THE BIOARCHAEOLOGY OF BLUE BAYOU: A LATE PREHISTORIC
MORTUARY SITE FROM VICTORIA COUNTY, TEXAS

A Thesis
by
ANTHONY GEAN COMUZZIE

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May 1987
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ABSTRACT

The Bioarchaeology of Blue Bayou: a Late Prehistoric Mortuary Site from Victoria County, Texas. (May 1987)

Anthony Gean Comuzzie, B.S., Texas A&M University

Chairman of Advisory Committee: Dr. D. Gentry Steele

The human skeletal material from a late prehistoric hunter-gatherer society was analyzed. The sample consisted of forty individuals representing both sexes and a wide range of age. Of the individuals recovered 22 were assessed as to sex: 12 individuals as male and 10 individuals as female. 36 individuals were identifiable as to age: 5 in early childhood, 1 an adolescent, 5 adolescent/adults, 19 adults, 4 adult/old adults, and 2 old adults. The mean age at death appears to be approximately the same for both sexes, approximately 35 – 45 years of age. Comparison of physical characteristics and discrete traits suggests a possible biological affinity for this sample with other prehistoric coastal populations. Statistical comparison of mean stature for the sample with other coastal samples suggests that the Blue Bayou population is slightly shorter. However, Blue Bayou appears to be just as robust as these coastal populations. There is also a pronounced degree of sexual dimorphism present within this sample, again similar to what has been noted in other coastal samples. There is little evidence of pathogenic activity with the majority of pathological conditions
being associated with the dentition. It is felt the Blue Bayou sample may exhibit a higher frequency of carious activity than that seen in the coastal populations from this same region. Based on the general lack of pathogenic activity, with the exception of caries, as well as the marked degree of sexual dimorphism, it is felt this population enjoyed a relatively high standard of health and successful subsistence pattern.
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CHAPTER I

INTRODUCTION

Blue Bayou (41 VT 94), a late prehistoric cemetery site from Victoria county in south Texas, is located on the Guadalupe River just south of the city of Victoria on land owned by the Dupont chemical company. The site rests just north of the Tamalupian and Texan biotic province border in the Texan province (Blair, 1950) and approximately 30 miles inland from the Gulf of Mexico (Fig. 1). The primary datum for the site is located at an elevation of approximately 15.90 meters above sea level.

This area (Fig. 1), often referred to as the Coastal Bend, is characterized by coastal lowlands with low ridges common along the bay shores (Shafer and Bond, 1985). The climatic conditions are mild, with hot summers and cool winters, with an average annual temperature of 20. C (Shafer and Bond, 1985). The major rainfall for the area occurs in May and September with dryer conditions prevailing November through May (Hester, 1980). Annual rainfall for the region is 80 to 90 cm (Arbingast and Kennamer, 1976).

Vegetation in this area has been described by Gould (1975) as a combination of coastal grassland, thorn scrub, and marsh zones. Common woody plants of the region include several species of Quercus (oak), primarily represented by Quercus virginiana (live oak) and

This thesis follows the style of American Journal of Physical Anthropology
Figure 1. Map of Texas showing location of Blue Bayou
Quercus marylndica (blackjack oak), along with Ungnadia speciosa (Mexican buckeye) and Prosopis sp. (mesquite) Hester, 1980; Shafer and Bond, 1985). In the grassland prairie and marsh regions the grasses include Heteropogon contortus (tanglehead), Sorghastrum elliotii (Indian grass), Andropogon gerardii (big bluestem), Buchloe dactyloides (buffalo grass) and Andropogon saccharoides (silver bluestem) (Jones, 1975; Gould, 1975; Shafer and Bond, 1985). In the areas nearer the bays the more common grasses include the salt-adapted species of Spartina spartinae (cordgrass), Distichlis spicata (seashore saltgrass), Spartina alterniflora (smooth cordgrass), and Monanthochloë littoralis (shoregrass) (Gould, 1975; Shafer and Bond, 1985). It has been suggested that during prehistoric times mesquite and other thorny shrubs were not as dense as they are in many parts of this region today. Their proposed recent spread is largely a result of modern agricultural practices (Hester, 1980).

The indigenous faunal community for this area is relatively rich and diverse, principally reflecting the wide range of microhabitats present. There is a variety of relatively large land mammals found here including Odocoileus virginianus (white-tailed deer), Sylvilagus floridanus (eastern cotton tail), Sylvilagus aquaticus (swamp rabbit), Lepus californicus (California jack rabbit), Lynx rufus (bobcat), Canis latrans (coyote), Mephitis mephitis (striped skunk), Procyon lotor (raccoon), Didelphis virginiana (opossum), Dicotyles tajacu (collard peccary), and Vulpes vulpes (red fox) (Davis, 1978). Historically this region has also supported populations of Ursus americanus (black bear), Bison bison (bison), and Antilocapra americana (pronghorn)
There is also a great diversity of rodents present including *Cratogeomys castanops* (pocket gopher), *Sigmodon hispidus* (cotton rat), *Neotoma floridana* (wood rat), and *Sylvilagus niger* (fox squirrel) (Davis, 1978), along with many others in relatively large numbers. Other land animals from this region include many species of snakes, and several species of lizards, frogs, and turtles (Blair, 1950). Additionally, the region has a seasonal abundance of migratory water fowl including *Anas* (ducks) and *Anser*, *Chen*, and *Branta* (geese) along with several other game birds including *Colinus* (quail), *Meleagris* (wild turkey), *Zenaida* sp. (dove) and *Tympanuchus* (prairie chicken) (Peterson, 1980).

Along with the terrestrial fauna this region is rich in both freshwater and marine organisms. The rivers of this area contain *Ictalurus* sp. (catfish), *Micropterus* sp. and *Pomoxis* sp. (bass), along with several other species of fish (Eddy, 1957). The shallow waters of the bays and estuaries contain a wide variety of fish and invertebrates including *Micropogon undulatus* (croaker), *Cynoscion nebulosus* (speckled weakfish), *Pogonias cromis* (drum), *Crassostrea virginica* (oyster), *Crago vulgaris* (brown shrimp) and *Callinectes sapidus* (blue crab) (Hoese and Moore, 1977; Fotheringham, 1980).

The site was initially exposed in the course of removing topsoil for construction activity at the Dupont plant during the spring of 1982. This activity was halted when a natural gas pipeline, which had originally been built in the 1940's, was encountered. The area was then left exposed allowing substantial erosion to occur. The first evidence of the site was recovered approximately a month and a
Half later, in May, 1982, by local avocational archaeologists Bill Birmingham, Don Will, and Jim Woodrich while surface collecting in the area. The Texas Archaeological Research Laboratory, The University of Texas, Austin was notified of the presence of human bone along with other cultural debris eroding out of the surface and, as a result, the site was registered.

Since the site appeared to be in danger of continued erosion, it was decided that excavation should begin immediately. Most of the actual field work was conducted by local avocational archaeologists with the assistance and guidance of Dr. Tom Hester, Al Wesolowsky, and students from the Division of Behavioral and Cultural Sciences and the Center for Archaeological Research, The University of Texas, San Antonio. Along with the actual excavation pits, several quarter meter test pits were also excavated to determine the extent of the site. All material exposed during excavation was plotted on the site map and photographed in situ prior to being removed. Following the completion of the excavation the entire site was back-filled and covered with crushed limestone.

Field observations were made and limited laboratory analysis conducted on the skeletal sample from the site by Al Wesolowsky, Center for Archaeological Research, The University of Texas at San Antonio during the summer and fall of 1982. This work consisted principally of identification of various in situ skeletal elements along with a limited attempt to estimate sex and age of a few of the individuals for inclusion in the field notes. No detailed demographic or pathological analysis was performed.
Based upon the results from the test pits, it is felt that Blue
represents a relatively extensive cemetery site and that the
material removed comprises only a small sample of what is present.

There are a number of burial orientations but the one most
commonly encountered was with the individual positioned on its side
with legs flexed and the skull oriented to the southeast or
southwest. This pattern of burial orientation appears to be
characteristic for nearly all burial sites for this time period and
region of south Texas (Shafer and Bond, 1985; Hester, 1980).

Radiocarbon dates for the sample have been obtained from bones
recovered from three of the burials. These samples, dated by The
University of Texas dating lab in Austin, give a maximum combined
range of 80 B.C. to 718 A.D. This places the sample in the very
terminal portion of the Archaic to the Late Prehistoric (Hester,
1980). A late prehistoric time is also suggested by the presence of
what has been identified as a "Scallorn" dart point in one of the
burials (Hester, 1980; Turner and Hester, 1985). In large part, the
separation between Terminal Archaic and Late Prehistoric in other
regions is one of distinct cultural change reflecting a shift away
from hunting and gathering and a move towards agriculture (Hester,
1980; Shafer and Bond, 1985). For South Texas, however, this
separation between the Archaic and the Late Prehistoric is a direct
assessment of the age of the site and not a reflection of major
cultural change since a hunter-gatherer lifestyle seems to have
predominated even into historic times for most of the indigenous
populations (Hester, 1980; Newcomb, 1961; Corbin, 1974; Shafer and
Bond, 1985). Consequently, the temporal placement of sites into either of these cultural phases becomes somewhat arbitrary. This problem is further complicated by a general lack of detailed work done on the cultural development and evolution for this region to date.

Blue Bayou is located near the northern border of what has been referred to as the coastal corridor of the south Texas archaeological area. Sites from this region consist primarily of shell middens, lithic scatters, bone and ceramic concentrations and cemeteries similar to Blue Bayou (Shafer and Bond, 1985; Hester, 1980; Campbell, 1947, 1952, 1958; Fritz, 1972, 1975; Corbin, 1963). Other sites from this region dating to approximately the same age all suggest a cultural development associated with a hunter-gatherer society (Campbell, 1947, 1952, 1976; Comuzzie et al., 1986; Corbin, 1974, 1976; Fritz, 1975; Hall, 1981; Shafer and Bond, 1985). These very early sites tend to be characterized by a lack of pottery and a relatively strong utilization of marine resources (Campbell, 1947; Corbin, 1974, 1976).

