LA TIERRA

JOURNAL OF THE SOUTHERN TEXAS ARCHAEOLOGICAL ASSOCIATION

July 1985

Volume 12, Number 3

THE SOUTHERN TEXAS ARCHAEOLOGICAL ASSOCIATION

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

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LA TIERRA

Quarterly Journal of the Southern Texas Archaeological Association

Volume 12, Number 3 | Jimmy L. Mitchell
July, 1985 | Editor

Cover Illustration: A Face from the Lower Pecos. A Late Archaic man from one of the Shumla Caves of Val Verde County, Texas, as reconstructed by artist Betty Gatliff. See Roberta McGregor's article in this issue. (Drawing by Jim and Heidi Mitchell.)

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Library of Congress Catalog No. 76-649774

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

All contributions to this Non-Profit organization are tax deductible.

EDITORIAL

BELL VERSUS ANDICE: FURTHER COMMENTS

Weber and Patterson's article, "A Quantitative Analysis of Andice and Bell Points" in the last issue of this journal raises some interesting and important issues relating to how we use and study point types. Their data indicated that there were significant differences between the two point types only for stem length and maximum thickness; in all other attributes, the two groups of points were remarkably similar.

Since the examples studied were selected for their differences (to represent the two "types"), we would expect some statistically significant differences. But the real question may not be one of just technological or morphological class of point. Weber and Patterson point out that Calf Creek points from Oklahoma and Missouri are also similar; others (cf. Parker and Mitchell 1979; McKinney 1981) have suggested that Charcos points from Mexico may also be related.

Weber and Patterson assert in a recent letter that current typologies "may have been artificially extracted from the extremities of a morphological and cultural continuum" By selecting examples for study, we may be focusing on minor differences and not seeing the underlying commonality of technology andmorphology.

To test this idea (a continuum versus discrete types), these researchers need your help. They need to locate additional examples of Bell, Calf Creek, Charcos, and Andice points, as well as specimens which are mixtures (or intermediate) between such "types." This is an important piece of research which has considerable implications for how we think about and study prehistoric points. If you have any such specimens, please contact either Carey Weber or Lee Patterson and help them collect data which can resolve this issue.

THE EDITOR

NOTES ON SOUTH TEXAS ARCHAEOLOGY: 1985-3

Thomas R. Hester

Form and Function: Hand Axes, Fist Axes and Butted Knives

Early in the history of archaeology, a great deal of attention was paid to heavy, pointed, and crudely chipped stone tools commonly called "hand axes." The discovery of these specimens in association with extinct animals figured prominently in the acceptance of human antiquity in an otherwise unbelieving world. Even today, among the best known stone tools are the hand axes of the Acheulean tradition in the European and African Paleolithic.

In late 19th century American archaeology, some enthusiasts began to write of an "American Paleolithic" based on the discovery of similar specimens in New Jersey. A debate ensued, put to rest finally through the work of W. H. Holmes of the National Museum of Man. His systematic studies of East Coast lithic quarries clearly demonstrated that the American "hand axes" were quarry blanks--early stages in biface manufacture. Here, then, is a case where form (i.e., the European Paleolithic hand ax) had nothing to do with the antiquity of almost identical specimens in another part of the world.

In another vein, the term "hand ax" became entrenched in the literature. It was a hand ax because it looked like a hand ax--perfectly shaped for the large end to fit in the human palm and then to chop away (on something) with the pointed end. Little attention was paid to this functional tag for many decades in Paleolithic research. A study by Kleindienst and Keller (1976) reviewed the situation, especially in regard to the motor skills of early hominid hand ax use, and concluded that there was still no evidence as to just how these tools were used. Doubtless such implements may have been used for cutting, butchering, scraping, digging, and, of course, chopping--sort of a Paleolithic pocket knife. An experiment in 1978 showed that a hand ax might be thrown, discus-like, as a projectile weapon (O'Brien 1984). Paleolithic specialists have not rallied around these results!

In various parts of the New World, artifacts of hand ax form have been found. For example, I studied a lithic collection from Tierra del Fuego (Chapman and Hester 1975), and it contained an artifact clearly of hand ax form (Figure 1,c). Upon analysis, however, heavy dulling and use was noted on the sides (Figure 1,d), not at the tip. The tool was used in heavy cutting and sawing activities, not as a chopper or hand ax.

In central and southern Texas, archaeologists have for years recognized a specimen of hand ax form in the Late Archaic (Turner and Hester 1985:203). J. E. Pearce (1935) called them "fist axes" and noted the similarity in form to specimens in Europe. This label stuck for almost 40 years, until Sorrow (1968) noted wear on the tips of the specimens that suggested knife-like use ("could easily be attributed to cutting of plants") and coined the term "butted knife." In that same year, J. B. Sollberger (1968) noted a "high gloss shine" on Central Texas fist axes and suggested they were used as "carcass cleavers," in mammal butchering.

It is clear, no matter what term one uses, that the Late Archaic tools (Figure 1, a,b) are not "fist axes." They often have elegantly chipped blades, with thin and finely retouched distal tips. Any ax-use would shatter the tool. Further, one can observe, even with the naked eye, a distinctive polish on the tips of many of these specimens. This glossy polish extends up both faces of the blade at times, sometimes seen on old facets after the tool has been resharpened. This kind of polish is usually linked to the cutting of meat--perhaps to be expected on a tool used for butchering a large animal, likely either deer or bison (the bones of both being common in Late Archaic sites in Central Texas). However, this is only speculation, for to my knowledge, there has never been a detailed microscopic wear pattern analysis, one that should be

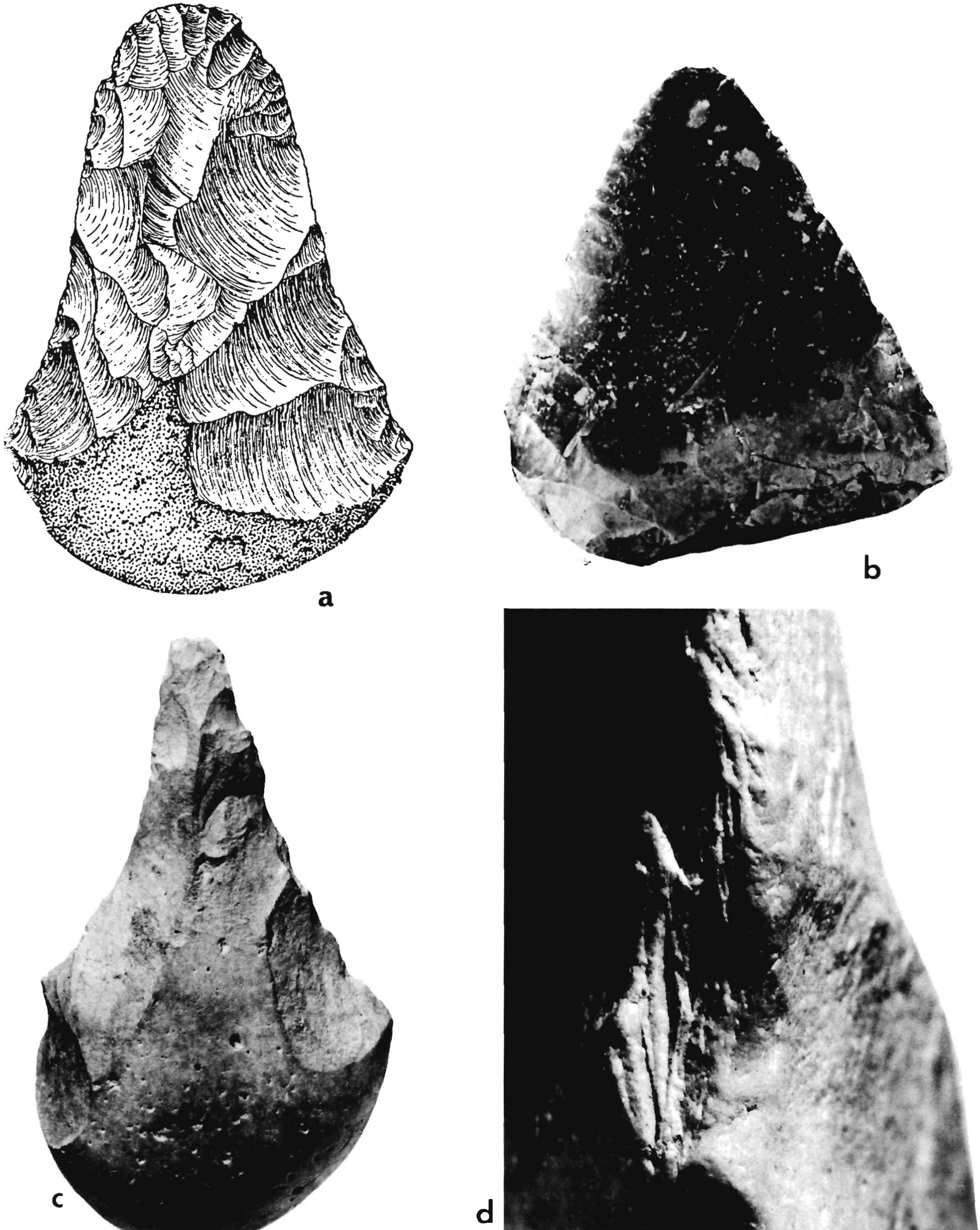

Fig. 1. a, "butted biface" from Central Texas (drawing by K. Roemer, courtesy of Turner and Hester 1985:203); b, "fist ax" from 41 UV 37, Uvalde County, published by T. R. Hester, Plains Anthropologist 15:245, 1970); c, "butted knife" from Tierra del Fuego (Chapman and Hester 1975) with dulled areas indicated on tool edges; d, X4 magnification of dulling on one tool edge. Specimens a, b, and c illustrated actual size.

accompanied by replicative experiments. There are abundant samples of these tools in archaeology labs and in private collections. This is clearly a study that needs to be done.

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COMPARATIVE ECOLOGIES: THE TEXAS CHAPARRAL VERSUS THE AUSTRALIAN OUTBACK

Grant D. Hall

THE SOUTH TEXAS BRUSH COUNTRY

Southern Texas is a brush-covered, low relief region characterized by a semiarid climate producing hot, humid summers and mild winters. Major components of the brush community include mesquite (Prosopis sp.); several acacias (blackbrush, A. amantacea, guajillo, A. berlandieri, huisache, A. farnesiana, and catclaw, A. greggi); a variety of cacti (most importantly prickly pear, Opuntia lindheimer); live oak (Quercus virginiana); spiny hackberry (Celtis pallida); Texas persimmon (Diospyros texana); Texas ebony (Pithecellobium flexicaule); whitebrush (Aloysia ligustrina); cenizo (Leucophyllum frutescens); and guayacan (Parlieria angustifolia). Pecan trees (Carya illinoinensis) also grow along some of the creeks and rivers of the area. With only two or three exceptions, these species produce seeds, beans, or fruit in abundance at certain times of the year. Such floral products are a major source of food for wildlife (Everitt and Alaniz 1981). The above major components of South Texas plant communities are understoried by a wide range of grasses, shrubs, and other plants yielding seeds, fruits, foliage, and/or tubers (roots), many of which also serve as food sources for wildlife and cattle (Lehmann 1975).

HOW THE BRUSH COUNTRY CAME TO BE

The present widespread and, in some cases, incredibly dense coverage of the landscape by brush species in South Texas is a comparatively recent phenomenon. Early Spanish explorers and later Anglo-European settlers have left records describing a land that was much more open (Weniger 1984:60-61, 142-144). Prairies and savannahs were extensive, and brush was confined to drainages and rocky or otherwise soil-poor zones (Inglis 1964).

The spread of brush species throughout South Texas has been attributed, in part, to the introduction of horses and cattle to the region in early historic times. Reflecting the richness and extent of grasslands in South Texas, livestock that escaped the Spaniards in the earliest years of exploration and colonization proliferated into vast, untended herds that ran wild in an unfenced domain (Kilgore 1983). For nearly 300 years, these herds grew and laid waste to the prairies through overgrazing. In the 1800s, sheep were introduced and caused even more widespread decimation of the grasslands.

Range managers have found that each time a pasture is overgrazed by livestock, up to 50% of the soil's available nitrogen content is depleted (Felker 1982). Nitrogen contained in grass eaten by livestock becomes volatilized and is released into the atmosphere from the animals' manure. After overgrazing a pasture two or three times, the herds effectively eliminated the available nitrogen in the soil, an element upon which the grass species were heavily dependent for vigorous growth. Lacking nitrogen, the grasses were unable to compete with the brush species, many of which have the ability to "fix" or draw nitrogen from the atmosphere and were thus able to move into the nitrogen-poor areas vacated by the grass. Livestock assisted in this process by ingesting seeds of brush species and then excreting seed-filled manure in areas previously supporting grasses.

Unchecked range fires may also have aided in the maintenance of prehistoric grasslands (Harris 1966). Firing caused either by natural processes or set intentionally by humans (Campbell and Campbell 1981:17) would have benefited the prairies by selectively retarding growth of brush species. Elimination of aboriginal populations and the control of range fires in historic times greatly reduced the contribution of fires in controlling brush spread.

