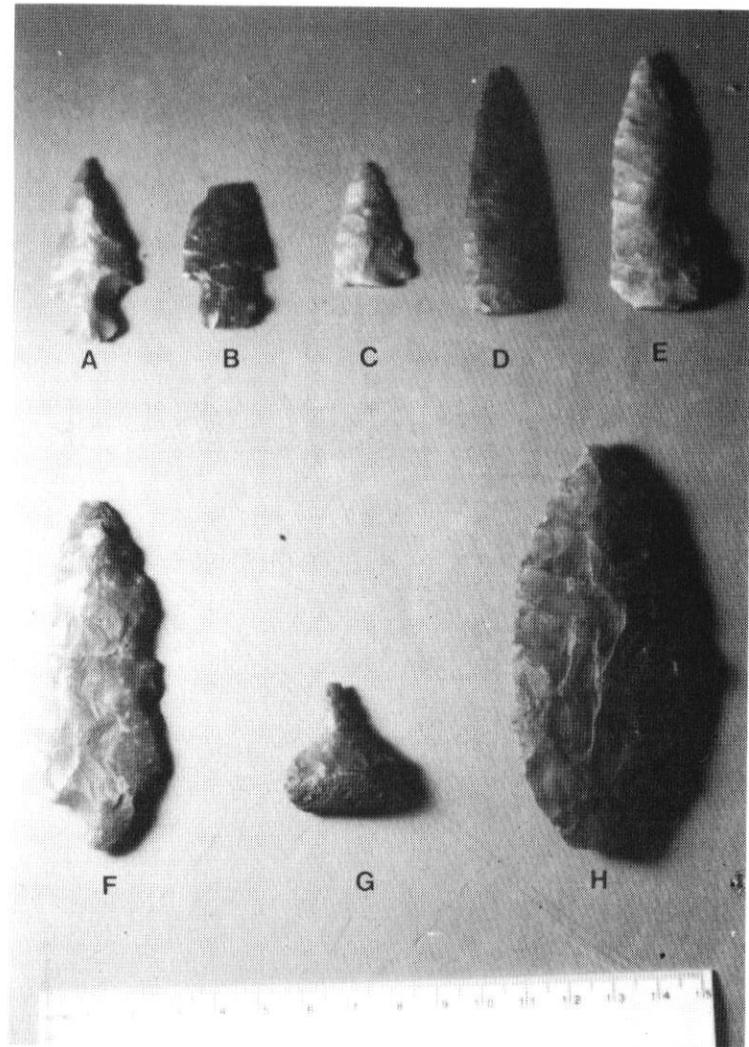
A,B,C - Plainview-like; D - Early Stemmed (?);
 E,F - Early Side-Notched; G - stemmed scraper;
 H,I - Early Stemmed

Figure 1. Early Dart Points and Scraper



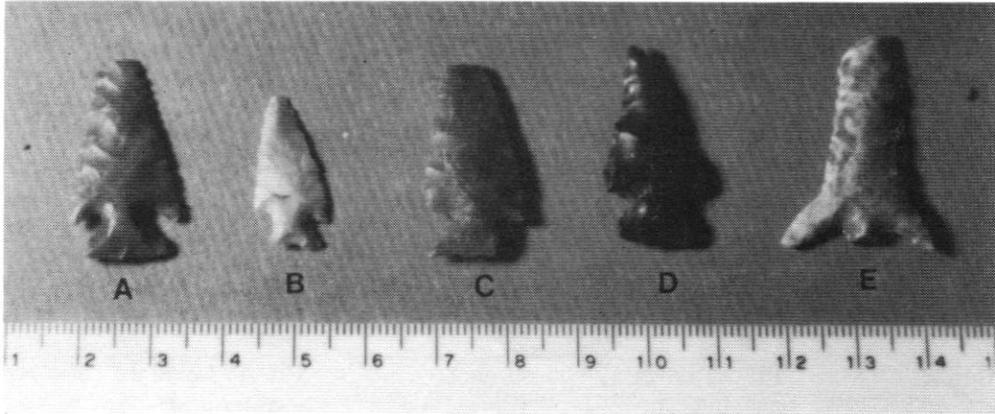
A - Bulverde; B - Yarbrough; C - Kent; D - Gary;
E, F, G - Ensor; H - Travis-like

Figure 2. Dart Points



A - Ellis point; B - Palmillas point; C, F - unclassified points; D, E - Early Stemmed points; G - drill; H - preform

Figure 3. Lithic Artifacts



A to D - Scallorn; E - Perdiz

Figure 4. Arrow Points



Figure 5. Large Bifaces

Two Additional Trade Beads from Site 41CH161

Melissa May

Two additional trade beads of European manufacture have been recovered by Bill McClure from the fine screening of the bulk samples excavated at site 41CH161 in 1991. Attributes of these beads, called Bead 3 and Bead 4, are given in Table 1. Beads 1 and 2 were described previously by May (1993) and the background for this site by Kindall and Patterson (1993).