There seems to be little hope of assessing cultural affiliation of the human remains from Blue Bayou with any known historic group based on the archaeological evidence. However, it is known that there were hunter-gatherers living in this same region well into historic times. Based on historic records, there was a relatively diverse, predominantly inland group, referred to as the Coahuiltecan, and a predominantly coastal group known as the Karankawa (Hester, 1980; Newcomb, 1961). Both of these groups have been further
...ded into smaller groups based on their utilization of a particular geographical territory for foraging (Hester, 1980). In historic times a population referred to as the Aranama were reported to have lived in the area between the San Antonio and Calupe rivers near the Texas coast (Hester, 1980), the area in which Blue Bayou is also found. These peoples have been included in the Coahuilteco-speakers, but it has also been suggested that they represent a unique group (Hester, 1980). Based on known historic accounts, all of these historic Indian groups from this region display a minimal social organization, a basically utilitarian material culture, and a subsistence pattern largely based on hunting and gathering (Hester, 1980; Newcomb, 1961). Even though Blue Bayou shows similarities with some of these historic groups in terms of culture and geographic position, particularly the Aranama, it is impossible to convincingly determine affinities.

While Blue Bayou displays all the characteristics suggestive of a hunter-gatherer society of Terminal archaic to Late Prehistoric age, there are few other sites from the immediate area for comparison. To date the only other major cemetery site in Victoria county of comparable antiquity is the Morhiss site (41 VT 1). This site was excavated in the 1940's but there has been only been a brief description published (Campbell, 1976). This severely limits its usefulness for comparative work. It is this lack of detailed analysis and descriptions for large samples from this geographic and temporal setting that makes the detailed analysis of Blue Bayou of interest.
As a result of this minimal amount of documented comparative material, one of the major purposes of the present work is to provide a data base on the skeletal biology and demography of Blue Bayou for use in future comparative studies. A well-documented comparative collection for this geographic region and time frame is essential if an appreciation of the natural range of variation for such biological aspects as stature, robusticity, and sexual dimorphism is to be established. Without well-documented comparative collections, it will never be possible to develop useful models for the interpretation of the prehistoric lifeways of the populations from the coastal bend of Texas.

More specifically, there are several questions of immediate interest which can be explored preliminarily by use of the human remains recovered from Blue Bayou. It has long been a common practice to portray the subsistence patterns of many of these prehistoric hunter-gatherer groups as marginal at best and often on the brink of starvation (Hester, 1980; Rathbun et al., 1980). However, it has recently been suggested by Comuzie et al. (1985) that this might not be the case for prehistoric populations from the lower Texas coast. The material from Blue Bayou offers the opportunity to begin to assess the quality of subsistence offered by hunting and gathering for this region of the coastal bend based on the skeletal evidence for the frequency and pattern of disease and metabolic stress (Clarke, 1978; Milner, 1982). Such an assessment would then allow for comparisons of the health and general quality of life of the Blue Bayou sample with other samples which have been
suggested to have utilized similar lifeways.

Another topic which can be addressed by use of this sample is the prevalence and structure of culturally induced modification of the skeletal elements. Recent studies in the dental anatomy of prehistoric populations from the Texas coast have revealed some very interesting wear patterns (Comuzzie et al., 1986; Comuzzie and Steele, 1987). It has been suggested that perhaps these patterns of wear are associated with specific cultural practices common to this type of lifeway. The material examined from Blue Bayou shows evidence of the type of wear documented from other prehistoric coastal populations as well as a few unique patterns.

Also of interest is the possibility of assessing biological affinities based on physical structures (Wilkinson, 1977; Comuzzie et al., 1986; Droessler, 1981; Jantz, 1974; Ossenberg, 1974) for prehistoric populations from this region. The issue is of interest due to the general lack of cultural remains recovered from sites in this region with which to make assessments of population affinities. Based on work done on prehistoric populations from the Texas Coast at Shell Point (Wilkinson, 1973), and Palm Harbor (Comuzzie et al., 1986), there appear to be physical characteristics which are shared by these populations and tend to distinguish these prehistoric coastal populations from other populations in the region. The biological assessment of the Blue Bayou sample in relationship to these samples is important in providing a clearer picture of the type of isolation, both biologically and culturally, which might be occurring (Leslie, 1977; Droessler, 1981; Wilkinson, 1971; Owsley et
While there has long been a strong interest, and a great deal of speculation on the physical anthropology of the Texas coast (Comuzzie et al., 1986; Wilkinson, 1973, 1977; Aten, 1965), there remains few if any of comprehensive and integrated studies of the bioarchaeology of the prehistoric period of this region. There have been a number of previous works dealing with relatively small burial samples from this region (Wilkinson, 1973; Mallouf and Zavaleta, 1979; Hester and Corbin, 1975; Comuzzie et al., 1986) along with a few others dealing with slightly larger samples (Jackson, 1933; Aten et al., 1976; Hall, 1981) but none have dealt with populations from Victoria or immediately adjacent counties. The Blue Bayou sample is significant then because it represents the first relatively large prehistoric burial sample to be analyzed in any detail for the central portion of the coastal bend. Furthermore, many of the previous works have concentrated on describing the structural features of the individuals analyzed without attempting to provide a detailed bioarchaeological analysis such has been done for other regions (e.g. Ubelaker, 1974; Buikstra, 1976, 1977; Droessler, 1981; Jantz, 1972, 1973; Owsley et al., 1981; Owsley and Bass, 1979; Wilkinson, 1971). It is the author's intent to provide as complete a documentation as possible of the vital statistics for the individuals recovered for use in future comparative studies along with beginning to address some of the previously less considered topics of a bioarchaeological nature such as demographic structure, quality of health, successfulness of subsistence strategy, and population affinity.
CHAPTER II

MATERIALS AND METHODS

The purpose of this research is to provide information concerning the skeletal biology and demographic profile of the human remains from Blue Bayou. At present the physical anthropology of the central Texas coast is only poorly understood. This study was designed to provide one of the first bioarchaeological studies of a population recovered from the region. The sample is noteworthy because its relatively large size, and the care with which it was excavated and analyzed.

The remains excavated at Blue Bayou consisted of what was described in the field notes as thirty primary burials and eight bone masses. It is now felt, based on this analysis, that these "bone masses" actually represent secondary interments consisting mostly of fragmented and partial remains of single individuals. The rest of the sample appears to be from primary interments, and with few exceptions limited to single burials. At least 45 separate individuals are represented in the recovered material.

Basically the objectives of the study were three fold. The first objective was the conservation, reconstruction, and curation of these remains to allow for the retrieval of the maximum amount of information on the skeletal biology of the Blue Bayou sample. The second objective was to provide as complete a description as possible of the structural features of the individuals represented. The third objective and the most important, was to compare this sample to other
from this same time and geographical area. As pointed out by 
Dra (1976), all too often there is little or no effort made at 
reviewing the research designs and data of the physical 
archeologist in the development of a regional synthesis. It has 
been shown, however, that biological data has much to offer in terms 
of increasing the understanding of the cultural prehistory of an area 
(Baker, 1974; Buikstra, 1976, 1977; Droessler, 1981; Jantz, 1972, 
Due to the modest amount of bioarchaeological research which has been 
done on the central Texas coast, the analysis of the Blue Bayou 
samples provides some new insights in the bioarchaeology of these 
early prehistoric inhabitants.

While the material recovered from Blue Bayou represents a 
relatively large sample for analysis, the remains were initially 
recovered in a rather fragmented condition. Thus, the first 
objective of the project was the cleaning and reconstruction of the 
skeletal elements. It appeared that most bones were broken in situ by 
ground pressure probably resulting from the swelling and shrinking 
of the sandy clay soil in which these remains were deposited. 
Fortunately a high percentage of the fragments were recovered. In 
terms of actual preservation the substructure of the bone was 
relatively solid, which greatly facilitated cleaning and 
reconstruction. In order to provide a usable sample the bony 
elements were cleaned of any remaining matrix and then consolidated 
by immersion in a solution of Vinac B-15. In a large number of 
instances it was possible following this procedure to reconstruct
the elements by joining the fragments with a solution of HCl.

Upon completion of the cleaning and conservation, the remains were separated by individual per burial and assigned a three digit number for analysis. The first two digits of this code represented the burial association and the last digit represented the individual (i.e., 110 = burial 11 individual 0). All individuals were analyzed separately, observations and measurements were encoded on standardized forms, and coded data entered into a computerized data base. A synopsis of the analysis of each individual is provided in Appendix A.

The analysis of each individual consisted of both quantitative and qualitative observations, the goal being to record as much data for each individual as possible. Fortyseven separate measurements were taken, with as many of these as possible being recorded for each individual. A description of these measurements is provided in Appendix B. The measurements were taken with standard anthropometric instruments and following the techniques and landmarks outlined by Montague (1960), Stewart (1952, 1978), Olivier (1970), El-Najjar and McWilliams (1978) and Rogers (1984). The qualitative portion consisted of a visual assessment of the remains with the goal being to develop an appreciation of the physical variation and anomalies characterizing this population. A description of these observations is provided in Appendix C.

The numerical data were analyzed statistically in two ways. Tests for significance in the number of individuals between the sexes
by use of chi-square analysis at the .05 level of significance. However, the test for possible significance between means within the various age categories was done utilizing the Kolmogorov-Smirnov test at a .05 acceptance level. Comparisons of raw data for significance in differences of both inter- and intra-sample means were made by use of a two-tailed T-test at a .05 level of significance. The calculated values of these statistical measures are provided in Appendix D.

One of the primary goals of this research was to provide a demographic profile of the sample to facilitate the interpretation of mortality rates and quality of life within the Blue Bayou population. As a result, the determination of an individual's sex and age was of basic importance since this information is critical for the reconstruction of the demographic profile of a population (Ubelaker, 1978). Due to the general lack of preservation of pelvic remains in the sample the techniques employed had to utilize skeletal elements often felt to give a less accurate determination (Bass, 1971; Krogman, 1962; El-Najjar and McWilliams, 1978; Ubelaker, 1978; Steele and Bramblett, N.D.). Therefore, the determination of sex was made whenever possible by use of several different techniques to assure as much accuracy as possible (Black, 1978a; Keen, 1950; Bass, 1971; Stewart, 1978). As with determination of sex, the assessment of an individual's age was based on as many different criteria as possible to provide a more accurate estimation. The assessment of age for immature individuals was made based on various developmental criteria (Bass, 1971; Krogman, 1962; El-Najjar and McWilliams, 1978;
1978; Steele and Bramblett, N.D.), many of which are
with the dentition (Schour and Massler, 1940). For mature
males the assessment of age was based on the degree of
eruption (Bass, 1971; Krogman, 1962; El-Najjar and McWilliams,
Stewart, 1978; Steele and Bramblett, N.D.), particularly the
degree of dental attrition (Miles, 1963). Unlike the determination
of sex however, age could not always be accurately assessed so age
categories were utilized.