EVIDENCE FOR BRUSH SPECIES IN PREHISTORY

Identifications of carbonized wood samples recovered from recent archaeological excavations in South Texas (Hall, Black and Graves 1982; Black MS) have demonstrated that certain major components of the modern brush community were present in the region at least as far back as 3,000 years ago (Dering 1982; Jones MS). Such samples include mesquite, acacia, and persimmon.

Rockshelters and caves in regions immediately bordering southern Texas--the Trans-Pecos to the west and Tamaulipas to the south--contain deposits in which perishable residues of prehistoric human activity are extremely well preserved. Macrobotanical remains (MacNeish 1959; Irving 1966) and the contents of human coprolites (Bryant 1974; Williams-Dean 1978; Stock 1983) provide convincing evidence for: 1) the local existence of a wide variety of brush species in prehistoric times, and 2) the aboriginal usage of products from some of these brush species as food. Comparing the South Texas situation to those of the Trans-Pecos and Tamaulipas, the immediate proximity of the regions, their similar climates and plant communities, and the generally comparable lifestyles of prehistoric inhabitants are significant factors. These similarities permit the surmise that prehistoric people in southern Texas were relying on many of the same plant products as sources of food.

CABEZA DE VACA'S OBSERVATIONS

The archaeological record in South Texas is augmented by limited, but tantalizing ethnohistoric data. The most important information was left by Cabeza de Vaca, the resilient Spaniard who was shipwrecked on the Texas coast in the early 1500s (Campbell and Campbell 1981). He spent several years with various bands of coastal Indians, including groups that ranged over South Texas. He mentions many of the animals represented in modern archaeological faunal assemblages as having been prey to the people he lived with. Cabeza de Vaca also noted that the native populations of the region relied heavily during the summer months on fruit produced by the prickly pear cactus (Opuntia lindheimeri). Consumption of mesquite beans, ebony beans, and other unspecified "seeds" is documented. The people were also eating roots. As Campbell and Campbell (ibid:18) note:

> Roots of unidentified plants were an important source of food during the winter months, when many other foodstuffs were not available. Cabeza de Vaca says that the Mariame could not have survived in winter without roots. "Two or three" kinds of roots were dug by women. Plants with edible roots were thinly distributed, hard to find, and difficult to dig out. It is said that women searched areas around an encampment for distances of two or three leagues (five to eight miles), beginning the search at daybreak. Roots were cooked for two days in some sort of oven, probably a shallow pit oven. Women spent considerable time each night preparing ovens for baking roots. Some roots are described as being very bitter and causing the abdomen to swell.

Later Spanish settlement of northern Mexico and southern Texas brought death to many native inhabitants and drastic changes in traditional lifeways of the survivors. Most later chroniclers did not have benefit of Cabeza de Vaca's keen eye for detail or intimate knowledge of aboriginal habits. As a consequence, little additional ethnohistoric data useful to the problem considered here is presently available for South Texas.

PREHISTORIC ABORIGINAL SITES IN SOUTH TEXAS

There is archaeological evidence for the presence of humans in South Texas extending back almost 12,000 years in time (Hester 1980). During this entire span, the data indicate that aboriginal groups survived as highly mobile hunters and gatherers. The sites bearing evidence of prehistoric aboriginal settlement activity are open, that is, there are no caves or rockshelters in the region. Through time, the humid climate and mechanical and chemical action of the soils on physical remains in these open sites have had the combined effect of reducing vestiges of human activity to an assemblage of stone, bone, shell, and carbon. Within this array, stone (chert tools and debitage, sandstone grinding implements, and hearth stones) and shell (from mussels and land snails) are far more commonly preserved than bone and carbon. Nevertheless, the recovery and identification of animal bones from a number of sites has provided substantial information concerning the kinds of animals that the people were hunting or catching for meat food. The shells of mussels and snails supply evidence of additional easily gathered meat food. As previously mentioned, carbonized plant remains identified as mesquite, acacia, and persimmon have recently been recovered from archaeological deposits in South Texas. Recognition of these species as having existed in the region's prehistory does not prove whether or not people were actually using mesquite or acacia beans for food, simply that they were available as a potential food resource. However, another indirect line of evidence indicates the utilization of plant foods by prehistoric people in South Texas in the form of numerous sandstone grinding slabs and manos found on many of the sites. Research has thus far not revealed any direct evidence of what was being processed on these slabs.

THE PROBLEM

Studies of contemporary hunter-gatherer groups living in temperate and tropical climates have shown that plants provide between 60 and 70% of the foods eaten (Lee 1968:30-48).

The various lines of evidence discussed above all point to the conclusion that the prehistoric inhabitants of South Texas also relied extensively on plant foods for their subsistence. Yet, the archaeological record in South Texas only provides us with some lumps of carbon and grinding implements as indirect, but nevertheless tangible, evidence of plant food exploitation. Given the ethnographically demonstrated importance of plant foods to certain hunter-gatherer groups, the extent of such floral exploitation and its archaeological recognition loom as current and extremely important problems in ongoing study of South Texas prehistory. Future progress in interpretation of prehistoric lifeways in southern Texas will be heavily dependent on the extent to which methods can be developed for identifying the floral food products exploited by the region's aboriginal inhabitants.

In hopes of discovering some profitable directions for future research with respect to this problem in South Texas, we might review a portion of the extensive archaeological, ethnohistoric, and ethnographic literature concerning the aboriginal populations of Australia. These data are particularly appropriate for study because of general similarities in: 1) climate; 2) kinds of plants exploited; and 3) the particular lifeways of the hunter-gatherers who occupied arid portions of the Australian continent. Hunter-gatherer adaptations in the American Southwest and in south Africa are also equally relevant to the South Texas situation, but are not considered here.

THE AUSTRALIAN PARALLEL

Around the world from Texas, the great island continent of Australia offers a remarkably diverse range of climates and landform settings (see Figure 1).

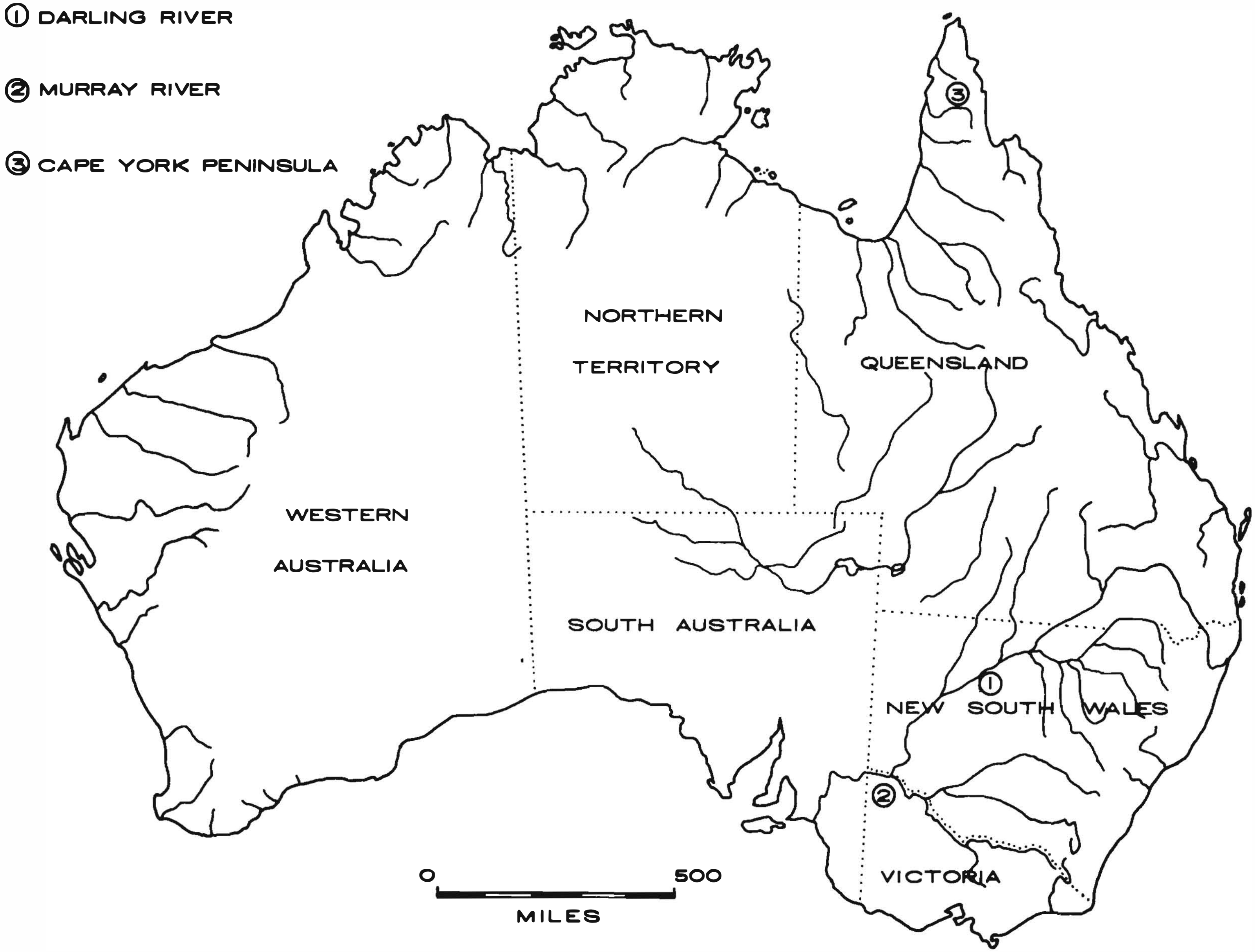

Figure 1. Archaeological areas in Eastern Australia.

The continent was peopled at least as early as 40,000 years ago. Australia's first settlers--the Aborigines--and their descendents existed throughout this lengthy timespan as hunters, fishers, gatherers. Their material culture was limited, but obviously effective and well adapted to the lives they led. Several types of chipped or ground stone tools, digging sticks, spears, hafted adzes, and various carrying devices were among the most important tools they possessed (Mulvaney 1975; Flood 1983).

Two hundred years ago, the initial settlement of Australia by Europeans occurred. As was so often the case elsewhere in the world, European contact had a devastating impact on the indigenous populations of Australia. Through introduction of new diseases, usurpation of territory, and outright slaughter, the Aborigines were terribly reduced in numbers. Nevertheless, active and observant early explorers and settlers left a wealth of ethnographic detail concerning the lifeways of the Aborigines in early contact times. Further, certain of the surviving aboriginal groups continued to live by traditional means and thus preserved knowledge of their cultures for the future.

In this study, a selective review is made of available literature dealing with specific aspects of Australian aboriginal plant food exploitation. Keeping in mind the particular problems outlined for South Texas, special attention will be given to information concerning utilization of acacia seeds, roots and tubers, and grass seeds. Methods of collecting and processing these products and the possibilities for their visibility in the archaeological record will also be considered.

ROOTS, TUBERS, AND SEEDS

A comprehensive study entitled "Aboriginal Habitat and Economy" by Roger Lawrence (1969), provides a wealth of information concerning aboriginal subsistence pursuits over four general areas of eastern Australia. The information presented was gathered from a wide variety of published and unpublished records. The areas include an arid to semiarid mid-continental zone incorporating the western half of South Australia and much of the Northern Territory. In terms of its climate and general vegetational patterns, this region of Australia most closely parallels conditions in South Texas. Two other areas studied by Lawrence incorporate all of New South Wales and the interior reaches of southern Queensland. The fourth area is the Cape York Peninsula.

For the dry region of central Australia (South Australia and the Northern Territory), the records show that the Aborigines were harvesting seventeen kinds of roots or tubers, eighteen varieties of acacia seeds, and thirty other kinds of seeds (ibid.:76-82). Roots and tubers were unearthed with digging sticks. Some could be eaten raw, but most were processed by roasting and/or pounding before being eaten. Lawrence (ibid.:49) cites Strehlow (1965:125) in a report "that 19 Ngalia people remained at the one camp in the sandhills for many weeks and their protruding stomachs indicated that they had been living largely on the yam of Ipamoea costata for several months." Records show that the various acacia seeds were roasted or parched and then ground into a meal or flour. The smaller seeds of shrubs and grasses were collected in novel ways. Bird excreta containing the seeds might be gathered up. Branches or stems of the plants bearing seeds were broken off and placed on hard, dry clay pans where beating released the seeds which were then scooped up. Certain other seeds were collected by ants and concentrated around nest entrances where they could be more easily picked up in large quantities. Husking, winnowing, parching or roasting, and grinding were methods of processing smaller seeds. The resulting flour might be eaten as a paste or made into cakes that were cooked on a fire (Lawrence 1969:80-82). Other items of the material culture probably involved in the collecting and processing of roots and seeds included vegetable- and fur-twine bags, wooden dishes, baskets, and wallets of skin and bark. "Grindstones were seen in many camps and consisted of sandstone slabs or similar material. They were evidently not transported from camp to camp when the occupants moved" (ibid.:66).

Another area studied by Lawrence was the region of southeastern Australia drained by the Darling, Lachlan, Murrumbidgee, and Murray Rivers. The aboriginal groups living along these rivers were oriented much more to exploitation of aquatic resources than were people in central Australia. There appears to be less reliance on roots and seeds as food sources. Lawrence's tables show greatly reduced numbers of these products for the region. The processing methods and tools used in harvesting and preparation are not substantially different from those described above for central Australia.