Table 1. Description of Beads 3 and 4 from Site 41CH161

	Bead 3	Bead 4
Provenience:	Pit A, Level 12 (55-60 cm)	Pit A, Level 13 (60-65 cm)
Size:	Small/seed	Small/seed
LD:	2.56 mm	2.8 mm
PD:	1.0 mm	0.9 mm
Length:	1.9 mm	3.1 mm
Color:	Benjamin Moore (1993): 3/C 1488, Munsell (1992): Gley 6/5GY/1	Benjamin Moore: 3/C 1488, Munsell: Gley 6/5GY/1
Clarity:	Opaque	Opaque
Shape:	Tube	Tube
Kidd's (1970) type:	1a10 (Surf Green)	1a10 (Surf Green)
Manufacture:	Drawn	Drawn

Both beads are broken on the ends, so it could not be determined whether they were finished by hot tumbling. Bead 4 has some sand in the perforation, but whether this is residue from a finish technique or just sediment associated with burial is unknown. These two fragments may be parts of the same bead since they are almost identical in size, color, clarity, shape, type, and method of manufacture, but no fit could be established.

Beads 3 and 4 were found 30 to 35 cm deeper in Pit A than was Bead 1. If these beads were in situ, it would place the lowest levels of Pit A in the Historic Period. This would be inconsistent with other artifacts described by Kindall and Patterson (1993). It is possible that these beads migrated downward from younger levels due to the shrink and swell of the soil or bioturbation. Thus these beads cannot be used to better determine the age of occupation for site 41CH161.

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Identification of Unifacial Arrow Points

Leland W. Patterson

You can lead a horse to water, but you can't make
it drink – old proverb

You know, you only find what you are looking for,
really, if the truth be known – Mary Leakey

Introduction

The use of unifacial arrow points in Southeast Texas, mainly in the form of marginally retouched flakes, was first proposed in 1973 (Patterson 1973). Later, many specimens of possible unifacial arrow points were obtained for this region, and early time periods were identified (Patterson 1982, 1992) for use of this artifact type, from stratigraphic sequences of excavations and from preceramic-age surface collections. Excavations at sites 41HR315 (Patterson 1980) and 41FB223 (Patterson et al. 1994) show that unifacial arrow points possibly started in the late part of the Middle Archaic (about 4000 B.P.) or in the early part of the Late Archaic (about 3500 B.P.). Unifacial arrow points were found in the Early Ceramic Period (A.D. 100-600) in excavations at site 41WH73 (Patterson and Hudgins 1992). The use of unifacial arrow points continued in the Late Prehistoric (A.D. 600-1500) after the start of bifacial arrow points about A.D. 600 (Aten 1983:306). Some sites with unifacial arrow points in the Late Prehistoric period are 41WH12 (Patterson and Hudgins 1989), 41WH19 (Patterson et al. 1987: Fig. 4), 41PK88 (McClurkan 1968: Fig. 48), and 41HR273 (Ensor and Carlson 1991: Fig. 42).

Unifacial arrow points are fairly common at prehistoric sites in Southeast Texas. In the 1992 contents of the computerized data base for Southeast Texas (Patterson 1989), there are 174 unifacial arrow points, compared to 824 Perdiz points, 128 Scallorn points, 228 Catahoula points, and 316 Alba points.

Odell (1988) has proposed that the bow and arrow started about 4000 B.P. during the Late Archaic in the midwestern United States, with use of pointed flakes having minimal marginal retouch. Odell's conclusion is based on the study of impact fractures on projectile points (Odell and Cowan 1986). Gibson (1976) has proposed that some specimens of unifacial Jaketown perforators of the Poverty Point culture may have been used as arrow points during the Late Archaic period in Louisiana. Thus, there are three independent proposals for early use of the bow and arrow in southern North America, at least as early as the Late Archaic time period.