In addition to the demographic analysis an assessment of the
possible biological affinity of the Blue Bayou material was also
conducted. The samples chosen for comparison were from Palm Harbor
(41:AS 80), a Late Prehistoric cemetery site suspected of being
Karankawan (Comizzio et al., 1986), and Mission San Juan Capastrano
(41:BX 5), a historic cemetery sample reportedly documented as
Coahuiltecan (Humphreys, 1971). The assessment of biological
affinity followed the work of Wilkinson (1977), and Finnegan and
Marcik (1979). Wilkinson (1977) suggested that it was possible to
recognize pre-contact Karankawans by a suite of cranial features such
as size and shape of browridges and mental eminence. The technique
developed by Finnegan and Marcik (1979) is based on the presence and
absence of discrete traits in the populations being compared. A list
of the traits utilized is provided in Appendix E.

Along with the sex and age of the sample the stature and
robusticity of each individual was assessed when possible. Due to
the fragmented condition of the long bones it was necessary to
estimate their intact length by use of the method developed by Steele
before estimations of stature could be made. Once long bone
was estimated, stature estimations were made utilizing
formulae developed by Genoves (1967). It was decided the formulae
developed by Genoves (1967) based on a Mesoamerican sample would
provide a more accurate estimation of the stature in this population
than the formulae developed by Trotter and Gleser (1952) based on
American whites and blacks as well as a mongoloid sample. This
assumption was based on the similarity of the reconstructed mean long
bone lengths from the Blue Bayou sample to those of the sample used
by Genoves (1967).

Along with stature, the robusticity of the individuals was
assessed. These characteristics, stature and robusticity, provide
the data necessary for quantifying the degree of sexual dimorphism
present in the Blue Bayou sample. This was done since sexual
dimorphism may indicate the quality of health in the sample (Brauer,
1982; Stini, 1969, 1972; Tobias, 1972). An understanding of the
amount of sexual dimorphism present also helped in determining the
sex of indeterminant individuals in the sample as well as providing
yet another basis for comparison between this and other prehistoric
cemetery samples.

In conjunction with the description of the demographic and
physical profiles of the sample the final objective of the research
was to assess the types and prevalence of pathology, trauma, and
metabolic insult as a means of assessing the quality of health at
Blue Bayou (Steinbock, 1976; Ortner and Putschar, 1981; El-Najjar and
McWilliams, 1978; Steele and Bramblett, N.D.; Clarke, 1978; Milner,
Markers of physiological stress due to disease, injury, or poor nutrition are often reflected in bone and teeth as either macro or microscopic alterations which can be observed and often times the latter diagnosed (Steinbock, 1976; Ortner and Putschar, 1981; El Pelldand McWilliams, 1978; Patterson 1984). In the analysis of the Bayou material both a gross and microscopic analysis were performed on all identifiable remains. Due to their excellent state of preservation elements of the dentition were strongly emphasized in proportion of the research. The dentition was carefully examined for any evidence of enamel hypoplasia or other defects since this has often been to be a particularly good indicator of chronic disease and metabolic stress during the developmental years (El-Najjar et al., 1984; Patterson, 1984; Goodman, 1987). Along with the identification of pathologically induced changes, all the remains recovered were analyzed for evidence of traumatic injury or cultural modification.
CHAPTER III

DEMOGRAPHICS AND BIOLOGICAL AFFINITY

To facilitate comprehension of both the biological and the cultural characteristics of a population it is first necessary to establish the demographic profile of the study sample (Owsley and Bass, 1979; Ubelaker, 1974, 1978; Ward and Weiss, 1976; Weiss, 1973; Weiss and Ballonoff, 1975). This requires accurately estimating the sex and age of all individuals represented (Ubelaker, 1978). The determination of sex is important since it allows for the construction of sex ratios which can in turn provide insight into variations in levels of stress between the sexes. Establishing the age of individuals is of interest since this permits delineating age periods of high susceptibility to disease, nutritional deficiency, or trauma.

SEX

The determination of the sex of an unknown individual has long been of major concern in forensic anthropology (Bass, 1979; Stewart, 1978). Consequently, a wide variety of techniques have been developed for the assessment of sex (i.e. Black, 1978a,b; Brown and Townsend, 1979; Ditch and Rose, 1972; Giles, 1970; Hana and Washburn, 1953; Iscan and MillerShaivitz, 1984; Keen, 1950; Kelly, 1979; MaLaughlin and Bruce, 1985; Phenice, 1969; Steele, 1976). It is unfortunate, however, that the most successful of these techniques are based on the utilization of the pelvis, a skeletal element
ently recovered in the sample from Blue Bayou. Therefore, the
certainty of sex of individuals in this sample was made by methods
better than those requiring evaluation of pelvic remains. With this
consideration in mind and the lack of pelvic remains the gender estimations for Blue Bayou
was based in large part on sexually dimorphic traits of the skull
and long bones. When possible this assessment was based on cranial
architecture following the methods outlined by Keen (1950), Bass
Features considered were the size of gonial angle, and the
robusticity of browridges and mastoids.

It appeared that males could be identified by the presence of a
relatively heavy supraorbital torus, and well developed mastoids.
While the females also displayed a relatively strong degree of
robusticity with respect to these features they did not express it to
the same extent as the males. Of all the cranial indicators for sex
the size of the gonial angle proved to be the most useful. The
gonial angle was measured whenever possible, with males defined as
those individuals with an angle smaller than 120 degrees and females
with an angle greater than 120 degrees (Table 1 and Fig. 2). It was
possible by use of the gonial angle to classify eight of the
individuals in the sample as to sex. The assessments made utilizing
this technique agreed with those made previously for these
individuals based on the other methods utilized.

Along with the crania, the mid-shaft circumference of the femur
(Black, 1978a) also provided a way of assessing sex. This method is
based on the differences in the mid-shaft circumference of the femur
1. Gonial angle measurements.

<table>
<thead>
<tr>
<th>Burial</th>
<th>Sex</th>
<th>Gonial angle</th>
</tr>
</thead>
<tbody>
<tr>
<td>080</td>
<td>F</td>
<td>128</td>
</tr>
<tr>
<td>160</td>
<td>M</td>
<td>106</td>
</tr>
<tr>
<td>200</td>
<td>M</td>
<td>110</td>
</tr>
<tr>
<td>230</td>
<td>F</td>
<td>123</td>
</tr>
<tr>
<td>240</td>
<td>M</td>
<td>117</td>
</tr>
<tr>
<td>250</td>
<td>F</td>
<td>122</td>
</tr>
<tr>
<td>290</td>
<td>M</td>
<td>106</td>
</tr>
<tr>
<td>300</td>
<td>F</td>
<td>124</td>
</tr>
</tbody>
</table>

Individuals with a gonial angle greater than 120° were considered females and those with an angle less than 120° as males.
Fig. 2. Distribution of sex based on gonial angle.
between the sexes. Assessments were made by recording and plotting these measurements by individual and then locating the mid-point for the sample (Fig. 3). In the Blue Bayou sample males were considered to be those individuals with a mid-shaft circumference greater than 85 cm and females with a mid-shaft circumference below this sectioning point (Table 2). It was possible by use of this method to assess the sex of 9 individuals from the sample, 5 males and 4 females. The sex assessment of those individuals made by other techniques agreed with the observations based on this method as well.

It was not possible to estimate sex for all individuals in the Blue Bayou sample. Since the skeletal characteristics utilized in the determination of sex are the result of sexual differentiation it was not possible to accurately assess the sex of immature individuals. Of the forty-five discrete individuals recovered from Blue Bayou forty were identified as being of sufficient maturity to be classified as adults. Because of the incomplete nature of most adults it was possible to make an assessment of sex for only twenty-two of these forty: Ten were classified as females and twelve as males (Table 3). The sex assessment for each of the individuals analyzed is provided in appendix A.

In a population with no bias in selective pressure with regards to sex, a ratio of 1:1 is to be expected. Comparing the number of females to the number of males represented in this sample a Chi-Square analysis indicates that the number of females is not significantly different from the number of males. Based on this there appears to be no reason to suggest the presence of a
between the sexes. Assessments were made by recording and plotting these measurements by individual and then locating the mid-point for the sample (Fig. 3). In the Blue Bayou sample males were considered to be those individuals with a mid-shaft circumference greater than 85 cm and females with a mid-shaft circumference below this sectioning point (Table 2). It was possible by use of this method to assess the sex of 9 individuals from the sample, 5 males and 4 females. The sex assessment of those individuals made by other techniques agreed with the observations based on this method as well.

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Fig. 3. Distribution of sex by mid-shaft circumference of the femur (mm).
1. Mid-shaft circumference of the femur (mm) (Black 1978).

<table>
<thead>
<tr>
<th>Burial</th>
<th>Sex</th>
<th>Circumference at mid-shaft</th>
</tr>
</thead>
<tbody>
<tr>
<td>A010</td>
<td>F</td>
<td>84.0</td>
</tr>
<tr>
<td>0040</td>
<td>M</td>
<td>89.0</td>
</tr>
<tr>
<td>050</td>
<td>M</td>
<td>87.0</td>
</tr>
<tr>
<td>080</td>
<td>F</td>
<td>84.0</td>
</tr>
<tr>
<td>110</td>
<td>F</td>
<td>84.0</td>
</tr>
<tr>
<td>170</td>
<td>M</td>
<td>96.0</td>
</tr>
<tr>
<td>180</td>
<td>M</td>
<td>89.0</td>
</tr>
<tr>
<td>450</td>
<td>M</td>
<td>96.0</td>
</tr>
</tbody>
</table>

Individuals with a mid-shaft circumference greater than 85mm were considered males and those with a mid-shaft circumference less than 85mm were considered females.
3. Age distribution by sex.

<table>
<thead>
<tr>
<th>Age Category</th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>Old Adult</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Adult\Old Adult</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Adult</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Adolescent\Adult</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Adolescent</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>10</strong></td>
<td><strong>12</strong></td>
</tr>
</tbody>
</table>

This does not include age categories in which the individuals had not yet reached sexual maturity.
ential selective pressure, such as disease or physiological and emotional stress, operating with a bias towards either sex.