PALM NUTS AND "THE BASIC LEACHING TECHNOLOGY"

In the coastal regions of southeastern Australia and on Cape York in northeastern Australia, Lawrence's study shows that numerous roots and tubers were exploited, but not quite as many seeds were utilized. Relative to the vegetable foods they relied upon, the Aborigines living in these two regions were distinguished by the ability to detoxify a number of roots, seeds, and nuts that would otherwise have been inedible. In southeastern Australia, Macrozamia palm nuts required careful detoxification before they could be eaten. In Cape York, a variety of plant products required elaborate processing. Included among these were nuts of the cycad palm (Cycad media), the Moreton Bay Chestnut (Catanospermum australe), the matchbox bean (Entada scandens), and portions of mangroves (Brugnieri rheedii and Avicennia officinalis). As Lawrence (1969:166-167) notes:

> The preparation of these involved various sequences of cooking by roasting, steaming or boiling, breaking up by cutting, grating or crushing, and leaching by washing. The preparation of the Matchbox Bean was evidently so arduous, in relation to the results produced, that it was regarded more as a stand-by than a staple. However, this and the fruits of the Pandanus were important because they served to tide the natives over lean periods when other food was unprocurable.

In a detailed study of cycad exploitation, Beaton (1982) notes that evidence of cycad usage has been traced back as early as 4,300 years ago in archaeological deposits of a rockshelter in Queensland. Recognizing the value of the methods permitting human consumption of otherwise toxic food substances, Beaton (ibid.:56) states:

> ...I ask is there such a thing as a tool we might term the Basic Leaching Technology? Are the complex leaching/drying/fermenting techniques for cycads only permutations of this fundamental tool which may be adjusted to fit prevailing availabilities in the environment? If so, then the leaching tool and knowledge of how to correctly use it would be an important addition to the hunter-gatherer tool kit, like the addition of a new set of weapons.

Beaton goes on to discuss the adaptive benefits of leaching technology and suggests that the ability to make cycad nuts edible is what allowed large congregations of Aborigines to convene in northeastern Australia at certain times of the year.

AQUATIC ROOTS

Gott (1982), in an article entitled "Ecology of Root Use by the Aborigines of Southern Australia," discusses a number of aquatic and terrestrial roots commonly considered sources of food to the Aborigines. Plants studied include, from wetlands, the marsh club-rush (Scirpus medianus), water ribbons (Triglochin procera), and the bulrush (Typha domingensis). Commonly exploited dryland species were murnong (Microseris scapigera), orchids (Orchidaceae), cinnamon bells (Gastrodia sesamoides), greenhoods (Pterostylis sp.), and Austral bracken (Pteridium esculentum). Gott makes several interesting observations concerning plant foods and their use by the Aborigines. She notes (ibid.:60): "If a plant has been found to be edible, it could have been eaten.... The assumption that if one species of a genus is edible then other species of that same genus will also be edible should be treated very cautiously, since some genera...contain both edible and poisonous species." Gott suggests that root plants should be thought of as "staple foods" due to their high carbohydrate content and their tendency to be available for a greater length of time each year than are most other plant products. The beating of bulrush (Typha) rhizomes after cooking serves to release nutritious starch from the fibrous matter inside the root (ibid.:61). This, in addition to a tenderizing function, may explain why pounding was a common processing step in the preparation of roots for human consumption.

MURNONG, EARTH OVENS, AND FLATULENCE

Another article by Gott (1983) is devoted exclusively to "murnong" (Micorseris scapigera), also called the "yam" or "yam daisy." Murnong has a small, edible tuber that was heavily exploited as a food source by the Aborigines. Prior to the introduction of livestock by the Europeans, murnong grew profusely over many areas of southeastern Australia. The tubers grew at shallow depth in loose soil and were thus extremely easy to gather. Cattle and sheep have grazed the species almost out of existence. Gott (ibid.:9) quotes three early accounts of how murnong was prepared. By one technique, the tubers were baked in a hole in the ground. Backhouse (1843) gave the following account:

> These roots are cooked by heating stones in the fire and covering them with grass, laying the roots upon the grass, and a covering of grass upon them, and lastly, one of earth over the whole. When roasted...are said to be sweet, and are very delicious.

In another cooking process, the tubers were placed in rush baskets that were then put into "ovens" overnight. Gott (1983:9) mentions that the ovens were used so frequently for preparing tubers that they came to be called "mirrn'yong mounds." Though murnong can be eaten raw, Gott proposes that cooking of the tubers served to make them more digestible for humans and allowed more of the nutritious components to be absorbed into the body. The following quote from Gott (1983:11) deals with the abdominal swelling in humans resulting from ingestion of root or tuber foods.

> Ingestion of tubers of Jerusalem Artichoke by Europeans is frequently responsible for the production of flatulence or cramps. Dredge (1839:9) noted the "large belly which all the native children have from their feeding continually on Paraam...Murnong, Gum, etc.". This flatulence indicates anaerobic breakdown of the inulin by colonic bacteria, with the formation of volatile fatty acids, which may then be absorbed in the colon, and thereby possibly contribute to energy requirements.

It will be recalled that Cabeza de Vaca observed such a condition among the Indians who ate cooked roots in South Texas. Gott (ibid.:11-12) speculates that aboriginal murnong harvesting techniques probably tended to promote the growth and spread of the plant. At any rate, thousands of years of murnong exploitation by the Aborigines apparently had no adverse impact on the survival of the species, but domesticated Old World animals almost eliminated it from the Australian scene in less than 200 years.

GRASS SEED HARVESTS--AN ARID-LAND ADAPTATION

Aboriginal use of grass seed as a food source in the Darling River region of southeastern Australia has been considered by Allen (1974). The Bagundji were among the people included in Lawrence's (1969) study and, as already discussed, were strongly oriented to food products provided by the river. As made apparent in Lawrence's survey, Allen (1974:313) observes:

> Seed collection in Australia is predominately an arid land adaptation (Meggitt 1964:30). In the collections of the State museums most grinding stones are from the dry interior, areas receiving a rainfall of 300 mm. or less. In well watered areas like eastern or northern Australia, plants were utilized more often for their fruits, nuts or tubers than for their seeds (Meggitt 1964:30).

Grass shoots bearing seeds were cut while the seeds were still green and then stacked in heaps. As the seed dried, it fell into concentrations below the stacks and could be more efficiently collected. The Bagundji stored grass seed in skin containers and wooden dishes. The seeds were ground on

> large flat stones with either a single or double depression. Grinding was generally done with water and the resulting dough was eaten raw or cooked in the ashes of a fire. During the seed harvest season the grindstones were carried by the women from camp to camp. At the end of the season they were left at a favorite camping ground (Allen 1974:315). Archaeological evidence indicates that seed processing was occurring as long ago as 15,000 years in the Darling Basin (ibid.:315).

IMPLICATIONS OF THE AUSTRALIAN DATA FOR SOUTH TEXAS

Relative to the problems concerning the character and extent of vegetable food exploitation among the prehistoric inhabitants of South Texas, the Australian ethnographic data provide certain useful insights. The Aborigines in any given region of eastern Australia relied upon a diversity of plant foods, but did not necessarily utilize every potentially edible plant product available in their area. There was a hierarchy to the plant food products with some being highly desirable and heavily relied upon when available. Other, less desirable plant foods were used mostly only in times when preferred foods were in short supply or unavailable.

The Aborigines used the seeds from a remarkable array of Acacia species. Most were roasted and ground before being eaten. In South Texas, the presence of four species of acacia in the modern brush community--all heavy seed producers--suggests a valuable and inexhaustible source of one kind of food to prehistoric humans. The fitness of these various acacia seeds for human consumption is presently unknown and must be determined. As Gott (1982) has warned, the edibility of products from one species in a genera does not automatically mean that products from other species in that same genera will be fit for human consumption. Extensive utilization of acacia products in Australia certainly does not permit the untested conclusion that South Texas Indians used them as well. The Australian data simply indicate that there is a strong possibility of acacia seed exploitation that, assuming absence of toxic substances either naturally or after rudimentary processing, the South Texas peoples would probably have taken advantage of.

The Australian ethnographic data show that the Aborigines relied extensively on certain roots and tubers as a food source in all areas of eastern Australia. Some of these products could be eaten directly from the ground, but it was more commonly the practice to toast and/or pound roots and tubers before they were eaten. Researchers in Australia indicate that there are three reasons for this process. These include improving palatability, eliminating toxins, and freeing nutritive substances that might not otherwise be absorbed in the human digestive tract. The abdominal swelling noted by Cabeza de Vaca among the root-eating Indians of South Texas is apparently a common condition. The symptoms are recorded in the Australian ethnographies and Gott (1983) indicates that the swelling is a natural by-product of the human digestive process. The range of tubers and roots used by the Aborigines suggest that virtually all types of underground plant parts available in South Texas must be considered as potential sources of human food until such time as they are determined to have toxic properties that can't be eliminated by roasting, pounding, and/or leaching.

Grass seeds were another food source heavily exploited by the Australian Aborigines. The highly imaginative techniques used by the Aborigines to efficiently gather small grass seeds is instructive. Assuming that grasslands were more extensive in prehistoric South Texas, grass seed is certainly a resource that should be taken into serious consideration as an important food to the region's prehistoric people.

An extremely important lesson taught by the Australian Aborigines is that roots or seeds cannot automatically be classed as unfit for human consumption because they contain toxins or unpleasant qualities in their natural state. The Aborigines have shown a remarkable aptitude for removing toxic substances from such food sources. Cycad and Macrozamia palm nuts are extreme examples of the potentials. Beaton (1982) justifiably emphasizes the importance of the Basic Leaching Technology as a great adaptive advance among prehistoric peoples. The lesson for South Texas with respect to tubers, beans, and seeds is that determination of fitness for human consumption must take into account the possible beneficial effects of leaching technology before a conclusion is reached about any product. Leaching technology was certainly known by California Indians and it is likely that the methods were known elsewhere in the American Southwest as well. Jones (1981) has inferred leaching technology for processing oak acorns for the Texas hill country.

The Australian ethnographies lend little hope for archaeological recognition via the kinds of recovery and analysis procedures now usually performed on prehistoric sites in southern Texas. The harvesting equipment--digging sticks, bags, nets, baskets, and bowls--is perishable. The processing and cooking technology leaves no readily distinguishable signs with the important exception of stone grinding implements. Reported use of grinding slabs in both pounding or crushing and grinding capacities suggests that careful study of patterns of wear on a large sample from widely scattered sites might yield suggestive results. Otherwise, however, it appears as if remains of the material culture hold little promise for learning more about plant food use in prehistoric South Texas.

FUTURE RESEARCH

Based on the data from Australia, the following areas of research hold the best potential for increasing our knowledge of floral product exploitation in South Texas prehistory:

1) Analysis of carbonized remains should certainly be continued. When carbon is recovered, especially from "hearth" features, samples should routinely be submitted for species identification. Where the amount of carbon recovered is adequate for radiocarbon assay, the assay work (a destructive process) should be done only after species identifications have been attempted. The maximum

potential for carbon is realized when it yields both a radiocarbon date and a species identification. The knowledge of when a plant species existed in prehistory can be just as important as knowing when a culture existed.

2) More attention should be given to grinding slabs (metates) and grinding stones (manos). I cannot say with certainty that careful examination of these artifacts will ultimately yield useful results. However, if enough specimens are studied, significant patterns of wear may eventually reveal themselves. The overall morphology of the grinding facet, the wear perceptible on the surface of the facet (both macroscopically, such as pecking or grooving, and microscopically, as striations), and the direction of grinding motion (circular, back and forth, or pounding) are kinds of observations that may tell something about what was being processed. Scrapings from the surfaces of grinding facets should be analyzed with the idea in mind that phytoliths, pollen, and/or other organic residues derived from the material processed remain on the stone.

3) An exhaustive survey of the root, bean, nut, seed, and foliage products that are (or were) available in the region must be made. Each product needs to be tested for toxicity as well as for nutritional value and palatability. Some number of the products can probably be eliminated from further consideration, but only after the possibility of rendering fit by leaching technology has been considered. For each floral product determined suitable for human consumption, a comparative collection should be built. Plant parts (stems, epidermis, nut shells, seed pods, husks, nut/seed meats, etc.) should be carbonized and studied for the characteristics that would permit identification of archaeological specimens. These plant parts should be studied for the distinctive phytoliths they may contain and "fingerprinted" according to their chemical and/or elemental constitution. Though probably the most difficult goal to reach from a technical standpoint, phytoliths and chemical/elemental "fingerprinting" will ultimately prove to be the most rewarding areas of research in the effort to identify plant foods used in South Texas prehistory.

4) The Australian Aboriginal data point to the feature commonly identified archaeologically as the "hearth" or "oven" as a place where plant foods were often concentrated, processed, and prepared just before being eaten. Matrices in and around such features in South Texas prehistoric sites are the ones that should receive the most careful scrutiny. In recommending these features for study, I am not suggesting that "hearths" and "ovens" are the only places within sites where vestiges of plant foods might be detected. Besides being food preparation "hot spots," these features offer to the field archaeologist the one great advantage of immediate visibility. They are things that we can actually see in the ground and can reasonably suspicion were used for plant food preparation.