It should be noted that standard types of bifacial arrow points were sometimes made in an essentially unifacial manner (Cox and Smith 1989: Table 1). Unifacial examples of standardized arrow point types, such as Perdiz, generally have pronounced thinning flake scars on one face, and are completely shaped to the standard form. Therefore, unifacial arrow points made with marginal retouch, which is the subject of this article, are different from standard types of arrow points that sometimes do not have much thinning on the second face.

Examples of early unifacial arrow points found in Southeast Texas are similar to arrow points used throughout the Eurasian Mesolithic period, such as illustrated by Clark (1977:112) and Odell (1978). Unifacial, marginally retouched arrow points of the Eurasian Mesolithic are part of what Clark (1977: Table 5) describes as the Mode 5 lithic stage with microlithic components, involving

small prismatic blades. This Mode 5 lithic technology entered the New World from Northeast Asia early in the Holocene period (Tolstoy 1975), with microlithic inserts used for arrow points at sites such as Trail Creek in Alaska (Larsen 1968:54). The bow and arrow, associated with microlith components, occurred in Northeast Asia as early as the Late Pleistocene (Chard 1974:37). Microblade technology, probably accompanied by the bow and arrow, diffused southward in North America from the Arctic, and can be found in southern North America in the Late Archaic period (Hester 1976: Fig. 13-5; Patterson 1973).

Story (1990:248) has noted that I am the only investigator to propose early use of the bow and arrow in Southeast Texas, before the Late Prehistoric period. Since unifacial arrow point specimens, made as marginally retouched flakes and small blades, are fairly common in Southeast Texas, other people seem not to have found early unifacial arrow points simply because they have not looked. Analytical criteria for the identification of arrow points made as marginally retouched flakes are given in this article. Some examples of this artifact type are illustrated in Figure 1.

Identification of unifacial arrow points

Many archeologists have experience only in the identification of various types of bifacial projectile points, which are usually obvious in lithic collections. Unifacial arrow points made as marginally retouched flakes are usually not obvious in lithic assemblages, however, and greater effort in analysis is required to identify this type of artifact. The following are analytical criteria for the identification of marginally retouched arrow points:

1. Purposeful Retouch It is generally necessary to use a 10-power magnifier to identify purposeful fine marginal retouch, to distinguish between unifacial arrow points and fortuitously pointed flakes. As with arrow points of the Eurasian Mesolithic, early unifacial arrow points in Southeast Texas are usually not retouched on all flake edges. Some examples of retouch on unifacial points are shown in Figures 2 and 3. Specimens in Figure 2A,B are from site 41FB223 (Patterson et al. 1994: Fig. 4). The specimen in Figure 2A has uniform marginal retouch along the left lateral edge. Little retouch was needed on the right lateral edge to form a uniform point. The specimen in Figure 2B is a similar example, with uniform marginal retouch on the left lateral edge and some retouch on the right lateral edge at the point tip. A specimen from site 41WH73 (Patterson and Hudgins 1992) is shown in Figure 2C. The point tip is bifacially retouched, and there is some unifacial marginal retouch on both faces at different edge locations.

2. Specimen Shape A marginally retouched flake must have an appropriate shape to function as an arrow point, including a fairly symmetrical pointed tip, and a basal area of suitable shape and thickness to allow easy hafting. Flake graters in this region have unifacially retouched pointed tips, but would not be confused with arrow points because graters are usually made on irregularly shaped flakes. In contrast, some specimens with symmetrical shapes that have been classified as perforators may have actually functioned as arrow points (Gibson 1976). Specimens shown in Figure 3 for sites 41WH19 (Patterson et al. 1987) and 41HR5 (Patterson notes) leave little doubt that arrow points made as marginally retouched flakes were used in Southeast Texas.

3. Weight and Thickness Standard bifacial arrow point types in Southeast Texas usually weigh less than 2.3 grams and have thicknesses under 5 mm (Patterson 1985). All specimens that I have classified as marginally retouched unifacial arrow points in Southeast Texas fall within these metric limits. An arrow point must be small to maintain balance of the arrow.