While natural selective pressures represent a primary force in the setting sex ratios, cultural pressures can also play a significant 1979; role in human populations. One explanation generally offered for 1979; culturally induced differential sex ratios in archaeological cemetery 1979; samples is that males dying from injuries suffered in aggressive 1975; activities (i.e. warfare) away from home, are not brought back for burial in the cemetery. Since the sex ratio at Blue Bayou appears to be 1:1 there does not seem to be any reason to suggest that males from this group are being lost in hostile activities away from the camp in any appreciable numbers. This interpretation is further supported by the fact that only one individual within this sample displays evidence of what is most probably mortal wounds suffered as a result of human aggression (see Chapter V). This same 1:1 ratio might also seem to suggest that female infanticide was not a common practice as has been suggested for some of the historical groups of this region (Hester, 1980; Newcomb, 1961; Aten et al., 1976). In most societies where female infanticide is practiced it is common to see it result in an under representation of adult females in the population. Furthermore, it would not appear on the basis of sex that one portion of the population is being afforded any special treatment with regards to burial within the cemetery.
with sex, a reliable assessment of age is an important aspect of reconstruction of demographic trends for a population (Bass, Stewart, 1978). Consequently, there are many techniques which have been developed for age assessment (i.e. Ericksen, 1979; Hoffman, Kerley, 1965; Lovejoy, 1985; McKern, 1970; Meindl and Lovejoy, Miles, 1963). While some of these procedures, particularly those based on developmental sequences (Schour and Massler, 1940), can give quite precise age estimates, those based on degenerative processes, typically associated with old age, tend to be less accurate. Since the assessment of adult age cannot always be precise, individuals were generally assigned to age categories rather than to an actual chronological age. In the case of the Blue Bayou sample five major age categories based on qualitative observations were used: infant (birth to 2 years), early childhood (3 years to 5 years), late childhood (6 years to 12 years), adolescent (13 years to approximately 20 years), adult (21 years to approximately 45), and old adult (46+ years) (El-Najjar and McWilliams, 1978; Steele and Bramblett, N.D.). These were further supplemented by two additional categories; adolescent/adult and adult/old adult which were used to accommodate those individuals which showed characteristics of both the categories.

As with the assessment of sex the limiting factor in the selection of techniques for age determination is the preservation of skeletal elements necessary for evaluation. Since teeth were the most frequently recovered element useful for age determination the
Observations for the assessment of age were made utilizing the dentition (Schour and Massler, 1940; Miles, 1963). When possible, techniques were supplemented with techniques utilizing other skeletal elements (Bass, 1971; Jurmain, 1980; Meindl and Lovejoy, 1981; Krogman, 1962; El-Najjar and McWilliams, 1978; Steele and Pett, N.D.). The age estimations for all individuals analyzed are provided in appendix A.

In the case of those individuals in the sub-adult categories it was generally possible, based on the eruption sequence of the dentition (Schour and Massler, 1940), to assign a fairly accurate age to the specimen in question. When preservation permitted it was also possible to estimate the age of a sub-adult based on the degree of epiphyseal fusion (Bass, 1971; Krogman, 1962). Since these techniques are based on predictable developmental sequences the age estimates obtained are generally very accurate.

For mature individuals age estimations utilizing the dentition (Miles, 1963), as well as other skeletal elements (Jurmain, 1980; Ortner and Putschar, 1981), were based on the extent of degeneration of the structure under observation. With respect to the dentition the measure of age was based on the extent of occlusal attrition exhibited following the technique developed by Miles (1963). The degree of attrition for these individuals was scored on the basis of none, slight (crowns of teeth polished), moderate (some exposure of secondary dentin on the occlusal surface), heavy (the complete loss of enamel from the occlusal surface), and severe (the complete loss of enamel from all aspects of the tooth with subsequent reshaping).
The rate of attrition can be quite variable between populations as a result of differences in the abrasiveness of the diet or dental practices in the utilization of the teeth (Brace and Molnar, 1972; Cybulski, 1974; Dahlberg, 1963a,b; Molnar, 1968, 1970, 1971, 1972; Patterson, 1984) it tends to be fairly constant for individuals within an egalitarian society. Based on the archaeological material recovered from Blue Bayou there appears to be no evidence of social stratification, so attrition rates for individuals within the population were assumed to be homogeneous.

Age for mature individuals was also estimated based on the presence of degenerative conditions in the joints associated with arthritis (Jurmain, 1980; Ortner and Putschar, 1981). In most cases it has been suggested that degenerative arthritis does not appear until at least the onset of the fourth decade of life (Ortner and Putschar, 1981), thereby, making it primarily a condition associated with the old adulthood category of this sample. Age of mature individuals was also estimated when appropriate, on the degree of obliteration of the cranial sutures (Bass, 1971; Krogman, 1962; Meintl and Lovejoy, 1985). Of all of the methods utilized to obtain age estimates this is the least accurate because completely fused sutures are generally associated only with relatively old individuals. Because these techniques utilized for the assessment of age in adults were open to a greater range of uncertainty than those for sub-adults, age estimations of mature individuals was based on as many different techniques as possible.

Of the forty-five individuals identified thirty-six were
as to age (Table 4). Figure 4 shows the age distribution for the sample. Based on these distributions it appears that the population had experienced an 83% mortality rate before reaching the old adult category (Table 4). As a result it appears that the mean age at death was approximately 35-40 years.

When we statistically compare, by use of Kolomogorov-Smirnov, the age distributions of the males and females (Table 1 and Fig. 4) we find no significant difference between the number of individuals found in each age category. This suggests that there were no significant differences in mortality rates between males and females. This indicates that the sample should be relatively reliable for demographic interpretation (Ubelaker, 1978). However, when we look at the frequency of individuals assigned to the early childhood category (Table 4 and Fig. 4) it appears early childhood was a stressful period of life, but individuals surviving past this stage had a fairly strong chance of reaching adulthood. This interpretation is supported by the fact that no individuals classified in the late childhood category (Table 4) were recovered, thereby, suggesting the mortality rate for individuals in this age category was most probably low. It should be kept in mind that these conclusions are based on a relatively small sample, and can only be considered tentative.

In summary, the demographic data suggests that at Blue Bayou there was an equal representation of males and females in all adult age categories which suggest the absence of any biased selective pressure between sexes, either biologically or culturally.
Age distribution.

<table>
<thead>
<tr>
<th>Age Category</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Old Adult</td>
<td>2</td>
</tr>
<tr>
<td>Adult\Old Adult</td>
<td>4</td>
</tr>
<tr>
<td>Adult</td>
<td>19</td>
</tr>
<tr>
<td>Adolescent\Adult</td>
<td>5</td>
</tr>
<tr>
<td>Adolescent</td>
<td>1</td>
</tr>
<tr>
<td>Late Childhood</td>
<td>0</td>
</tr>
<tr>
<td>Early Childhood</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>36</td>
</tr>
</tbody>
</table>
Fig. 4. Age distribution at Blue Boye (N=36).
the age distribution is generally felt to be in
with those associated with other prehistoric hunter-
societies with respect to the adult population but juvenile
appear to be somewhat under represented. The mortality rate
was to be relatively high during the years of early childhood
apparent decrease in the juvenile years followed by a rather
increase again in adulthood. In general the life span appears
of modest duration, on the average not usually exceeding 35 -
years. However, there are enough individuals surviving to this
and beyond to suggest that the quality of health might be
what better in comparison to what has previously been suggested
for other groups utilizing a similar lifestyle (Hester, 1980; Rathbun
etal., 1980).

IV. BIOLOGICAL AFFINITY

One aspect of the bioarchaeology of the prehistoric coastal bend
of Texas which has received little attention to date is the question
of the possible biological relationships of the various reported
samples within the area. The evaluation of biological affinities of
human populations has proved quite beneficial in the understanding of
the bioarchaeology of other regions (Buikstra, 1976, 1977;
Droessler, 1981; El-Najjar, 1978; Jantz, 1974; Ossenberg, 1974;
Owsley et al., 1981; Wilkinson, 1971). The only real study directed
toward this question for prehistoric coastal populations of Texas is
that of Wilkinson (1977). He suggested that it was possible to
identify pre-contact Karankawans based on the structure and
city of the mandible and skull, and that Shell Point, Jamaica and the Oso Creek material represent samples of this tradition. This idea was further considered by Comuzzi et al. to suggest the possible biological relationship of the Palm material to these sites.

For this study, comparisons of the Blue Bayou material with samples followed Wilkinson (1977), and Finnegan and Marcsik (1986). The Blue Bayou sample was compared to both the Palm Harbor sample (Comuzzi et al., 1986), suggested as representing pre-contact Yumanka, and material from San Juan Capastrano (Humphreys, 1971), a sample identified as historic Coahuiltecan. It should be noted, however, that upon examination of the San Juan Capastrano material for this comparison it became apparent that this may not be as biologically a homogeneous a population as previously reported.

Based on a visual assessment of the mandibles of the three samples, utilizing the characteristics outlined by Wilkinson (1977), it would appear that the Blue Bayou material is more similar in appearance to the Palm Harbor sample than to the San Juan Capastrano sample. Statistical comparisons of the means for measurements of the mandible documented no significant difference between Blue Bayou and Palm Harbor for gonial angle, height of ascending ramus, and mandible length (Tables 5 - 7). However, there was a significant difference between these populations with respect to minimum breadth of the ascending ramus (Table 8). This suggests that the Blue Bayou population is more closely associated with these prehistoric coastal populations than to the historic Coahuiltecan sample. The lack of
Comparison of gonial angles of the mandible.