Three things should be done with the matrix in and around hearth or oven features. Large pieces of carbon should, of course, be collected and carefully packaged for species identification and/or radiocarbon assay. Small matrix samples (three or four 16-dram vials would be adequate) should be saved for pollen, phytolith, and chemical/elemental analyses. Bulk matrix samples (consisting of virtually all of the matrix in and immediately around the feature) should be collected for processing using flotation recovery techniques (Davis and Wesolowsky 1975; Story 1980; Black and McGraw 1985). Recovery by flotation is aimed primarily at minute carbonized remains and animal bones that cannot be collected (intact, or at all) by usual dry screening techniques.

THE CHALLENGE

Much of what has been suggested above in terms of future research involves complicated, highly technical studies that can only be accomplished by dedicated specialists possessing appropriate know-how and access to sophisticated instruments and laboratory facilities. I harbor no illusions about how difficult it will be to follow the research course charted here. It has been within the capabilities of modern science to do what is proposed for some years now. What has been lacking are the financial resources that would support specialists in what will undoubtedly be a protracted and complex struggle. However, the potential is there.

The necessary specialized research is beyond most of us who work in the field of South Texas archaeology. In the meantime, there are some things that all of us can be doing to pave the way for realizing the full potential of future research into prehistoric utilization of floral products. For the various kinds of research presented, it is within our present means to:

1) collect samples of large pieces of carbon for species identification and radiocarbon assay,
2) begin the systematic study of grinding implement wear patterns,
3) collect scrapings from the working surfaces of grinding implements,
4) survey the food products yielded by South Texas flora,
5) collect matrix samples from hearth and oven features, and
6) institute flotation recovery techniques.

As is apparent, these measures mostly involve the collection of materials that would be available in the event that circumstances someday allow for special analyses to proceed. In the areas of radiocarbon assay, pollen analysis, and carbon species identifications, qualified specialists and facilities are available at The University of Texas at Austin (Dr. Salvatore Valastro - Radiocarbon Laboratory) and at Texas A&M University (Dr. Vaughn Bryant, Dr. Richard Holloway, and others - Departments of Anthropology and Botany). If you have the money, and they have the time, it is presently possible to have radiocarbon assays run and to have species identifications attempted on carbonized botanical remains. The fact that few other people are actively involved in the types of research discussed above should not prevent us from exploiting the recognized potential insofar as we are able. We must wait patiently for the time when specialized research becomes feasible. Pending such developments, we can rest secure in the knowledge that we are doing all that is realistically possible to facilitate this research in the future.

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FACIAL RECONSTRUCTION OF A LOWER PECOS SKULL

Roberta McGregor

ABSTRACT

Applying a restoration technique used in forensic anthropology, artist Betty Pat Gatliff recently reconstructed the face of a Lower Pecos man whose skeleton had been recovered during the Shumla excavations in 1933.

BACKGROUND

In 1933 the Witte Museum in San Antonio sponsored excavation of a series of nine rockshelters known as the "Shumla Caves" in Val Verde County, Texas (Martin 1933; Schuetz 1956, 1957, 1961, 1963). Prehistoric people lived in the Lower Pecos area where the Devil's and Pecos Rivers enter the Rio Grande, from at least 9000 B.C. to about A.D. 1500.

ANTHROPOMORPHIC RESTORATION

Betty Pat Gatliff, of Norman, Oklahoma, is a pioneer in the field of restoring physical appearance of skeletal materials. She completed her first facial reconstruction in 1967 while employed by the Federal Aviation Administration. Now, 18 years later and retired from the FAA, Gatliff works regularly with police departments nationwide in the identification of homicide victims. The Shumla skull is her 96th facial restoration.

RECONSTRUCTION PROCESS

Successful reconstruction depends first upon replicating the soft tissue depths covering a skull which determines the shape of an individual's face. Tissue thickness combines the size of the muscle, fatty tissue, and skin thickness in one measurement. Since the tissue depths vary according to sex and race, Gatliff works in collaboration with physical anthropologists. Dr. David Glassman, a physical anthropologist of Southwest Texas State University at San Marcos, identified the Shumla skull as that of a Native American approximately thirty years old when he died about 1500 years ago.

Since no data about tissue thickness exists for prehistoric populations, Gatliff used tissue thickness charts compiled by Kollmann and Buchly in 1898 (Figure 1).

Gatliff first glued directly on the skull, at 26 selected landmarks, small cylinders cut from rubber erasers which correspond to the average tissue depths at those points (Figure 2). Using the cylinders as contour guides, Gatliff then built up the face with non-drying modelling clay (Figure 3). Soft tissue features which have no correlation with the underlying bone (e.g., shapes of eyelids, the lower part of the nose, ears, mouth width, and lip thickness) pose special problems that challenge the anatomical knowledge, artistic judgment, and experience of the artist. While difficult, these problems can be solved systematically (Gatliff and Snow 1979:27).

Hair style is another very difficult feature to replicate. Gatliff based the hair style on two well-preserved males recovered from the Lower Pecos area. One, in the private collection of Guy Skiles of Langtry, Texas, came from 41 VV 656 (Turpin and Henneberg 1985). This individual, known as the "Skiles mummy," retains all of his hair. Nola Montgomery, an artist with Texas Parks and Wildlife, reconstructed the face in a drawing which Turpin and Henneberg reproduced in their paper (ibid.). Gatliff also used the Witte's Burial No. 11 from Shumla Cave 5. Martin (1933:22) describes this man's hair as "undressed and shaggy, falling below the earlobes on the sides."

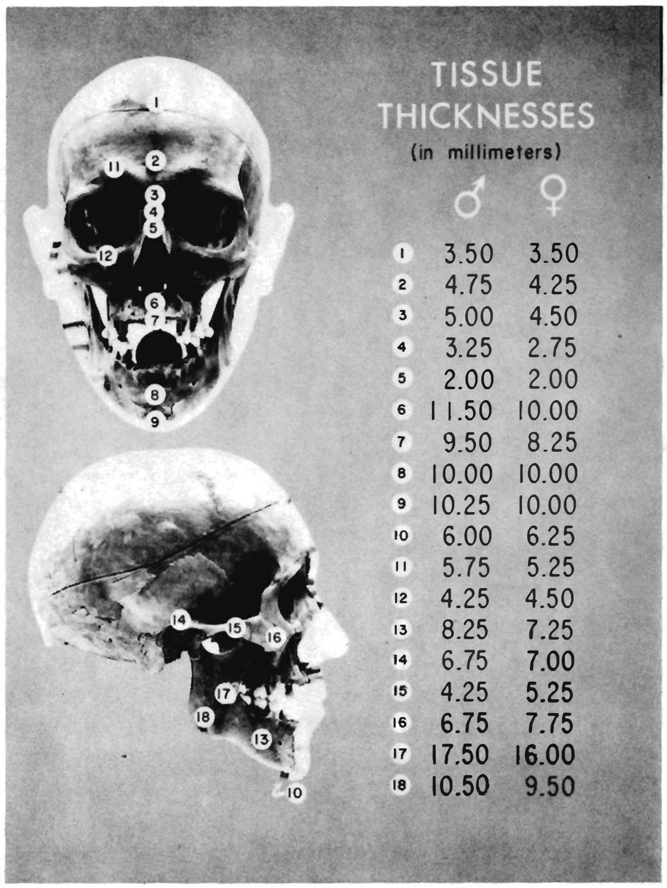


Figure 1. Average tissue thickness. (Adapted from Kollmann and Buchly, 1898.)

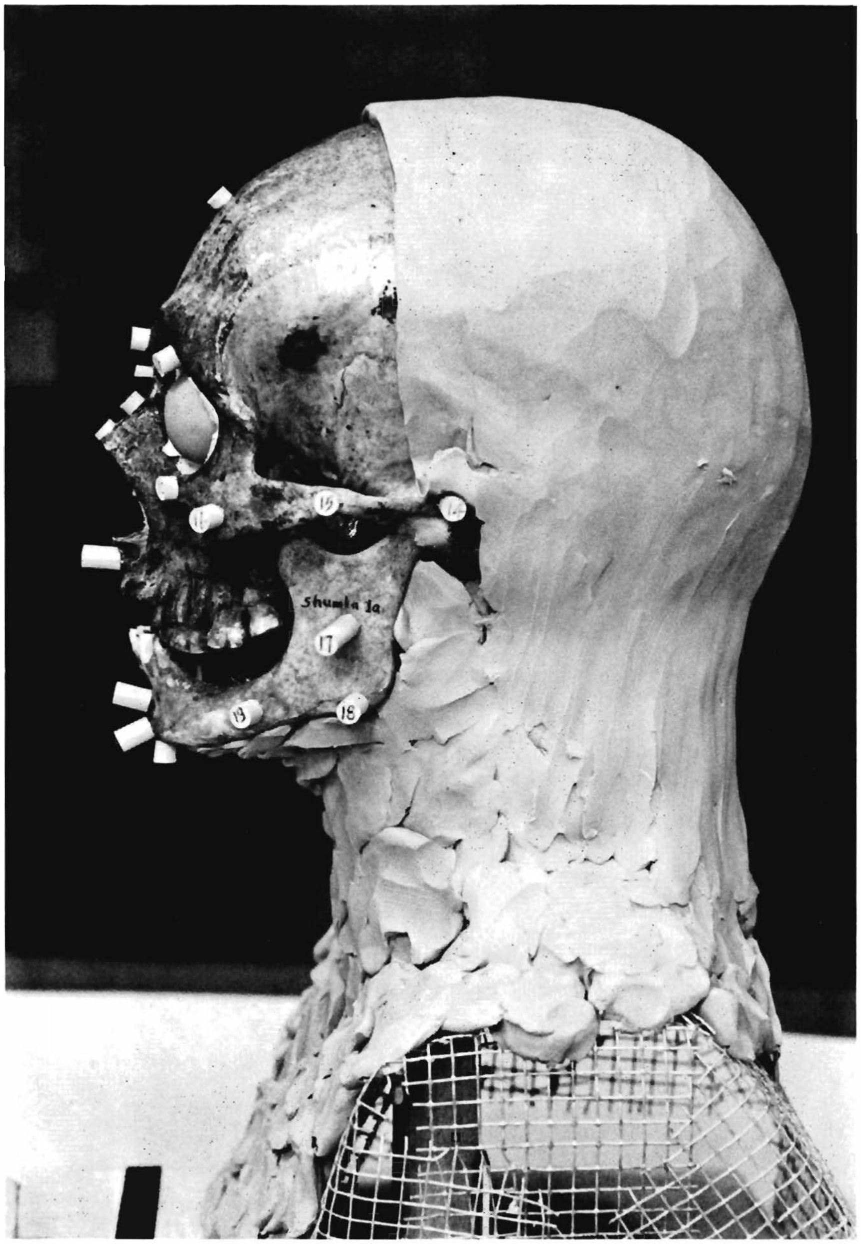
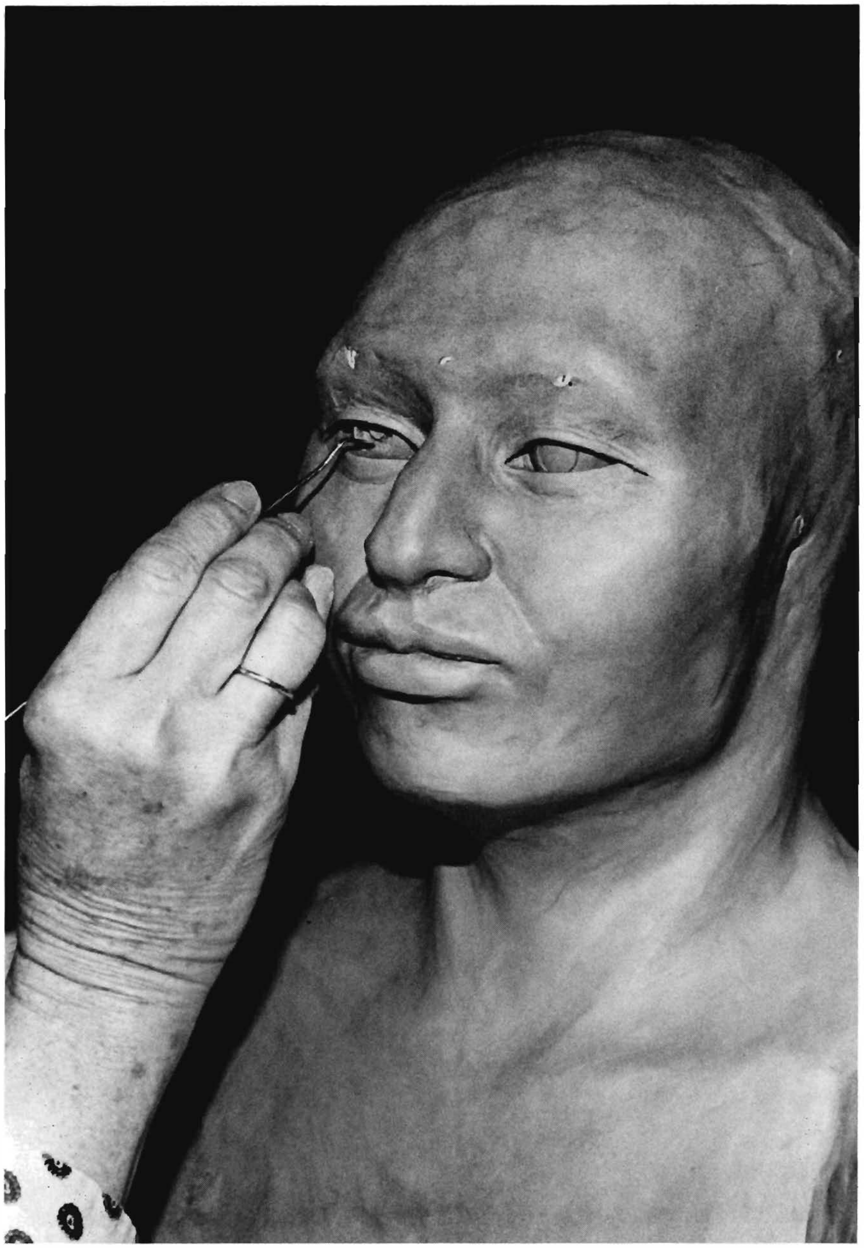


Figure 2. Reconstruction process with a layer of non-drying clay; thickness of muscle and skin layer approximated with cylinders cut to thickness from Figure 1.