4. Evidence of Hafting Arrow points are hafted on shafts for use. Evidence of hafting of a specimen can be in the form of basal shaping and/or use of an adhesive for hafting. Specimens shown in Figure 3 have short stems. The unifacial point specimen shown in Figure 4A, from site 41WH73 (Patterson and Hudgins 1992), has both basal shaping for a stem and remaining asphalt

on the basal area. Asphalt was often used as an adhesive to haft projectile points in this region. The specimen shown in Figure 4B is a pointed flake with little retouch, but with remaining asphalt on the basal area. This specimen is from site 41HR210 (Patterson 1975), and has a shape similar to one typical arrow point shape from the Eurasian Mesolithic (Clark 1977:112).

5. **Impact Fractures** Odell (1988, 1994) has used evidence of types of impact fractures (Odell and Cowan 1986) to identify flake specimens that were used as arrow points. The specimen shown in Figure 4A has definite evidence of impact fracture, as well as evidence of hafting. Specimens with impact fractures from site 41HR5 (Patterson notes) are shown in Figure 5. I am making additional studies of impact fractures on unifacial arrow points for sites in Southeast Texas, such as for site 41HR184 (Patterson n.d.).

Transition to bifacial arrow points

I have proposed (Patterson 1982, 1992) that recognized bifacial arrow point types represent the standardization of technology after earlier use of unifacial arrow points. There are several possible advantages for the use of bifacial arrow point forms. Bifacial flaking allows use of a wider variety of flake blank shapes than can be used with unifacial marginal retouch. This may have been especially important when scavenged flakes from earlier sites were being used to make arrow points, since selection of flake shapes would have been limited. Also, bifacial flaking permits good shaping of stems for hafting. Sharp shoulders on bifacial arrow points may have had some advantage in causing animal bleeding for better hunting results.

It may be possible to form sharper point tips by bifacial retouch than by unifacial retouch. However, experiments by Odell and Cowan (1986) do not show much difference in penetration for unifacial and bifacial arrow point forms. Both unifacial and bifacial arrow points were efficient for hunting.

Summary

Criteria have been given for the identification of unifacial arrow points made as marginally retouched flakes. This type of artifact is fairly common in Southeast Texas (Patterson 1992: Table 1). Other investigators are encouraged to look for early unifacial arrow points in lithic collections from prehistoric sites in Texas, and other parts of southern North America as well.