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>X</th>
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<th>Range</th>
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</tr>
</thead>
<tbody>
<tr>
<td>you</td>
<td>3</td>
<td>111</td>
<td>5.6</td>
<td>106</td>
<td>117</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>125</td>
<td>4.2</td>
<td>122</td>
<td>128</td>
</tr>
<tr>
<td>Harbor</td>
<td>2</td>
<td>104.5</td>
<td>0.7</td>
<td>104</td>
<td>105</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>109</td>
</tr>
<tr>
<td>Juan Capastrano</td>
<td>1</td>
<td></td>
<td></td>
<td>127</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>1</td>
<td></td>
<td></td>
<td>137</td>
<td></td>
</tr>
</tbody>
</table>

1 Data obtained from Comuzzie et al. (1986).
Comparison of mean height of the mandibular ascending ramus

<table>
<thead>
<tr>
<th>Location</th>
<th>N</th>
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<th>S.D.</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parcchou</td>
<td>2</td>
<td>68.5</td>
<td>9.2</td>
<td>62.5 - 75.0</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>----</td>
<td>----</td>
<td>59.5</td>
</tr>
<tr>
<td>Pool Harbor</td>
<td>2</td>
<td>72.5</td>
<td>0.7</td>
<td>72.0 - 73.0</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>----</td>
<td>----</td>
<td>66.0</td>
</tr>
<tr>
<td>San Juan Capastrano</td>
<td>1</td>
<td>----</td>
<td>----</td>
<td>65.0</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>----</td>
<td>----</td>
<td>55.0</td>
</tr>
</tbody>
</table>

1 Data obtained from Comuzzie et al. (1986).
Comparison of mean mandibular length (mm).

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>X</th>
<th>S. D.</th>
<th>RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult</td>
<td>2</td>
<td>84.0</td>
<td>4.2</td>
<td>81.0 - 87.0</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>76.0</td>
<td>3.6</td>
<td>73.0 - 80.0</td>
</tr>
<tr>
<td>Tarbor</td>
<td>2</td>
<td>86.5</td>
<td>6.4</td>
<td>82.0 - 91.0</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td>82.0</td>
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<tr>
<td>Juan Capastrano</td>
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<td></td>
<td></td>
<td>79.0</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td>69.0</td>
</tr>
</tbody>
</table>

1 This data obtained from Comuzzie et al. (1986).
Comparison of mean minimum breadth of the mandibular ramus (mm).

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>X</th>
<th>S.D.</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miami</td>
<td>2</td>
<td>34.5</td>
<td>0.3</td>
<td>34.0 - 35.0</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>30.0</td>
<td>1.4</td>
<td>29.0 - 31.0</td>
</tr>
<tr>
<td>Palm Harbor</td>
<td>2</td>
<td>40.0</td>
<td>2.8</td>
<td>38.0 - 42.0</td>
</tr>
<tr>
<td>Captura</td>
<td>1</td>
<td>---</td>
<td>---</td>
<td>31.0</td>
</tr>
</tbody>
</table>

*This data obtained from Comuzzi et al. (1986).*
between Blue Bayou and San Juan Capastrano is not
surprising since the two samples are separated chronologically from
each other by approximately a thousand years. However, the
similarities between the Blue Bayou sample and Palm Harbor is
not so great since they suggest that there is some degree of
relationship between the slightly inland Blue Bayou population and
the living directly on the coast.

Comparisons between Blue Bayou, Palm Harbor and San Juan
Castrano were also made following the technique of Finneghan and
Marczik (1979). This technique assesses similarity based on shared
discontinuous traits of the skull and mandible. It has been shown
that these characteristics have a high genetic component and the
differences in the frequencies with which they occur in different
populations may be a reflection of genetic relationships (Finnegan
and Marczik, 1979; El-Najjar, 1978; and Leslie, 1977). Individuals
from the three samples were scored for the presence or absence of the
42 characteristics listed in appendix E. While actual biological
distance statistics were not calculated some relationships did begin
to emerge. Once again the Blue Bayou material shared few
characteristics with the San Juan Capastrano sample and more with the
sample from Palm Harbor. Table 9 provides the number of individuals
exhibiting each of the various characteristics from each of the sites
compared.

Along with the discrete characteristics of the skull and
mandible (Finnegan and Marczik, 1979) the Blue Bayou sample exhibits
what Taylor (1978) considered relatively rare dental variations (see
Table 9. Comparison of discrete cranial traits. (following Finnegon and Marczik 1979).

<table>
<thead>
<tr>
<th>Site</th>
<th>N</th>
<th>X</th>
<th>S.D.</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue Bayou</td>
<td></td>
<td>1</td>
<td>----</td>
<td>90.0</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>----</td>
<td>----</td>
<td>87.0</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>----</td>
<td>----</td>
<td>87.0</td>
</tr>
<tr>
<td>Palm Harbor¹</td>
<td></td>
<td>2</td>
<td>110.0</td>
<td>99.0 - 121.0</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>----</td>
<td>15.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>----</td>
<td>----</td>
<td>89.0</td>
</tr>
<tr>
<td>San Juan Capastrano²</td>
<td></td>
<td>1</td>
<td>----</td>
<td>113.0</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>----</td>
<td>----</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>----</td>
<td>----</td>
<td>84.0</td>
</tr>
</tbody>
</table>

¹ This data was obtained from Comuzzi et al. (1986).

²
Chapter V). None of these dental variations were reported for Palm Harbor (Comuzzie et al., 1986) or San Juan Capastrano (Personal Observations). Based on the presence of these relatively rare genetic traits of the dentition it would appear that the Blue Bayou sample might represent a fairly isolated breeding population (El-Jajjar, 1978; Leslie, 1977).

While these assessments are only tentative they should offer a starting point for future research in this area. At present it would appear that the Blue Bayou sample might have been relatively isolated as a breeding population. This point is supported not only by the dental evidence but also by a statistical analysis of the means of cranial measurements between Blue Bayou and Palm Harbor which tends to suggest a slight difference in cranial shape (Tables 10 - 13). However, it does share similarities in the structure of the mandible and cranium (Wilkinson, 1977) with individuals from the Palm Harbor sample which might suggest a possible biological affinity with this and other prehistoric populations from the coast.
Table 10. Comparison of mean minimum frontal breadth (mm).

<table>
<thead>
<tr>
<th>Site</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>X</td>
<td>S.D.</td>
<td>Range</td>
</tr>
<tr>
<td>Rue Bayou</td>
<td>M</td>
<td>2</td>
<td>84.5</td>
<td>2.1</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>1</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td>Palm Harbor</td>
<td>M</td>
<td>2</td>
<td>101.0</td>
<td>1.4</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>1</td>
<td>----</td>
<td>----</td>
</tr>
</tbody>
</table>

1 Data obtained from Comuzzie et al. (1986).
Table II. Comparison of mean horizontal circumference of the cranium (mm).

<table>
<thead>
<tr>
<th>Site</th>
<th>N</th>
<th>X</th>
<th>S.D.</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue Bayou</td>
<td>M</td>
<td>3</td>
<td>493.7</td>
<td>5.8</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>1</td>
<td>-----</td>
<td>477.0</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>2</td>
<td>520.5</td>
<td>0.7</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>1</td>
<td>-----</td>
<td>495.0</td>
</tr>
</tbody>
</table>

1 Data obtained from Comuzzi et al. (1986).
Table 12. Comparison of mean maximum length of the cranium (mm).

<table>
<thead>
<tr>
<th>Site</th>
<th>N</th>
<th>X</th>
<th>S.D.</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue Bayou</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>3</td>
<td>169.7</td>
<td>8.1</td>
<td>165.0 - 179.0</td>
</tr>
<tr>
<td>F</td>
<td>1</td>
<td>----</td>
<td>---</td>
<td>171.0</td>
</tr>
<tr>
<td>Palm Harbor(^1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>2</td>
<td>189.5</td>
<td>6.4</td>
<td>185.0 - 194.0</td>
</tr>
<tr>
<td>F</td>
<td>2</td>
<td>184.5</td>
<td>9.2</td>
<td>178.0 - 191.0</td>
</tr>
</tbody>
</table>

\(^1\) Data obtained from Comuzzie et al. (1986).
Table 13. Comparison of mean maximum cranial breadth (mm).

<table>
<thead>
<tr>
<th>Site</th>
<th>N</th>
<th>X</th>
<th>S.D.</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bayou</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>3</td>
<td>129.7</td>
<td>1.6</td>
<td>128.0 - 131.0</td>
</tr>
<tr>
<td>F</td>
<td>1</td>
<td>-----</td>
<td>---</td>
<td>127.0</td>
</tr>
<tr>
<td>Palm Harbor</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>2</td>
<td>133.5</td>
<td>3.5</td>
<td>131.0 - 136.0</td>
</tr>
<tr>
<td>F</td>
<td>2</td>
<td>141.0</td>
<td>0.0</td>
<td>141.0</td>
</tr>
</tbody>
</table>

1 Data obtained from Comuzzie et al. (1986)
CHAPTER IV

STATURE AND PHYSIQUE

With sex and age, the estimation of stature and physique of individuals plays an integral part in the interpretation of the biology of a population. Stature and robusticity can serve as an indicator of the general quality of health of an individual and it has even been suggested that perhaps the degree of sexual dimorphism expressed in a population might be a strong indicator of the success of the subsistence pattern being utilized by that population (Brauer, 1982; Stini, 1969, 1972; Doran, 1975).

STATURE

When attempting to reconstruct the physical appearance of an individual from a skeletal sample the easiest and most useful estimations are those of stature. This is in large part due to the many discriminant function formulae which have been developed for the estimation of stature (i.e. Genoves, 1967; Trotter and Gleser, 1952; Steele, 1970; Musgrave and Harneja, 1978). While the theory behind the reconstruction of stature is relatively simple, the material recovered does not always avail itself to these formulae. As with sex, an estimation of stature can only be accurately attempted with the remains of mature individuals. Furthermore, it is generally only the long bones of the appendicular skeleton that are of use in stature estimations. Often in archaeological samples, such as in Blue Bayou, these skeletal elements necessary to reconstruct
There were no intact long bones recovered from Blue Bayou making necessary to first estimate their intact lengths before any estimations of stature could be attempted. This was accomplished following Steele (1970), Steele and McKern (1969), and Steele and Embrett (N.D.). Of 40 individuals from Blue Bayou it was possible to reconstruct the lengths of 16 long bones; 6 femurs, 3 tibias, and humeri (Table 14) representing a total of 10 individuals.

Of the formulae developed for the estimation of stature the two most commonly followed are those derived by Trotter and Gleser (1952) and Genoves (1967). The formulae of Trotter and Gleser (1952) were developed from measurements of long bones of American whites and blacks taken from the Terry collection and a Mongoloid sample taken from WW II casualties. The formulae of Genoves (1967) were based on long bone lengths of a Meso-American cadaveral sample. As a result of the use of different study samples the two methods do not yield the same estimation of stature for an unknown individual (Table 15).