EYE: The outer point of the cornea is approximately tangent to a line drawn from superior to inferior margins of the orbit; the apex of the cornea is at the juncture of two lines: one from the maxillo-frontale to the ectoconchion--the other bisecting the orbit.

NOSE: WIDTH is computed: blacks--nasal aperture + 16 mm (8 mm each side); whites--nasal aperture + 10 mm (5 mm each side). PROJECTION is approximately three times the length of the nasal spine.

MOUTH: Aligns with centers of sockets and widest points of chin.

EAR: Length (from top to bottom) roughly equal to nose length.

Figure 3. Reconstruction of soft tissue structures.

Figure 4. Shumla Cave Man of the Late Archaic Lower Pecos (circa A.D. 450) reconstructed by Betty Pat Gatliff.

RECONSTRUCTION RESULTS

Final results of the reconstruction process are shown in Figure 4. The face of this adult Shumla Cave man would be easily recognized by his friends and family of the Late Archaic Lower Pecos (circa A.D. 450). We know this from Gatliff's work with modern homicides where friends and relatives have identified victims from her reconstructions. In the present project, her talents have been applied to a specimen from the prehistoric era.

ACKNOWLEDGMENTS

Many thanks to Dr. Bill Green of the Witte Museum for critiquing this paper, and to Karen Branson for her excellent typing. The Shumla Cave skull has been cleaned and returned to the Witte archives for proper curation.

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A REPORT ON THE HAIDUK SITE BURIALS

Robert R. Harrison

ABSTRACT

Five Karnes County burials were analyzed at the Center for Archaeological Research at The University of Texas at San Antonio. The burials were located on Rudy Haiduk's property near Falls City, Texas. These burials consisted of the incomplete and fragmented remains of one undetermined, two probable male, and two female Native Americans. One of the burials is Late Archaic based on associated Marcos points. The others have no associated artifacts and thus their time of origin is unknown. Information was obtained on the health status, diet, and physical stature of these individuals.

INTRODUCTION

Several years ago while checking a fenceline, the landowner, Mr. Rudy Haiduk, noticed part of a human skull in a bulldozer cut that paralleled the fenceline. Subsequent investigation and excavation by Mr. Haiduk and a friend revealed a partially intact burial (designated as Burial 1, 41 KA 23) and more than 50 artifacts were recovered. Later, while excavating a stock tank, Mr. Haiduk unearthed several more burials on his property. These burials, along with the first specimen, were loaned to the Center for Archaeological Research at The University of Texas at San Antonio for analysis, during the winter and spring of 1985. For a description of the artifacts recovered with Burial 1, see Mitchell, Chandler and Kelly (1984).

Previous archaeological work in Karnes County has been limited. Calhoun (1979), Kelly and Highley (1979), McGraw (1979), and Mitchell et al. (1984) have reported excavations or surveys of various portions of the county. None of these reports have indicated any extensive prehistoric occupation in Karnes County, and no prehistoric burials have been documented from Karnes County prior to the Haiduk burials.

THE SITE

The Rudy Haiduk site is located approximately one mile southeast of Falls City in Karnes County (Mitchell et al. 1984). The San Antonio River is on the southern border of the site, and Marcelinas Creek is to the west. The terrain slopes upward north of the San Antonio River to a rolling upland. The river and creek margins are covered with a thicket of oak, elm, mesquite, and pecan trees intermixed with brush and weeds. The upland is grassy with clumps of oak and mesquite.

The vicinity has extensive amounts of burned rock, mussel shell, and lithic debris eroding through the topsoil. The landowner has recovered projectile points from this part of his property ranging from Paleo-Indian to Early Historic types (Haiduk, personal communication, 1985).

THE BURIALS

The first skeleton (Burial 1) was located on the second terrace of the north bank of the San Antonio River. The skeleton was found in a flexed position with the head toward the southwest (toward the river). Reportedly, the remains were in a prepared pit, the floor of the pit being covered with fine white sand (Mitchell, et al. 1984).

The other burials were recovered from the upland portion of the Haiduk property. They were located approximately 300 meters north and east of Burial 1 and were in close proximity to each other. Two of the burials were close together and in a prone, extended position. Their heads were pointed in a southerly direction. Another burial was in an upright flexed position facing south toward the river. It was located approximately 75 meters east of the first two burials (Haiduk, personal communication, 1985). It is uncertain as to which actual burial site corresponds to which of the latter burials. Neither detailed excavation notes nor area sketches of the burials were made at the time of excavation.

CONDITION OF BURIAL REMAINS

Upon disinterment, the remains were placed into four gallon glass jars along with samples of the associated rocks and reinterred for a period of time. Many potentially diagnostic bones were badly fragmented. Each burial was identified at the time of reinterment by placing an edge-notched penny into the jar. One notch signified Burial 1, two notches signified Burial 2, etc. At some time between arrival at the CAR laboratory and the author's acquisition of custody of the remains, the cranium of Burial 1 had been partially reconstructed, along with some of the associated long bones. The other burials were still in their original jars.

The condition of the bones varied from very badly weathered, fragmented, friable, and unrecognizable to moderately good condition. Many of the long bones exhibited areas of extensive rodent-gnawing. Evidence of excavational and post-excavational fracturing, as opposed to antemortem trauma, was relatively easy to demonstrate. Fresh green bone, when subjected to stress, often fractures and splinters along uneven planes, leaving a jagged or splintered appearance. In contrast, seasoned dry bone, when subjected to the same stresses will often present a clean, even fracture line. In addition, bone fractured during or after excavation often displays a lighter coloration along the cortical edge of the fracture than does bone fractured at the time of interment or post interment. All burials were missing the vertebral column, pelvic bones, scapula, and hand and foot bones. Ribs were represented by small fragments. Other fragments were unidentifiable.

METHODS OF ANALYSIS

The bones were removed from their respective jars and cleaned of adherent soil with clear tap water. Care was taken to keep the burials segregated. After cleaning, the specimens were air dried at room temperature. After drying, those specimens with diagnostic potential were separated from the specimens that were too badly fragmented to reconstruct or were unrecognizable. Where necessary, individual bones were stabilized by dipping or painting with a 1:5 mixture of polyvinyl acetate and acetone (PVA). A 1:3 mixture of PVA was utilized as a glueing agent when fragments were reconstructed. Identifiable bones for each burial were noted on a standard checking sheet (see Figures 1-4).

Skeletal measurements were accomplished using an osteometric board, vernier caliper, and metric tape. All measurements were taken in centimeters or millimeters. Unless otherwise noted, all measurements are according to Bass (1984).

When it was identified that a burial contained the remains of more than one individual, the bones were labeled as A or B, to separate the different individuals. Separation, when possible, was based upon robustness, sexual traits, perceived age, and dentition.

Gender Estimation

There are many methods for estimating the gender of a skeleton. The most reliable of these involve examination and measurement of the gender differences to be found in the pelvis. Brothwell (1981:62) has estimated that up to 95 percent accuracy is possible in determining the gender of skeletal material from

Burial Number 1

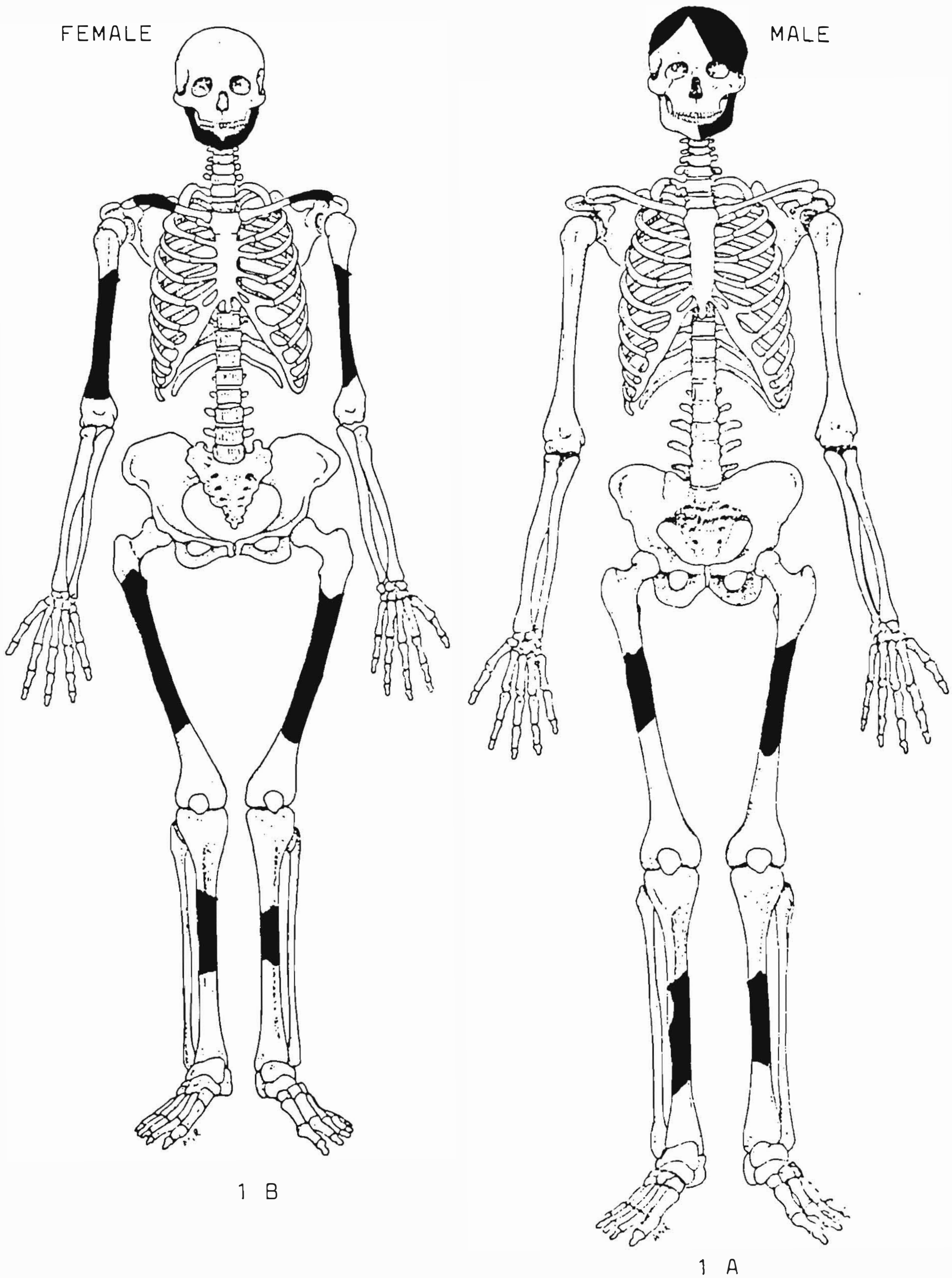

Figure 1. Burials 1A and B from the Rudy Haiduk Site, 41 KA 23, Karnes County, Texas. Note the duplication of long bone and mandible fragments indicative of two individuals.