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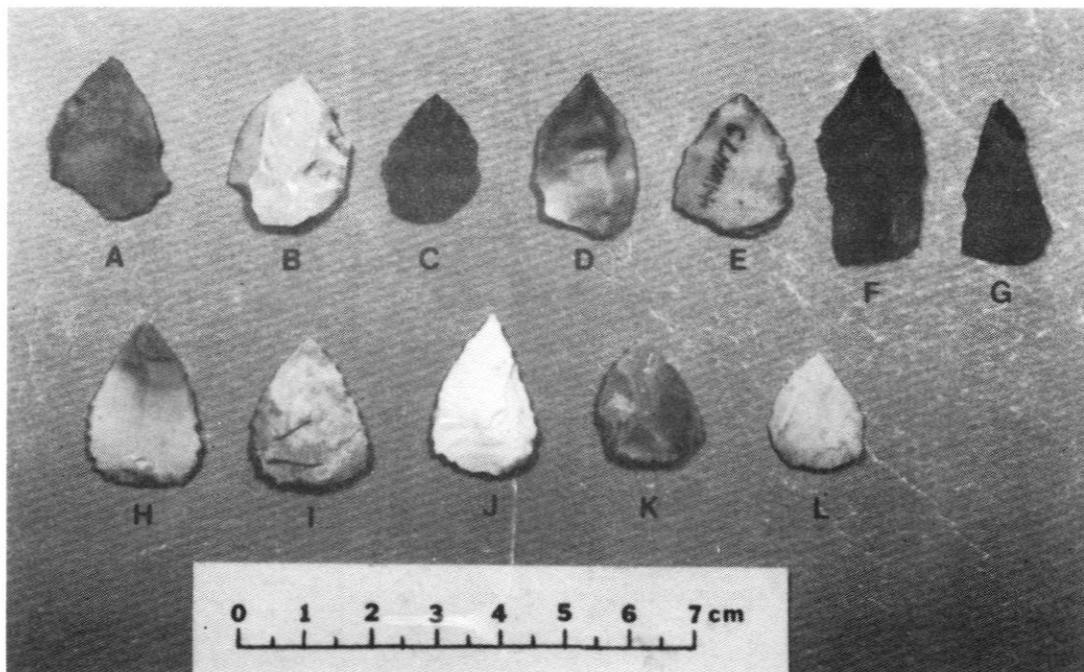
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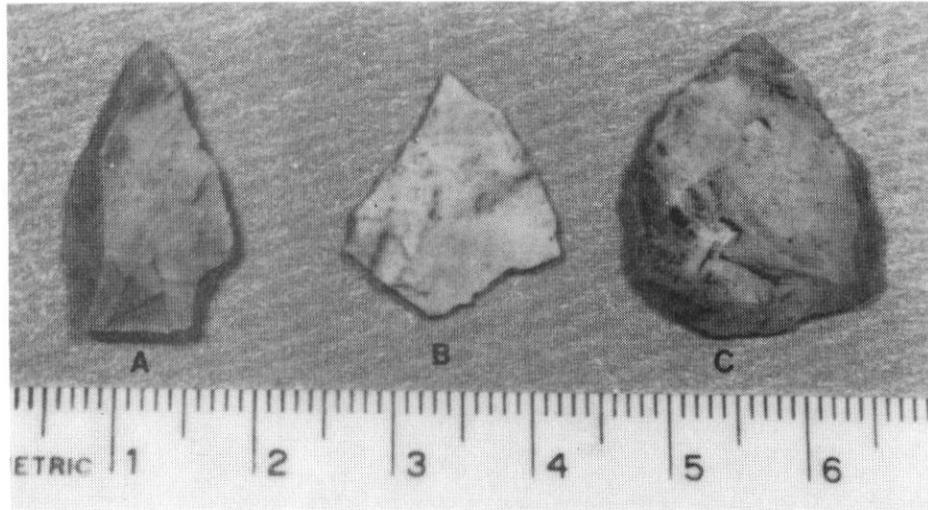
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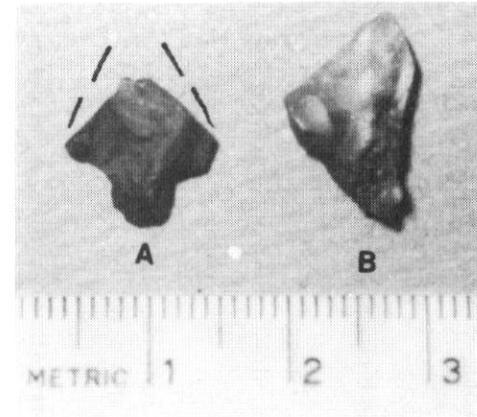
A,B,C,D - site 41HR315; E - site 41WH73; F,G - site 41HR184;
H to L - modern replicates for comparison