Therefore, to insure as accurate an estimation of stature as possible mean long bone lengths from the Blue Bayou sample were compared with those utilized in the creation of the formulae developed by Trotter and Gleser (1952) and Genoves (1967). The mean long bone lengths for this sample are shown in Table 16. Upon comparison it was found that the mean long bone lengths from Blue Bayou more closely corresponded to those of the Mesoamerican sample utilized by Genoves (1967). Consequently, the stature estimations for the Blue Bayou sample were made utilizing Genoves's (1967)
Reconstructed long bone lengths (cm) (Following Steele)

<table>
<thead>
<tr>
<th>Sex</th>
<th>Element</th>
<th>Side</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>Femur</td>
<td>Left</td>
<td>41.6 ± 1.31</td>
</tr>
<tr>
<td>UID</td>
<td>Tibia</td>
<td>Left</td>
<td>34.5 ± .74 (F)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>37.3 ± 1.38 (M)</td>
</tr>
<tr>
<td>Female</td>
<td>Femur</td>
<td>Left</td>
<td>39.0 ± 1.02</td>
</tr>
<tr>
<td>Male</td>
<td>Femur</td>
<td>Left</td>
<td>40.9 ± 1.31</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Right</td>
<td>41.3 ± 1.31</td>
</tr>
<tr>
<td></td>
<td>Tibia</td>
<td>Left</td>
<td>40.0 ± 1.38</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Right</td>
<td>39.6 ± 1.38</td>
</tr>
<tr>
<td>180</td>
<td>Male</td>
<td>Femur</td>
<td>40.6 ± 1.31</td>
</tr>
<tr>
<td>200</td>
<td>Male</td>
<td>Humerus</td>
<td>32.0 ± 1.17</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Right</td>
<td>30.0 ± .37</td>
</tr>
<tr>
<td>230</td>
<td>Female</td>
<td>Humerus</td>
<td>30.3 ± .84</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Right</td>
<td>30.0 ± .37</td>
</tr>
<tr>
<td>240</td>
<td>Male</td>
<td>Humerus</td>
<td>31.2 ± .34</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Right</td>
<td>32.2 ± .20</td>
</tr>
<tr>
<td>440</td>
<td>Female</td>
<td>Humerus</td>
<td>28.8 ± 1.18</td>
</tr>
<tr>
<td>450</td>
<td>Male</td>
<td>Femur</td>
<td>45.7 ± 1.31</td>
</tr>
</tbody>
</table>
Table 15. Mean stature at Blue Bayou.

<table>
<thead>
<tr>
<th>Sex</th>
<th>Stature (cm)</th>
<th>Formula</th>
<th>Ethnic Group Utilized</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>154.19 ± 5.77</td>
<td>Genoves²</td>
<td>Mesoamerican</td>
</tr>
<tr>
<td>Male</td>
<td>164.64 ± 6.05</td>
<td>Genoves²</td>
<td>Mesoamerican</td>
</tr>
<tr>
<td>Female</td>
<td>157.06 ± 6.68</td>
<td>Trotter³</td>
<td>American White</td>
</tr>
<tr>
<td>Male</td>
<td>168.02 ± 6.64</td>
<td>Trotter³</td>
<td>American White</td>
</tr>
<tr>
<td>Female</td>
<td>154.86 ± 6.27</td>
<td>Trotter³</td>
<td>American Black</td>
</tr>
<tr>
<td>Male</td>
<td>164.81 ± 6.75</td>
<td>Trotter³</td>
<td>American Black</td>
</tr>
<tr>
<td>Male</td>
<td>168.05 ± 6.46</td>
<td>Trotter³</td>
<td>Mongoloid</td>
</tr>
<tr>
<td>Male</td>
<td>166.32 ± 6.44</td>
<td>Trotter³</td>
<td>Mexican</td>
</tr>
</tbody>
</table>

¹ These statures are based on reconstructed long bone lengths following Steele (1970).

² Genoves 1967.

³ Trotter 1970.
Table 16. Mean long bone lengths (cm) for Blue Bayou$^1$.

<table>
<thead>
<tr>
<th>Element</th>
<th>N</th>
<th>X</th>
<th>S.D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humerus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>2</td>
<td>31.6</td>
<td>.57</td>
</tr>
<tr>
<td>F</td>
<td>2</td>
<td>29.6</td>
<td>1.00</td>
</tr>
<tr>
<td>Femur</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>4</td>
<td>42.2</td>
<td>2.40</td>
</tr>
<tr>
<td>F</td>
<td>1</td>
<td>39.0</td>
<td>-----</td>
</tr>
<tr>
<td>Tibia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>2</td>
<td>38.7</td>
<td>1.90</td>
</tr>
<tr>
<td>F</td>
<td>1</td>
<td>34.5</td>
<td>-----</td>
</tr>
</tbody>
</table>

$^1$ Based on reconstructed lengths following Steele (1970).
stature was estimated for six individuals from Blue Bayou. Four individuals analyzed were identified as males, one as female, and sex indeterminate. For the individual for which it was possible to determine sex, stature estimates based on both the male and female formulae were calculated. This was done to give a range of stature for this individual regardless of its sex. The stature estimations for these six individuals are provided in Table 17 and again in appendix A. The mean stature for the males and the females is provided in Table 15.

In Table 18 the mean stature, based on the length of the femur, of males from Blue Bayou is compared with those for males of two other prehistoric sites from the coastal bend area of Texas, Shell Point (Wilkinson, 1973) and Oso Creek (Wilkinson, 1973). Since mean female statures were not provided for these two comparative samples, the comparison of stature at Blue Bayou to that of Shell Point (Wilkinson, 1973) and Oso Creek (Wilkinson, 1973) is restricted to the male values. Based on a statistical analysis of the male means there does appear to be a significant difference in the means between Blue Bayou and Shell Point (Wilkinson, 1973) and Oso Creek (Wilkinson, 1973). It appears that the mean stature for Blue Bayou is slightly less than that for the other sites mentioned. Also when the range of stature at each site is compared it is seen that the range of the Blue Bayou sample generally falls outside the low end of the other samples. However, the mean stature for Palm Harbor (Comuzzi et al., 1986) appears to be very near that of Blue Bayou.
17. Stature estimations for Blue Bayou (Genoves 1967).

<table>
<thead>
<tr>
<th>Sex</th>
<th>Element</th>
<th>Stature (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Femur</td>
<td>160.40 ± 6.38</td>
</tr>
<tr>
<td>UID</td>
<td>Tibia</td>
<td>157.62 ± 5.52 (F)</td>
</tr>
<tr>
<td>&quot;</td>
<td>&quot;</td>
<td>166.86 ± 5.51 (M)</td>
</tr>
<tr>
<td>F</td>
<td>Femur</td>
<td>150.75 ± 6.02</td>
</tr>
<tr>
<td>170</td>
<td>Femur (L)</td>
<td>158.81 ± 6.38</td>
</tr>
<tr>
<td></td>
<td>(R)</td>
<td>159.72 ± 6.38</td>
</tr>
<tr>
<td></td>
<td>Tibia (L)</td>
<td>172.15 ± 5.51</td>
</tr>
<tr>
<td></td>
<td>(R)</td>
<td>171.37 ± 5.51</td>
</tr>
<tr>
<td>180</td>
<td>Femur</td>
<td>158.14 ± 6.38</td>
</tr>
<tr>
<td>450</td>
<td>Femur</td>
<td>169.66 ± 6.38</td>
</tr>
</tbody>
</table>

1 These statures are based on reconstructed long bone lengths following Steele (1970).
### Table 18. Comparison of mean stature of males from the Texas coast based on length of the femur (cm) (genoves 1967).

<table>
<thead>
<tr>
<th>Site</th>
<th>N</th>
<th>X</th>
<th>S.D.</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue Bayou¹</td>
<td>3</td>
<td>159.1</td>
<td>0.9</td>
<td>158.1 - 160.4</td>
</tr>
<tr>
<td>Shell Point²</td>
<td>4</td>
<td>169.4</td>
<td>5.0</td>
<td>162.5 - 174.5</td>
</tr>
<tr>
<td>Oso Series³</td>
<td>3</td>
<td>173.5</td>
<td>2.3</td>
<td>171.0 - 175.5</td>
</tr>
</tbody>
</table>

¹ Based on reconstructed lengths following Steele (1970).
² Data obtained from Wilkinson (1973).
³ Data as reported by Wilkinson (1973) from Woodbury and Woodbury (1935).
Unfortunately since the remains from Palm Harbor were recovered in a
mangled condition (Comuzzie et al., 1986) it was only possible to
provide a mean stature based on the combined long bones present
making a comparison by sex with other samples impossible. However,
when the mean of the Palm Harbor sample is compared to both the male
and female mean from Blue Bayou there appears to be no significant
difference. It has been suggested by Comuzzie et al. (1986) that the
mean stature at Palm Harbor is very close to that of Shell Point, Oso
Creek and other prehistoric coastal sites from Texas. Therefore, the
apparent difference in the mean as well as the range of stature
between the Blue Bayou sample and those of Shell Point and Oso Creek
may either reflect a true difference from these samples or may only
be the result of the relatively small size of the samples from which
they are drawn. It is possible that the mean stature of Blue Bayou
may indeed be slightly less than that of other prehistoric
populations since statistical comparison of the mean length of the
femur with those of other prehistoric groups from Texas (Doran,
1975), including those from the coastal region, do show a significant
difference (Table 19).

ROBUSTICITY

Robusticity is an important parameter in the reconstruction of
the general physique of a sample and the extent of sexual dimorphism
present. While the robusticity of an individual is not as
quantifiable as stature, estimates of robusticity still serve as
important indicators of the general quality of health in a population
Table 19. Comparison of mean femur lengths (cm).