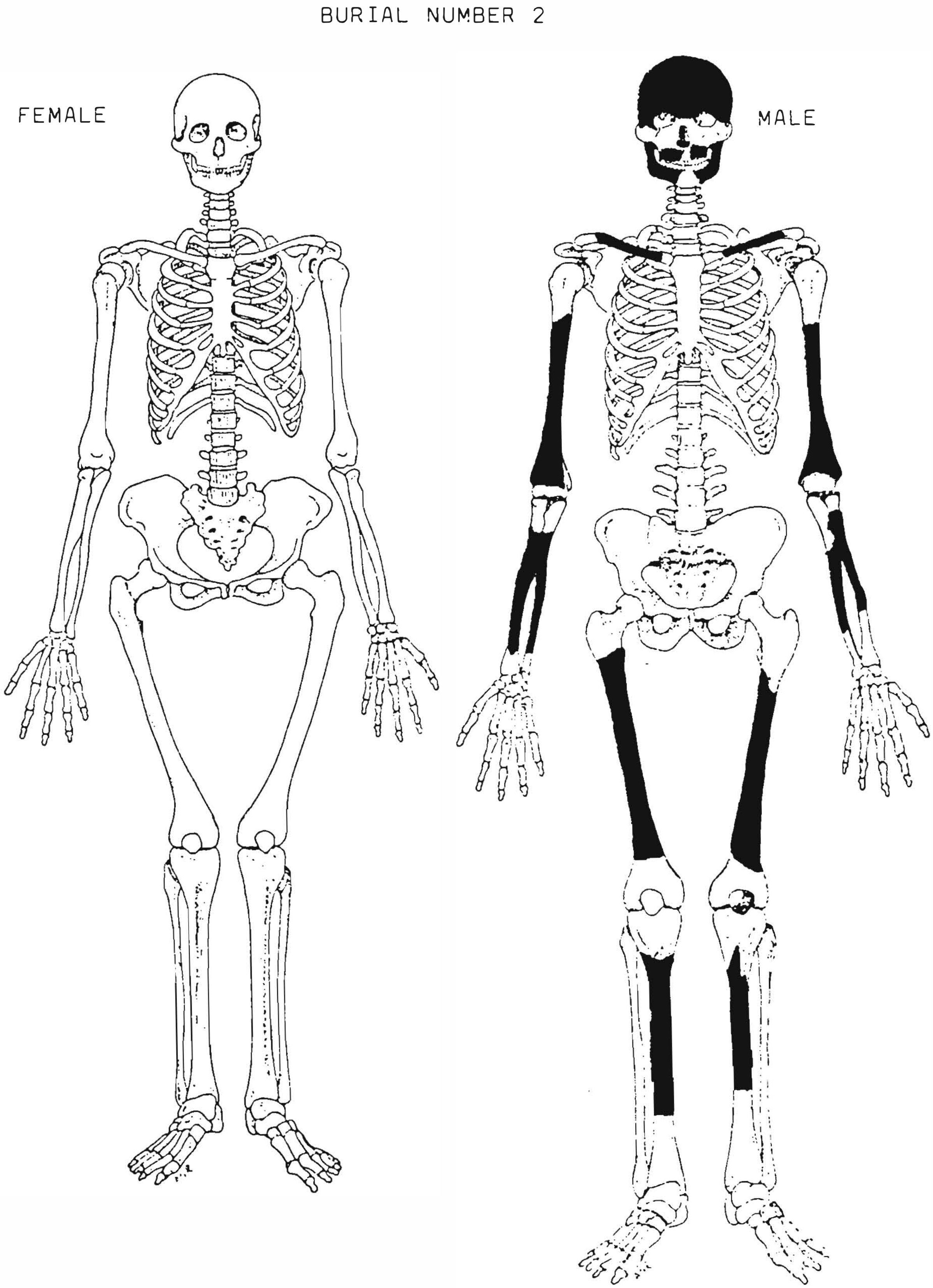

Figure 2. Burial 2 from the Haiduk ranch in Karnes County; probably an adult male.

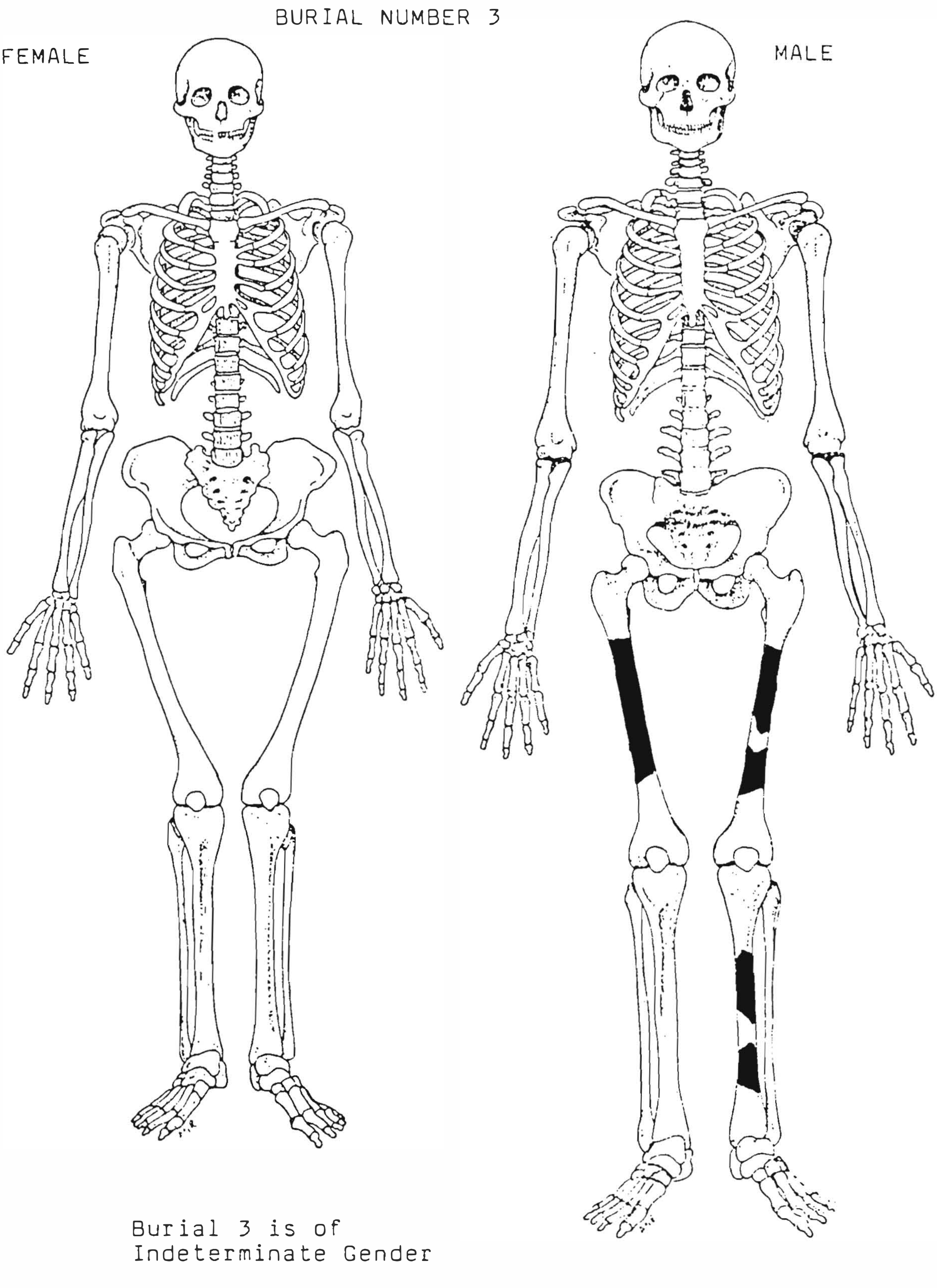

Figure 3. Burial 3 from the Haiduk ranch; bones recovered are not sufficient for accurate sex or age determination.

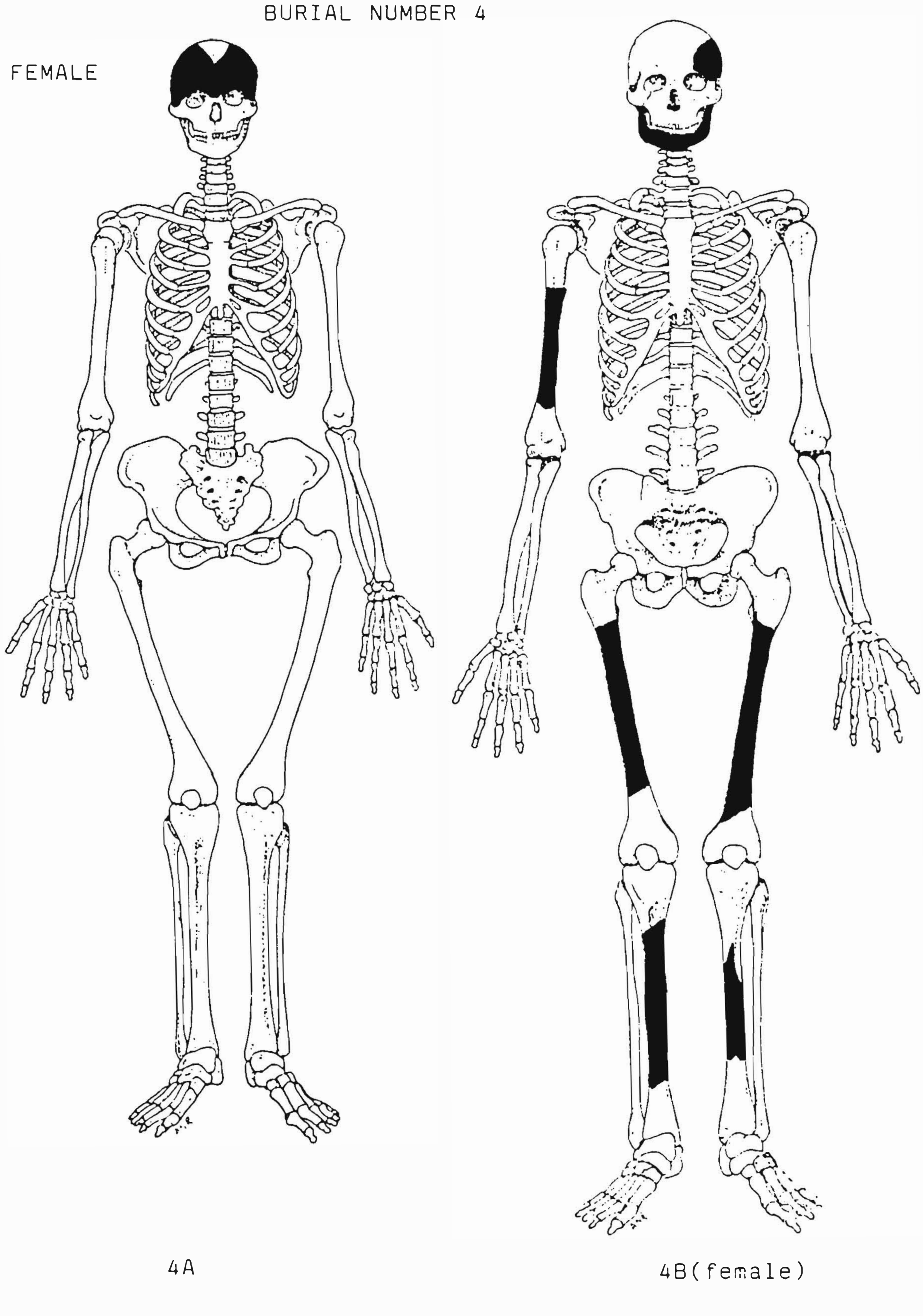

Figure 4. Burials 4A and B from the Haiduk ranch. Probably two adult females, one relatively young.

morphological observation of the pelvis. Unfortunately, there were no identifiable pelvic remains included in the Haiduk burials, so other methods of gender estimation had to be utilized.

Bass (1984:72) considers the skull to be the second best area of the skeleton on which to base an estimation of sex. His method of estimation is based on the fact that males tend to be more robust, rugged, and muscle-marked than females. Though absolute differences seldom exist and many intermediate forms are to be found, there are still some distinguishing characteristics. They are as follows (Bass 1984:72-74):

I. Face

1. Supra-orbital ridges are more prominent in males than in females.
2. Upper edges of the eye orbits are sharp in females, blunt in males.
3. The palate is larger in males.
4. Upper teeth are larger in males.

II. Mandible

1. The chin is more square in males and rounded with a point in the midline in females.
2. Lower teeth are larger in males.

III. Vault

1. The female skull is smaller, smoother and more gracile. The female skull retains the childhood characteristics of frontal and parietal bossing into adulthood.
2. Muscle ridges, especially on the occipital bone, are larger in males (nuchal crests).
3. The posterior end of the zygomatic process extends as a crest further in males, often much past the external auditory meatus.
4. Mastoid processes are larger in males.
5. Frontal sinuses are larger in males.

Other estimators of gender are based upon the assumption that as a result of sexual dimorphism, various long bones of the postcranial skeleton are longer, more robust, and have larger attachment areas for muscles in males than in females (Stewart 1947). Pearson and Bell (1919) utilized femoral head diameter as an indicator of gender. Parsons (1914) found vertical diameter of the femoral head and the bicondylar width of the distal end to be a reliable sexing indicator. Bass (1984:91) has noted that often the body of the sternum is more than twice the length of the manubrium in males and less than twice the length in females.

Estimation of Stature

Brothwell (1981) asserts that the most reliable method of estimating stature is from the length of the long bones, with femoral measurement being the most reliable. By applying a regression equation to the maximum bone length, an estimate of stature can be obtained. Commonly utilized long bones are the femur, tibia, and the humerus in that order. The disadvantage of this method is that it requires a complete unfractured bone.

Steele and McKern (1969) devised a method by which fragments of long bones (femur, tibia, and humerus) could be utilized to estimate stature. Unfortunately, this method relies on the identification of specific landmarks, which may not be present on a fragment.

Age Estimation

Brothwell (1981:64) has suggested that assessment of age at time of death, based on skeletal remains, is most likely to be accurate with immature or young adult individuals; skeletal remains of older persons present more of a problem. When dealing with younger populations, it is difficult to be certain that the maturation process took place at the same rate as among modern populations. Climate and diet may also have a considerable effect upon maturation time.

Skull sutures only offer a guide to relative age among adults; generally sutures will close endocranially before ectocranially, though some variation in this process exists. Brothwell (1981:65) asserts that the spheno-occipital synchondrosis is a reliable age indicator. It begins fusion at about the 17th year and completes fusion by the 20th to the 23rd year.