Figure 1. Arrow Points on Marginally Retouched Flakes



A,B - site 41FB223; C - site 41WH73

Figure 2. Unifacial Arrow Points



A - site 41WH73; B - site 41HR210

Figure 4. Unifacial Arrow Points with Asphalt on Base

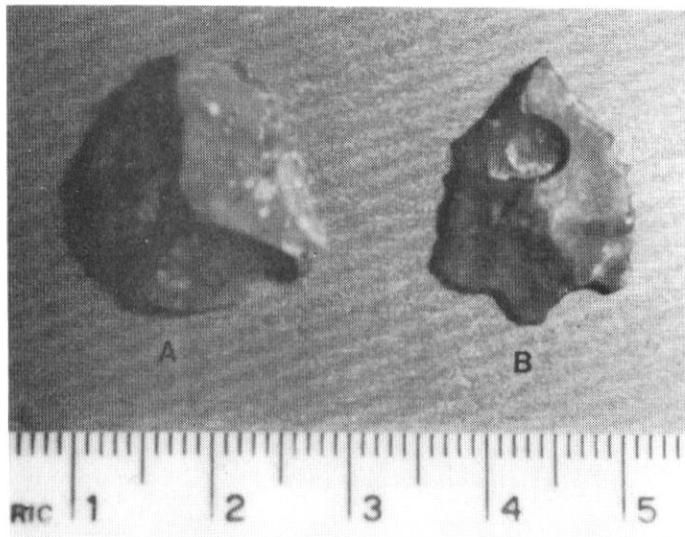


Figure 3. Unifacial Arrow Points, Sites 41WH19 and 41HR5

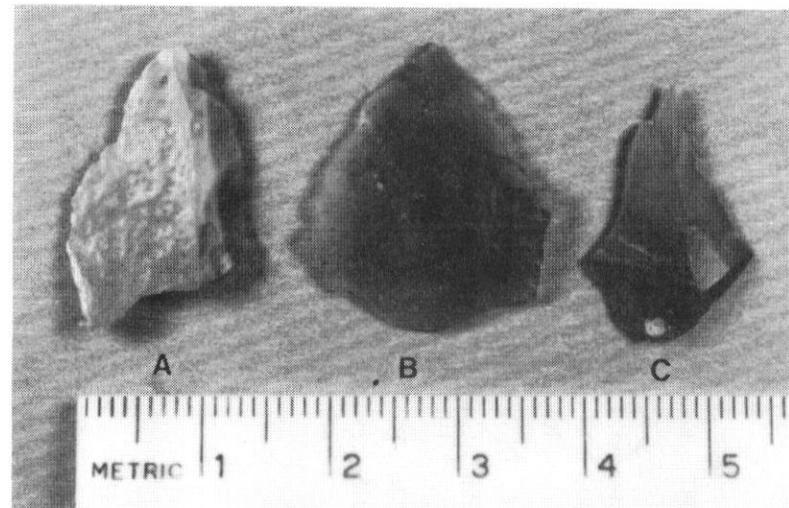


Figure 5. Unifacial Arrow Points with Impact Damage, Site 41HR5

Book Review

Domestic Animals and Stability in Pre-State Farming Societies,
by Carol Raish. B.A.R. Internat. Series no. 579. Hadrian Books, 122 Bamburg
Road, Oxford, OX 27 BP, England. 89 pp., 3 figures, 7 tables. 1992

L. R. Binford encouraged Carol Raish to do a Ph. D. thesis at the University of New Mexico to study a pattern from a generalist approach. Raish studied 11 archaeological sequences with large domestic animals and five without. For each sequence, she determined the time at which village farming (tribal level) began, and the time at which the state level was attained. She subtracted the two dates to determine the time duration required for this increase in complexity. Her Table 2 has the following durations in years: Central Europe 6200, Southeast Europe 6200, Greece 5000, Anatolia 4600, southern Britain 4000, northern Mesopotamia 3660, Peru 3650, northern China 3150, Pakistan 3030, Upper Egypt 2400, southern Mesopotamia 3660, Tehuacan Valley 1750, Basin of Mexico 1400, Valley of Oaxaca 1400, Cahokia 1073, Chaco Canyon 800. She takes the conservative view that Cahokia did not quite reach the state level before collapsing around A.D. 1350-1400. Chaco Canyon was marginal in terms of growing season and rainfall, and was abandoned about A.D. 1300. Peru is the only New World area with large domestic animals.

The pre-state farming sequence is shorter in the New World than the Old. This pattern has never been examined before.

Her Group N2 (11 areas, including Peru) had large animals, and Group N1 (five New World areas) did not. There is no overlap in durations between the two groups. In the null hypothesis, the group separation is artificial, and domestication of large animals is irrelevant to the time required. Statistical analysis rejects the null hypothesis. She theoretically proves not only that large domestic animals affect the time required to increase complexity to the state level, but that it works in a direction contrary to intuition: animals slow it down! Raish remarks that factors other than large domestic animals likely affect the time span, but proves that animals are a contributing factor to the extent of slowing it down.

She concludes that animals give stability and security. Without them, the food base is unstable, making society as a whole unstable. A society that is dependent on horticulture and has no sheep, cattle, goats, pigs, or camelids apparently compensates by increasing complexity toward the state level rapidly. In contrast to lives of big men and dates of battles, this stuff is the meat of history!

Collapse of Indian sites and cultures reminds me of wasp nests in a forest. When one ends, the forest is unchanged. The difference is that the new sites and cultures start from a higher developmental base. It is difficult to imagine serious discussions of causes of collapse of sites or cultures ignoring this study.

When Binford speaks, I listen. This book pulls together a lot of important data on 16 of the most interesting archaeological areas. It strikes me as a uniquely valuable study of the Neolithic Revolution. Every H.A.S. member would enjoy it and find it provocative. The library was able to borrow a copy for me from Texas A&M; after reading it, I asked the Friends of Fondren to try to get a copy for Rice. It is a shame that such a great book is so hard to find!

Thomas C. Williams