<table>
<thead>
<tr>
<th>Site</th>
<th>Cultural Area</th>
<th>N</th>
<th>X</th>
<th>S.D.</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue Bayou 1</td>
<td>M</td>
<td>4</td>
<td>42.2</td>
<td></td>
<td>40.6 - 45.7</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>1</td>
<td>39.0</td>
<td></td>
<td>39.0</td>
</tr>
<tr>
<td></td>
<td>Central Texas</td>
<td>18</td>
<td>45.7</td>
<td>1.7</td>
<td>43.0 - 49.1</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>7</td>
<td>43.8</td>
<td>1.2</td>
<td>41.2 - 45.2</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>11</td>
<td>43.0</td>
<td>0.9</td>
<td>42.1 - 43.8</td>
</tr>
<tr>
<td>Caddo 2</td>
<td>M</td>
<td>15</td>
<td>45.4</td>
<td>2.0</td>
<td>40.8 - 46.3</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>3</td>
<td>43.0</td>
<td>0.9</td>
<td>42.1 - 43.8</td>
</tr>
<tr>
<td>Coastal 2</td>
<td>M</td>
<td>10</td>
<td>45.7</td>
<td>2.3</td>
<td>42.0 - 49.5</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>8</td>
<td>43.7</td>
<td>2.0</td>
<td>41.1 - 42.3</td>
</tr>
<tr>
<td>Trans Pecos 2</td>
<td>M</td>
<td>4</td>
<td>42.2</td>
<td>2.5</td>
<td>39.8 - 45.5</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>3</td>
<td>42.4</td>
<td>1.3</td>
<td>40.9 - 43.5</td>
</tr>
<tr>
<td>Historic 2</td>
<td>M</td>
<td>9</td>
<td>46.4</td>
<td>2.1</td>
<td>43.6 - 49.8</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>7</td>
<td>41.5</td>
<td>1.3</td>
<td>39.5 - 42.8</td>
</tr>
</tbody>
</table>

1 These measurements are based on reconstructed lengths following Steele (1970).

2 These measurements were obtained from Doran (1975).
(Acheson, 1960; Anderson et al., 1977; Brauer, 1982; Hamilton, 1982; Stini, 1961, 1971, 1972, 1982; Tobias, 1972; Van Gerven, 1972; Doran, 1975). While most formal studies of robusticity have been based on quantitative data, in this case they were also supplemented with qualitative observations (Wilkinson, 1977; Anderson et al., 1977). Measurements were made whenever possible for all identifiable elements with these means presented in tables 20 - 27.

From the qualitative analysis the Blue Bayou sample appears to be relatively robust. Based on visual analysis the cortical bone of most of the individuals examined appears relatively thick, with most sites of muscle attachment are well defined, the browridges were readily apparent, and the mandibles appeared massive and bilobed. This visual assessment is also supported by the metrical data.

The means from the metrical analysis of the skull and mandible (Tables 20 and 21) were compared (Tables 5, 6, 7, 8, 10, 11, 12, 13, 28, and 29) with those of Palm Harbor, a prehistoric coastal sample which has been described as relatively robust (Comuzzie et al., 1986) and San Juan Capastrano, a historic Coahuiltecan sample, that on personal observation is felt to be relatively gracile. All statistical comparisons were made utilizing the male mean for a measurement.

Based on statistical analysis of comparable measurements for Blue Bayou and San Juan Capastrano, parietal thickness (Table 28) and mastoid length (Table 29), the means from Blue Bayou were significantly larger, while there did not appear to be a significant difference between Blue Bayou and Palm Harbor for parietal thickness.
<table>
<thead>
<tr>
<th>Measurement</th>
<th>Sex</th>
<th>N</th>
<th>X</th>
<th>S. D.</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Cranial Length</td>
<td>M</td>
<td>3</td>
<td>169.7</td>
<td>8.1</td>
<td>165.0 - 179.0</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>1</td>
<td>-----</td>
<td>---</td>
<td>171.0</td>
</tr>
<tr>
<td>Maximum Cranial Breadth</td>
<td>M</td>
<td>3</td>
<td>129.7</td>
<td>1.6</td>
<td>128.0 - 131.0</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>1</td>
<td>-----</td>
<td>---</td>
<td>127.0</td>
</tr>
<tr>
<td>Auricular Height</td>
<td>M</td>
<td>1</td>
<td>-----</td>
<td>---</td>
<td>119.0</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>-</td>
<td>-----</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Horizontal Circumference</td>
<td>M</td>
<td>3</td>
<td>493.7</td>
<td>5.8</td>
<td>487.0 - 497.0</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>1</td>
<td>-----</td>
<td>---</td>
<td>477.0</td>
</tr>
<tr>
<td>Parietal Chord</td>
<td>M</td>
<td>3</td>
<td>110.0</td>
<td>5.6</td>
<td>105.0 - 116.0</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>1</td>
<td>-----</td>
<td>---</td>
<td>107.0</td>
</tr>
<tr>
<td>Parietal Arc</td>
<td>M</td>
<td>3</td>
<td>123.3</td>
<td>5.8</td>
<td>120.0 - 130.0</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>1</td>
<td>-----</td>
<td>---</td>
<td>119.0</td>
</tr>
<tr>
<td>Frontal Chord</td>
<td>M</td>
<td>2</td>
<td>110.0</td>
<td>1.4</td>
<td>109.0 - 111.0</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>2</td>
<td>108.2</td>
<td>2.5</td>
<td>106.0 - 110.0</td>
</tr>
<tr>
<td>Frontal Arc</td>
<td>M</td>
<td>2</td>
<td>121.5</td>
<td>0.7</td>
<td>121.0 - 122.0</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>2</td>
<td>118.5</td>
<td>3.5</td>
<td>116.0 - 121.0</td>
</tr>
<tr>
<td>Occipital Chord</td>
<td>M</td>
<td>1</td>
<td>-----</td>
<td>---</td>
<td>107.0</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>1</td>
<td>-----</td>
<td>---</td>
<td>89.0</td>
</tr>
<tr>
<td>Occipital Arc</td>
<td>M</td>
<td>1</td>
<td>-----</td>
<td>---</td>
<td>129.0</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>1</td>
<td>-----</td>
<td>---</td>
<td>105.0</td>
</tr>
<tr>
<td>Parietal Thickness</td>
<td>M</td>
<td>2</td>
<td>9.0</td>
<td>0.0</td>
<td>9.0</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>2</td>
<td>5.5</td>
<td>0.7</td>
<td>5.0 - 6.0</td>
</tr>
<tr>
<td>Simotic Chord</td>
<td>M</td>
<td>-</td>
<td>-----</td>
<td>---</td>
<td>-----</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>1</td>
<td>-----</td>
<td>---</td>
<td>14.0</td>
</tr>
<tr>
<td>Minimum Frontal Breadth</td>
<td>M</td>
<td>2</td>
<td>84.5</td>
<td>2.1</td>
<td>83.0 - 86.0</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>1</td>
<td>-----</td>
<td>---</td>
<td>87.0</td>
</tr>
<tr>
<td>Mastoid Length</td>
<td>M</td>
<td>4</td>
<td>32.8</td>
<td>3.2</td>
<td>30.0 - 36.0</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>2</td>
<td>28.0</td>
<td>0.0</td>
<td>28.0</td>
</tr>
</tbody>
</table>
## Table: Mean mandibular measurements (mm).

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Sex</th>
<th>N</th>
<th>X</th>
<th>S.D.</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height of mandibular body</td>
<td>M</td>
<td>2</td>
<td>84.0</td>
<td>4.2</td>
<td>81.0 - 87.0</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>3</td>
<td>76.0</td>
<td>3.6</td>
<td>73.0 - 80.0</td>
</tr>
<tr>
<td>Height of ramus</td>
<td>M</td>
<td>2</td>
<td>68.5</td>
<td>9.2</td>
<td>62.5 - 75.0</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>1</td>
<td>-----</td>
<td>----</td>
<td>59.5</td>
</tr>
<tr>
<td>Height of mandibular symphysis</td>
<td>M</td>
<td>1</td>
<td>-----</td>
<td>----</td>
<td>34.5</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>2</td>
<td>31.5</td>
<td>2.1</td>
<td>30.0 - 33.0</td>
</tr>
<tr>
<td>Minimum breadth of ramus</td>
<td>M</td>
<td>2</td>
<td>34.5</td>
<td>0.3</td>
<td>34.0 - 35.0</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>2</td>
<td>30.0</td>
<td>1.4</td>
<td>29.0 - 31.0</td>
</tr>
<tr>
<td>Gonial angle</td>
<td>M</td>
<td>3</td>
<td>111</td>
<td>5.6</td>
<td>106 - 117</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>2</td>
<td>125</td>
<td>4.2</td>
<td>122 - 128</td>
</tr>
<tr>
<td>Bipgonial breadth</td>
<td>M</td>
<td>1</td>
<td>-----</td>
<td>----</td>
<td>90.0</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>1</td>
<td>-----</td>
<td>----</td>
<td>87.0</td>
</tr>
</tbody>
</table>
### Table 22. Mean measurements of the humerus (mm).

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Sex</th>
<th>N</th>
<th>X</th>
<th>S.D.</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum length</td>
<td>M</td>
<td>2</td>
<td>31.6</td>
<td>.6</td>
<td>31.2 - 32.0</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>2</td>
<td>29.6</td>
<td>1.0</td>
<td>28.8 - 30.3</td>
</tr>
<tr>
<td>Maximum diameter of head</td>
<td>M</td>
<td>1</td>
<td>----</td>
<td>----</td>
<td>31.0</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td></td>
<td>----</td>
<td>----</td>
<td>----------</td>
</tr>
<tr>
<td>Anterior/posterior mid-shaft diameter</td>
<td>M</td>
<td>3</td>
<td>20.3</td>
<td>2.1</td>
<td>18.0 - 22.0</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td></td>
<td>----</td>
<td>----</td>
<td>----------</td>
</tr>
<tr>
<td>Medial/lateral mid-shaft diameter</td>
<td>M</td>
<td>3</td>
<td>18.3</td>
<td>4.3</td>
<td>16.0 - 20.0</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>1</td>
<td>----</td>
<td>----</td>
<td>18.0</td>
</tr>
<tr>
<td>Maximum medial/lateral distal</td>
<td>M</td>
<td>2</td>
<td>54.0</td>
<td>7.1</td>
<td>49.0 - 59.0</td>
</tr>
<tr>
<td>diameter</td>
<td>F</td>
<td>1</td>
<td>----</td>
<td>----</td>
<td>15.0</td>
</tr>
<tr>
<td>Minimum circumference</td>
<td>M</td>
<td>4</td>
<td>61.3</td>
<td>8.0</td>
<td>54.0 - 65.0</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>2</td>
<td>55.0</td>
<td>1.0</td>
<td>54.0 - 56.0</td>
</tr>
<tr>
<td>Mid-shaft circumference</td>
<td>M</td>
<td>3</td>
<td>67.6</td>
<td>9.6</td>
<td>55.0 - 72.0</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>1</td>
<td>----</td>
<td>----</td>
<td>54.0</td>
</tr>
</tbody>
</table>