Teeth are often valuable indicators of age. Eruption time of human teeth is reasonably consistent and a reliable measure for aging children. Also, dental attrition or wear has been used as an indicator of age among prehistoric populations, or populations that have a diet high in abrasive material.

Age among sub-adults can be estimated by epiphyseal union of various bones of the postcranial skeleton. Epiphyses are generally closed by age 25. Reformation of the pubic symphysis face has also been used in the estimation of age (Brothwell 1981:68).

Dentition

The study of the degree of tooth wear and wear patterns offers anthropologists valuable information about ancient diet and food preparation. In addition, dental wear or attrition can aid in establishing relative age at time of death and, in some cases, total numbers of persons present in a burial. Dental wear or attrition is defined by Brothwell (1981:71) as the "wearing away of tooth substance during mastication by the rubbing of one tooth surface against another, together with the abrasive effect of any hard material present in the food." Also, slight movement of adjacent teeth against each other may produce shallow wear facets.

Molnar (1972:185) has identified atypical wear patterns of the anterior teeth in females. He speculates that these patterns resulted from the use of the anterior teeth as tools, possibly related to basket making or other activities which required holding or pulling fibrous material with the teeth. Smith (1984:39-54), correlates attrition and angle of attrition of molars with culture and subsistence pattern. Hunter-Gatherers, whose diet consists of tough fibrous food tend to show a molar wear pattern which is generally flat. In contrast, agriculturalists, whose diet consists of softer, more refined and better cooked foods, tend to demonstrate oblique wear of the molars. Agriculturalists also tend to have a higher incidence of dental caries, probably as a result of increased carbohydrates in the diet.

The dentition may offer a valuable aid in the estimation of age at the time of death; this is particularly true in the case of subadults. Age estimation in children and juveniles is based upon the high probability that the age at which various deciduous and adult teeth erupt is relatively consistent in human populations. Dental attrition and attrition rates have been used to estimate age at time of death, with varying results, among adult populations. Brothwell (1981:71:73) has suggested that for reliable estimates, population, antiquity of population, and technology of population, must be considered, for they can affect rates and patterns of dental attrition.

Also of interest to the anthropologist are variations in tooth morphology, such as molar cusp patterns, extra cusps, occlusion of maxillary to mandibular teeth, missing third molars, incisor shoveling, and tooth size. These factors offer valuable information concerning population and population change through time.

Dental wear of the Haiduk burials was coded according to Smith's (1984:45-46) category of wear stages.

ANALYSIS OF BURIALS

Burial 1A

Skull

The cranium was fragmented and incomplete. Much of the fragmentation appeared to have occurred at or post excavation. Upon reconstruction, it was found that the facial structure and much of the inferior occipital bone was missing, as was the foramen magnum and surrounding structures. There was no evidence of gross pathology. The sutures were fully closed both endocranially and ectocranially.

Left superior orbit: The orbital edge is blunt, with a moderately prominent and well-defined supraorbital ridge.

Nuchal crest: This is well-defined and moderately prominent.

Mastoid process: Both right and left processes are prominant and well-defined.

External auditory exostosis: Not present.

Mandible: Fragment includes the left mandibular body and a portion of the anterior ramus. The fragment is edentulous without evidence of resorption, abcesses, or periodontal disease. It is relatively robust, with well-defined muscle attachments consistent with the cranium. The lack of landmarks made it impossible to take the standard measurements.

Dentition

There were a total of 17 badly worn teeth present. The mandibular molars show slight lingual oblique wear, while the maxillary molars show slight buccal oblique wear. All molars display cupping of the dentine. Anterior teeth were so severely worn that many could not be identified as to location in the dental arch. No carious lesions were observed. The association of these teeth with Burial 1A was based on wear state and size. See Table 1 for dental chart of Burial 1A.

Postcranial Skeleton

The bones of the postcranial skeleton were fragmented and some required reconstruction. There were no complete long bones, nor were there articular surfaces present. No evidence of gross pathology or fracture was noted, and all epiphyses were united.

Right humerus: Fragment of mid- to distal shaft, 18.3 cm in length. Diameters at mid-fragment, anterior-posterior (A-P) 1.5 cm, medial-lateral (M-L) 1.9 cm, circumference (Circ) 6.1 cm.

Right femur: Fragment of mid- to distal shaft, 27 cm in length. Diameters at mid-fragment, A-P 2.8 cm, M-L 2.5 cm, Circ 8.4 cm.

Left femur: Fragment of mid- to distal shaft, 19.6 cm in length. Diameters at mid-fragment, A-P 2.9 cm, M-L 2.4 cm, Circ 8.5 cm.

TABLE 1

Dental Charts and Wear Tables, Burials 1A, 1B, 2, and 4B

Burial 1A

Maxilla: Right → Left

Tooth	M3	M2	M1	PM2	PM1	C	LI	CI	CI	LI	C	PM1	PM2	M1	M2	M3
Wear Code (Maxilla)	0	5	7	0	0	0	6	0	0	6	0	0	0	7	5	3
Wear Code (Mandible)	3	0	7	0	0	6	0	0	6	0	0	0	0	0	5	3

Mandible: Right → Left

Burial 1B

Maxilla: Right → Left

Tooth	M3	M2	M1	PM2	PM1	C	LI	CI	CI	LI	C	PM1	PM2	M1	M2	M3
Wear Code (Maxilla)	2	3	6	0	0	0	5	0	0	0	5	5	0	6	3	2
Wear Code (Mandible)	0	3	5	5	5	5	0	6	6	5	6	5	5	6	4	0

Mandible: Right → Left

Burial 2

Maxilla: Right → Left

Tooth	M3	M2	M1	PM2	PM1	C	LI	CI	CI	LI	C	PM1	PM2	M1	M2	M3
Wear Code (Maxilla)	3	6	7	5	5	4	7	5	6	0	0	0	5	7	6	5
Wear Code (Mandible)	3	5	6	4	4	4	0	5	5	0	4	4	4	6	5	5

Mandible: Right → Left

Burial 4B

Maxilla: Right → Left

Tooth	M3	M2	M1	PM2	PM1	C	LI	CI	CI	LI	C	PM1	PM2	M1	M2	M3
Wear Code (Maxilla)	0	7	0	7	0	0	0	0	0	7	0	0	0	8	0	0
Wear Code (Mandible)	0	0	8	0	0	0	7	0	0	0	0	7	0	0	0	0

Mandible: Right → Left

Wear Codes*:
- 0 = missing
- 1 = unworn
- 2 = moderate wear
- 3 = full cusp removal or distinct dentin line
- 4 = dentin exposures
- 5 = coalesced dentical areas
- 6 = large dentin area(s)
- 7 = full dentin exposure, enamel rim lost
- 8 = severe loss of crown height, breakdown of remaining rim, crown surface on roots.

* (adapted from Smith, 1984)

Tibia: Fragment of shaft without nutrient foramen, 16.2 cm in length. Mid-fragment diameters, A-P 2.7 cm, M-L 2.0 cm.

Tibia: Fragment of shaft without nutrient foramen, 14.1 cm in length. Mid-fragment diameters, A-P 2.6 cm, M-L 2.2 cm.

Burial 1B

Skull

The only portion of the skull of 1B that was recovered is a rather gracile fragmented mandible, which is missing the symphyseal region. The teeth are not present in their respective aveolar sockets. Loose teeth recovered from the burial were associated with 1B by virtue of size, distinctive coloration, and amount of attrition. The loss of dentition appears to be postmortem. There is no evidence of periodontal disease or resorption. The right condyle of the mandible is too small to be associated with the right mandibular fossa of Burial 1A, which, taken with the gracileness of the specimen, would suggest that it represents a separate individual.

Mandibular measurements are: Bicondylar breadth N/A; Bigonial breadth N/A; Height of ascending ramus (left) 5.2 cm; Minimum breadth of ascending ramus (left) 2.7 cm; Height of mandibular symphysis N/A.

Dentition

There are a total of 22 badly worn teeth present. Molar crown wear is generally flat. The upper right molar (M^2) displays a Carabelli's cusp and enamel pearl. The lower right molar (M_2) also displays an enamel pearl. The anterior lower incisors are severely worn. The right central incisor is worn at a mesial oblique angle and has a mesial superior notch. All incisors are shoveled. No carious lesions were noted. See Table 1 for dental chart of Burial 1B.

Postcranial Skeleton

The postcranial long bones of individual 1B were fragmented and some required reconstruction. None of the long bones were complete. With the exception of the two clavicles, no articular surfaces were present on any skeletal element. No evidence of gross pathology or fracture was noted, and all epiphyses were united.

Right clavical: Fragment distal half of shaft, 8.3 cm in length, very slender.

Left clavical: Fragment distal half of shaft, 8.2 cm in length, very slender.

Right humerus: Fragment of shaft, 23.2 cm in length. Diameters at mid-fragment, A-P 1.3 cm, M-L 1.8 cm.

Left humerus: Fragment of shaft, 19.3 cm in length. Diameters at mid-fragment, A-P 1.4 cm, M-L 1.8 cm.

Right femur: Fragment of shaft, 25.7 cm in length. Diameters at mid-fragment, A-P 2.7 cm, M-L 2.3 cm, Circ 7.8 cm.

Left femur: Fragment of shaft, 24.4 cm in length. Diameters at mid-

TABLE 2

Summary of Burial Attributes

Burial	Sex	Age	Sutures	Mandible	Teeth	Long Bones	Comments
1A	Male	Adult	Fully closed	Robust	17 badly worn	Robust	Prominent mastoid process
1B	Female	Adult (20-30)		Gracile	22 badly worn	very slender, gracile	Enamel pearl on tooth M^2
2	Male	Adult (20-30)	Closed	Promi-nent attach-ments	27 badly worn	Slender	Supra orbi-tal arches well-defined; enamel pearl on M^3
3	?	Adult (?)	-	-	-	frag-mented	
4A*	Female	Adult (young)	Incom-plete closure	-	-	-	
4B	Female	Adult (35+)	Entirely closed; endocra-nial ossi-fication		18 very badly worn		Some teeth worn to top of roots

* The skull fragment designated 4A may belong to Burial 1B or may be an additional burial

fragment, A-P 2.5 cm, M-L 2.3 cm, Circ 7.6 cm.

Tibia: Fragment of shaft, 17.8 cm in length. Diameters at mid-fragment, A-P 2.7 cm, M-L 1.6 cm.

Tibia: Fragment of shaft, 8.3 cm in length. Diameters at mid-fragment, A-P 2.6 cm, M-L 1.6 cm.

Burial 2

Skull

The cranium is extensively fragmented, partially along suture lines and partially post-excavatory. Facial bones are incomplete and the inferior basilar skull is missing. Though there is some separation along suture lines, the cranial sutures appear to have been closed at the time of death. There is no evidence of gross pathology. Both the right and left superior orbital edges are blunt. Supraorbital ridges are well-defined and of moderate size. The interorbital space at the nasal frontal suture is 2.4 cm. The right nuchal crest is slight but well-defined, while the left nuchal crest is missing. The right maxilla is present M^3 to the central incisors with dentition intact. The left maxilla is present M^3 to PM^2 with dentition intact. The mandible is fragmented and incomplete. Missing are the anterior mandibular body, left posterior ascending ramus, left inferior body, and the right coronoid process. Also, M_3 to PM_1 are intact and in situ bilaterally. The right mandibular condyle is a close fit with the right temporo-mandibular fossa. The height of the right ascending ramus is 7.0 cm. Other mandibular measurements were not attempted. Mandibular muscle attachments are well-defined and prominent. There is no evidence of aveolar abcesses or periodontal disease.

Dentition

There are a total of 27 badly worn teeth present, of which 22 are in their respective sockets. The five teeth not in their sockets were associated with Burial 2 by comparing wear, size, coloration, and matching wear facets. The molars show a generally flat wear pattern, with cupping of the dentine on both upper and lower first and second molars. There is an enamel pearl on the lingual aspect of the right M^3. The central upper incisors are mesial obliquely worn, with a mesial A-P notch being noted on the right central incisor. The incisors are shoveled. No carious lesions were observed. See Table 1 for the dental chart of Burial 2.

Postcranial skeleton

The postcranial long bones of individual No. 2 were fragmented and incomplete. No articular surfaces were present on any of the skeletal elements. No evidence of gross pathology or fracture was noted, and all epiphyses were united.

Right humerus: Fragment of shaft and distal end, missing the lateral epicondyl and articular surface, fragment is 25.9 cm in length. Maximum diameter at mid-shaft 1.9 cm, minimum diameter at mid-shaft 1.7 cm, least circumference of shaft 5.6 cm. There is a small septal aperture present into the olecranon fossa.

Left humerus: Fragment of shaft 23.6 cm in length. Maximum diameter at mid-shaft 1.9 cm. Minimum diameter at mid-shaft 1.7 cm. Least circumference of shaft 5.5 cm.

Right radius: Fragment of shaft 21 cm in length.

Left radius: Fragment of shaft 17.0 cm in length.

Right ulna: Fragment of shaft 17.5 cm in length.

Left ulna: Fragment of shaft 22.6 cm in length.

Right clavical: Fragment 12.4 cm in length, slender.

Left clavical: Fragment 13.0 cm in length, slender.

Right femur: Fragment of shaft, with a length of 36.9 cm. Diameters at mid-fragment, A-P 2.9 cm, M-L 2.3 cm, and Circ 8.0 cm.

Left femur: Fragment of shaft, with a length of 33.7 cm. Diameters at mid-fragment, A-P 2.8 cm, M-L 2.3 cm and Circ 8.4 cm.

Left patella: Missing medial, posterior inferior surface, no pathology.

Right tibia: Fragment of shaft 23.9 cm in length. Diameters at nutrient foramen, A-P 3.4 cm, M-L 2.2 cm. Platycnemic Index (M-L dia. at distal edge of nutrient foramen X 100 divided by A-P dia. at distal edge of nutrient foramen) 64.7 Range of Platycnemic Index X-54.9 (hyperplatycnemic) to 70.0-X (eurycnemic).

Left tibia: Fragment of shaft 23.2 cm in length. Diameters at distal edge of nutrient foramen, A-P 3.3 cm, M-L 2.2 cm, and Platycnemic Index of 66.7.

Burial 3

Postcranial Skeleton

There are several badly fragmented pieces of postcranial long bone present, all of which required reconstruction. Some of the specimens show evidence of extensive rodent gnawing.

Right femur: Reconstructed fragment of shaft, 28.3 cm in length. Badly rodent-gnawed on posterior distal and anterior proximal surfaces.

Left femur: Fragment of shaft, 17.6 cm in length. Badly rodent-gnawed anterior surface.

Tibia: Fragment of shaft, 12.0 cm in length. Badly rodent-gnawed posterior surface.

Tibia: Fragment of shaft, 16 cm in length. Badly weathered and eroded.

Burial 4A

Skull

The author partially reconstructed the severely fragmented skull. There is no evidence of gross pathology or external auditory canal exostosis. The endocranial suture closure was incomplete. Small portions of the vault are missing as are the inferior basilar area, foramen magnum, and mandible. The facial structure, with the exception of the right zygoma, is also missing. The reconstructed portion of the vault presents a rounded appearance with a suggestion of bossing. The superior orbital edges are relatively thin and sharp. The supraorbital ridges are not pronounced. The nuchal crest is not pronounced or well-defined and the mastoid processes are relatively small.

Burial 4B

Burial 4B was identified by duplication of cranial bones (posterior left frontal and anterior left parietal to include coronal suture, right nuchal crest) and dentition. The degree of cranial suture closure was also a factor in determining identification.

Skull

The three cranial fragments have complete endocranial ossification of suture lines. The ectocranial suture lines are closed and barely discernible. The mandible is missing the anterior tip of the symphyseal region and the right posterior aspect of the ascending ramus to include the condyle. There is evidence of bilateral antemortem loss of M_3 - M_2 and the inferior central incisors with subsequent aveolar resorption and remodeling of the mandibular body in the area of those teeth. Because of the incompleteness of the specimen, only the following left mandibular measurements were taken: Height of ascending ramus 5.8 cm; minimum breadth of ramus 3.1 cm.

Dentition

There are 18 very badly worn teeth thought to be associated with Burial 4B. Association of these teeth was based on the amount of severe wear. Seven of the teeth are codable, the rest are worn to the tops of the roots and are generally unidentifiable as to their location within the dental arch. No carious lesions were noted. See Table 1 for the dental chart of Burial 4B.

Postcranial Skeleton

The postcranial long bone fragments of Burial 4 were very badly rodent-gnawed, which consequently made measurements other than length impractical.

OBSERVATIONS

The burials appear to represent at least five individuals, though the remains of these individuals are intermixed among the burial jars. It was determined that some jars contain the remains of more than one individual, even though they were labeled initially as containing a single individual. Where duplication existed, the individuals were separated upon the basis of relative robusticity, sexual attributes, and, where possible, dentition. This method enabled a rough estimation of sex and numbers of individuals represented. There were portions of four separate cranial vaults and four mandibles present. There were, however, five sets of Tibias and other legbones. Thus, there are at least five individuals represented (see Table 2).

Burial 1 represents two individuals, labeled A and B. A is represented by a partial cranial vault with male attributes and a portion of a robust mandible. The more robust of the long bones have also been designated as belonging to A. B consists of a gracile mandible and the more gracile of the long bones.

Burial 2 consists of a partial cranial vault, maxilla, mandible, and long bones. The right mandibular condyle fits the corresponding temporo-mandibular fossa of the cranium, and the maxillary-mandibular dental occlusion is consistent. These factors suggest that the cranial remains belong to the same individual. The cranium displays male attributes which suggests that it represents a male. The right humerus has a septal aperture; Hrdlicka (1932:431-450) has stated that these apertures occur more commonly in females. The postcranial long bones are relatively slender and may or may not be associated with the cranium designated as Burial 2.

Burial 3 consists of some very fragmented and rodent-gnawed long bones, all from the lower extremity. Because of the poor condition of the bones, accurate measurements could not be taken.

Burial 4 consists of the fragmentary remains of two cranial vaults and one set of dentition. Also, fragments of one set of lower extremity long bones were present. The cranial fragments were labeled A and B. Distinction was made on the basis of duplication and suture closure.

The cranial remains labeled A display female attributes and incomplete suture closure of the ectocranium indicating a young adult. In contrast, the remains labeled B have complete suture closure of the ectocranium, suggesting an older individual. The B cranial remains are too incomplete to estimate gender. The left mandibular condyle of B fits the temporo-mandibular fossa of cranium A, but the bilateral loss of the last two molars with subsequent aveolar resorption and remodeling of the mandibular body suggests a greater age than A which makes it highly improbable that the cranium designated A is associated with the mandible designated B. In addition, the condition of the anterior aveolar aspect of the mandible designated B, suggests that the lower central incisors may have been lost antemortem, with subsequent partial aveolar resorption, which would presuppose greater age. The dental wear is severe which is inconsistent with the estimated age of Burial 4A. It is difficult to ascertain relative robustness of the postcranial bones, because of their poor condition.

The author has attempted to reassociate the various skeletal fragments. The following is his estimation of the relationship of the various skeletal remains. The skull, mandible fragment, teeth, and long bones designated 1A represent a single adult male. The mandible, teeth, and long bones labeled 1B represent a single adult female. Also, the skull designated 4A may be associated with Burial 1B. If so, we have a total of five individuals represented in the study; if not, then there may be more than five burials. The skull, mandible and teeth labeled Burial 2 represent a single adult male. It is uncertain if the postcranial remains designated Burial 2 represent fragments of a male or female, or an intermixture of both male and female remains. Burial 3 postcranial bones are too fragmented and gnawed to attempt to estimate gender. The mandible designated 4B appears to be female, as do the postcranial remains designated 4B. Thus, there are at least five individuals represented among the Haiduk Site remains: one of indeterminate sex, two probable males, and at least two probable females. The author estimates that three of the individuals were adults (one a young female) and one, 4B, was an older adult female. For Burial 3, no estimate of sex is possible, but long bone length suggests it is an adult.

CONCLUSIONS

The period to which most of the Haiduk site burials belong is uncertain, though Marcos points and Corner Tang knives were reported to be associated with Burial 1 by Mitchell et al. (1984). This would place that burial within the time frame of the Late Archaic. The other burials were recovered about 300 meters away and cannot be associated with Burial 1; their dating is completely unknown.

Most likely the Native Americans represented by the Haiduk burials were hunter-gatherers. Living in small wandering bands, they subsisted by hunting small and medium game, and gathering wild plant foods. Hester (1980:37) asserts that the region provided a great variety of plant and animal foods that could be exploited on a seasonal basis and which must have provided an ample diet for the prehistoric hunters and gatherers of South Texas. The osteological evidence presented by the Haiduk Site burials would appear to substantiate Hester's assessment of the South Texas Archaic diet.

Even though the physical remains are incomplete and in generally poor condition, much information has been gained about these natives of early Texas. That they subsisted by hunting and gathering is suggested by the occlusial surface wear pattern of their molars, which was generally flat during the early and middle stages of wear. As attrition of the tooth body progressed, the wear pattern became more angular. In contrast, typical agriculturalists demonstrate an angular occlusial wear pattern much earlier. Smith (1984:40-41) attributes the flat molar wear pattern of hunter-gatherers to the puncture-crushing form of mastication necessary in the oral preparation of tough fibrous foods, often cooked without the benefit of more advanced technologies (such as using pottery or metal cooking vessels). The extreme and seemingly rapid rate of molar wear would also be explained by a tough fibrous diet high in abrasives such as the soil to be found on wild plants and tubers or the grit produced by preparing plant foods on sandstone or limestone metates. The lack of carious lesions would argue that their diet was low in soft prepared foods and carbohydrates.

Anterior dental wear suggests the use of the teeth as tools. Mesial angulation was noted on the central incisors of three individuals, two of which also had notching of an upper or lower central incisor. This notching would infer that the incisors were utilized for either holding, biting and cutting, or pulling strands of tough fibrous material, such as the plant fibers utilized in the manufacture of twine or basketry. Incisor notching was noted to occur in representatives of both genders, so it would not be prudent to suggest that the cause of the notching was related to sexually specific tasks.

The individuals represented by the Haiduk site burials have prominent mastoid processes and well-defined nuchal crests. These are osseous areas which serve as attachment points for muscles that move and stabilize the head and neck. The prominant development of these areas suggests chronic application of anterior and vertical loading stress on the jaws. Such loading could be induced by utilization of the teeth for holding and pulling, various materials, as might be necessary in hide stripping or straightening wood spear shafts; in other words, use of the teeth as tools. Wolpoff (1980:178-179) has suggested just such a biomechanical model to explain an increase in size of the cranial muscle attachment areas among pleistocene hominids. At present the application of Wolpoff's model to Archaic native Texans is speculation on the part of the author. Given the presence of this trait of the Haiduk site, it does represent an area for future investigation in the Texas prehistoric population.

Although the postcranial skeletal remains are fragmented and incomplete, it is still possible to gain some insight into the physical stature of the individuals. Because of this fragmentation, it would be speculation to attempt to estimate the height of the individuals with any precision. However, the remaining long bones do give the impression that, by modern standards, the persons composing the Haiduk burials were rather short. Nor do the postcranial remains give the impression of great robustness. Instead they were probably rather slender individuals. This short, slender body build could argue that these individuals did not have to depend upon great muscular strength or rugged bone structure to subsist in their daily environment. Instead, they depended upon the efficient use of tools to acquire subsistence from their environment.

Cause of death was indeterminable for any individual. The landowner reported that during excavation of the burials, one of the skulls was noted to have a point embedded in it. This point was removed prior to reinterment by the landowner (Haiduk, personal communication, 1985). During analysis of the skeletal material, no evidence of disease or pathological conditions which might manifest themselves osteologically were observed. Neither was there evidence of trauma. Three of the individuals appeared to be young healthy adults. Their age was estimated by the author to be between 20 and 30 years. Another may be a younger female. Based upon dental attrition, the last individual (4B) was judged to be slightly older, possibly in her mid-thirties. The possibility exists that at least some of the Haiduk burials may be the victims of Archaic warfare; however, no direct evidence was observed in the osteological analysis to support this. We will probably never know for sure how these ancient people died, but more importantly, we have learned a little about how they lived.

ACKNOWLEDGMENTS

I wish to thank Dr. David Glassman, and Dr. Joel Gunn, for assistance and inspiration in the preparation of this paper.

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GRANT D. HALL is presently a doctoral student in archaeology at Harvard University, Cambridge, Mass. Grant (known in many Texas archaeological circles as "Mr. Clean") is a research associate with the UTSA Center for Archaeological Research and headed the research team on the massive Choke Canyon project, where he was also the field director of the 1981 Texas Archeological Society field school. Prior to entering Harvard, he served as both a TAS Director and as a Regional Vice-President (Region 6). Previously, while at the University of Texas at Austin, Grant headed the extensive Allens Creek project for the Texas Archeological Survey; as a result of that project (funded by Houston Power and Light Company), Grant authored a definitive study of cultural prehistory of the Lower Brazos River Valley (for a review of that work, see La Tierra 9(2):33-39, 1982). In addition to his present studies, Grant has been working with UTSA's Dr. Richard Adams at Rio Azul in Guatemala, where they discovered a 1500-year-old Maya tomb which was widely reported on national TV and the press (labeled by one of the New York papers as "Grant's tomb"). For a recent picture of Grant at work in Rio Azul, see page 345 of Brian M. Fagan's The Adventure of Archaeology, Washington, D. C.: National Geographic Society, 1985.

ROBERT R. HARRISON is a graduate student in Anthropology at UTSA, whose primary interests are osteology and archaeology. Bob recently completed a faunal analysis of materials from a site in Napa County, California, and is presently working on analysis of an Early Archaic burial from Bandera County, which was recovered in the 1985 UTSA summer field School. A native of Kansas, Bob and his family now make their home in San Antonio, and he is deeply committed to Texas archaeology. He is also working with Dr. David Glassman, a physical anthropologist at Southwest Texas State University in San Marcos, on an osteological study of skeletal materials from the Lower Pecos area at the Witte Museum.

ROBERTA (BOBBIE) McGREGOR is assistant curator at the Witte Museum and the 1985 Vice-Chairman of the Southern Texas Archaeological Association. Bobbie holds a BS from the University of Connecticut as well as a BA in Native American Studies from Incarnate Word College. She is currently studying for a Masters in Anthropology with UTSA. Her interests focus on the archaeology of the Lower Pecos, and she is engaged in a study of basketry of that region of Texas.