1 Based on reconstructed lengths following Steele (1970).
Table 23. Mean measurements of the ulna (mm).

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Sex</th>
<th>N</th>
<th>X</th>
<th>S.D.</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum length</td>
<td>M</td>
<td>2</td>
<td>280.0</td>
<td>14.5</td>
<td>270.5 - 291.0</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physiological length</td>
<td>M</td>
<td>2</td>
<td>246.0</td>
<td>11.3</td>
<td>238.0 - 254.0</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Least Circumference</td>
<td>M</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>1</td>
<td></td>
<td></td>
<td>40.0</td>
</tr>
</tbody>
</table>

1 Based on reconstructed lengths following Steele (1970).
Table 24. Mean measurements of the femur (mm).

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Sex</th>
<th>N</th>
<th>X</th>
<th>S.D.</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum length</td>
<td>M</td>
<td>4</td>
<td>42.2</td>
<td>2.4</td>
<td>40.6 - 45.7</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>1</td>
<td>2.2</td>
<td>----</td>
<td>------</td>
</tr>
<tr>
<td>Subtrochanteric anterior diameter</td>
<td>M</td>
<td>4</td>
<td>24.8</td>
<td>2.4</td>
<td>22.5 - 28.0</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>2</td>
<td>24.5</td>
<td>3.5</td>
<td>22.0 - 27.0</td>
</tr>
<tr>
<td>Subtrochanteric medial diameter</td>
<td>M</td>
<td>4</td>
<td>31.5</td>
<td>4.1</td>
<td>26.0 - 36.0</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>2</td>
<td>26.5</td>
<td>3.5</td>
<td>24.0 - 29.0</td>
</tr>
<tr>
<td>Medial, posterior diameter of mid-shaft</td>
<td>M</td>
<td>6</td>
<td>27.4</td>
<td>0.5</td>
<td>27.0 - 28.0</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>2</td>
<td>26.5</td>
<td>3.5</td>
<td>24.0 - 29.0</td>
</tr>
<tr>
<td>Mid-shaft circumference</td>
<td>M</td>
<td>6</td>
<td>90.7</td>
<td>4.2</td>
<td>87.0 - 96.0</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>3</td>
<td>84.0</td>
<td>0.0</td>
<td>84.0</td>
</tr>
</tbody>
</table>

1 Based on reconstructed lengths following Steele (1970).
### Table 25. Mean measurements of the tibia (mm).

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Sex</th>
<th>N</th>
<th>X</th>
<th>S.D.</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum length</td>
<td>M</td>
<td>2</td>
<td>38.7</td>
<td>1.9</td>
<td>37.3 - 40.0</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>1</td>
<td>---</td>
<td>---</td>
<td>34.5</td>
</tr>
<tr>
<td>Anterior posterior diameter of mid-shaft</td>
<td>M</td>
<td>3</td>
<td>32.8</td>
<td>1.9</td>
<td>31.5 - 35.0</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>2</td>
<td>28.0</td>
<td>2.1</td>
<td>26.5 - 29.5</td>
</tr>
<tr>
<td>Medial lateral diameter of mid-shaft</td>
<td>M</td>
<td>3</td>
<td>21.5</td>
<td>1.8</td>
<td>19.5 - 23.0</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>2</td>
<td>21.3</td>
<td>0.4</td>
<td>21.0 - 21.5</td>
</tr>
<tr>
<td>Anterior posterior nutrient foramen diameter</td>
<td>M</td>
<td>2</td>
<td>38.0</td>
<td>4.2</td>
<td>35.0 - 43.0</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>3</td>
<td>33.7</td>
<td>5.1</td>
<td>28.0 - 38.0</td>
</tr>
<tr>
<td>Medial lateral nutrient foramen diameter</td>
<td>M</td>
<td>2</td>
<td>23.5</td>
<td>3.5</td>
<td>21.0 - 26.0</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>2</td>
<td>22.0</td>
<td>1.4</td>
<td>21.0 - 23.0</td>
</tr>
</tbody>
</table>

1 Based on reconstructed lengths following Steele (1970).
### Mean measurements of the talus (mm) (Males only)

<table>
<thead>
<tr>
<th>Trait</th>
<th>N</th>
<th>X</th>
<th>S.D.</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>2</td>
<td>56.3</td>
<td>2.5</td>
<td>54.5 - 58.0</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>44.5</td>
<td>0.0</td>
<td>44.5</td>
</tr>
<tr>
<td>Height</td>
<td>2</td>
<td>31.8</td>
<td>3.2</td>
<td>29.5 - 34.0</td>
</tr>
</tbody>
</table>
Mean measurements of the calcaneus (mm) (Males only)

<table>
<thead>
<tr>
<th>Trait</th>
<th>N</th>
<th>X</th>
<th>S.D.</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>2</td>
<td>75.0</td>
<td>8.5</td>
<td>69.0 - 81.0</td>
</tr>
<tr>
<td>Width</td>
<td>2</td>
<td>24.0</td>
<td>1.4</td>
<td>23.0 - 25.0</td>
</tr>
<tr>
<td>Height</td>
<td>2</td>
<td>42.0</td>
<td>7.1</td>
<td>37.0 - 47.0</td>
</tr>
</tbody>
</table>

No female specimens recovered
Comparison of parietal thickness (mm).

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>X</th>
<th>S.D.</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>You</td>
<td>2</td>
<td>9.0</td>
<td>0.0</td>
<td>9.0</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>5.5</td>
<td>0.7</td>
<td>5.0 - 6.0</td>
</tr>
<tr>
<td>Harbor</td>
<td>3</td>
<td>8.3</td>
<td>0.6</td>
<td>8.0 - 9.0</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>---</td>
<td>---</td>
<td>8.0</td>
</tr>
<tr>
<td>Capastrano</td>
<td>2</td>
<td>7.5</td>
<td>0.7</td>
<td>7.0 - 8.0</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>6.0</td>
<td>0.8</td>
<td>5.0 - 7.0</td>
</tr>
</tbody>
</table>

1 Data was obtained from Comuzie et al. (1986).

2 This sample may not reflect a homogeneity biological population.
Table 29. Comparison of mean mastoid lengths (mm).

<table>
<thead>
<tr>
<th>Site</th>
<th>N</th>
<th>X</th>
<th>S.D.</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue Bayou</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>4</td>
<td>32.0</td>
<td>2.6</td>
<td>30.0 - 36.0</td>
</tr>
<tr>
<td>F</td>
<td>2</td>
<td>28.0</td>
<td>0.0</td>
<td>28.0</td>
</tr>
<tr>
<td>Palm Harbor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>2</td>
<td>31.5</td>
<td>2.1</td>
<td>30.0 - 33.0</td>
</tr>
<tr>
<td>F</td>
<td>1</td>
<td>----</td>
<td>----</td>
<td>28.0</td>
</tr>
<tr>
<td>San Juan Capastrano¹</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>2</td>
<td>28.0</td>
<td>0.0</td>
<td>28.0</td>
</tr>
<tr>
<td>F</td>
<td>3</td>
<td>25.0</td>
<td>3.3</td>
<td>21.0 - 29.0</td>
</tr>
</tbody>
</table>

¹ This sample may not reflect a homogeneity biological population.
maximum cranial breadth (Table 13), mastoid length (Table
bital angle (Table 5), height of ascending ramus (Table 6), and
ax of mandibular body (Table 7). These parameters are felt to be
a good reflection of robusticity (Anderson et al., 1977) and are
part responsible for giving the cranial remains from Blue
Bayou and Palm Harbor their characteristic structure (Wilkinson,
Comuzzie et al., 1986). However, there were significant
differences between Blue Bayou and Palm Harbor for the mean values of
maximum cranial length (Table 12), horizontal circumference of the
vium (Table 11), minimum frontal breadth (Table 10), and minimum
 breadth of ascending ramus of mandible (Table 8). With the exception
of minimum breadth of the ascending ramus, the differences with these
other measurements is felt to reflect differences in the shape of the
skull and face of the Palm Harbor sample rather than a difference in
robusticity. It is also suggested that the difference in the means
of the minimum breadth of the ascending ramus is most probably a
reflection of sample size. As a result it is felt that the skulls
and mandibles from Blue Bayou are close in robusticity to what has
been described for other prehistoric samples from the Texas coast

The mean values for measurements of the long bones from Blue
Bayou (Tables 22 - 25) were also compared with those of other
samples, and tended to support this assessment of relative
robusticity. This time the male means for these measurements were
compared with those from other prehistoric populations from Texas
grouped by cultural area utilizing the values reported by Doran
The cultural areas utilized for comparison were defined as central Texas, Caddo, Coastal, and Trans - Pecos (Doran, 1975). The means for these areas were compared to those from Blue Bayou for humerus length (Table 30), femur length (Table 19), and tibia length (Table 31). In addition the mean midshaft circumference of the femur in Blue Bayou and Palm Harbor were also compared (Table 32). The samples from central Texas, the coastal region, and the Caddo were all described as relatively robust while the sample from the Trans - Pecos was felt to be relatively gracile (Doran, 1975). For all of these cultural areas compared with Blue Bayou there was no significant difference in the means for the length of the humerus (Table 30). However, it must be noted that there is a significant difference between the means for humerus lengths for the Trans - Pecos sample compared to those of the central Texas and coastal samples (Table 30).

In terms of femur length there is a significant statistical difference between the mean of Blue Bayou and the central Texas and coastal samples but no significance between those of the Caddo and Trans - Pecos sample (Table 19). The statistical comparison of the mean length of the tibia for Blue Bayou with these other samples shows no significance (Table 31). There was no significant statistical difference in the mean midshaft circumference of the femur between Blue Bayou and Palm Harbor (Table 32). This pattern of significance and nonsignificance tends to indicate that perhaps Blue Bayou is relatively robust, but not quite to the degree of the central Texas and coastal samples. However, this apparent difference
Q. Comparison of humerus lengths (cm).

<table>
<thead>
<tr>
<th>Area</th>
<th>N</th>
<th>X</th>
<th>S.D.</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chayou 1</td>
<td>2</td>
<td>31.6</td>
<td>.8</td>
<td>31.2 - 32.0</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>29.6</td>
<td>1.0</td>
<td>28.8 - 30.3</td>
</tr>
<tr>
<td>Coastal Texas 2</td>
<td>21</td>
<td>32.5</td>
<td>1.6</td>
<td>29.3 - 36.2</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>30.4</td>
<td>1.3</td>
<td>29.0 - 33.0</td>
</tr>
<tr>
<td>Galveston 2</td>
<td>10</td>
<td>33.1</td>
<td>1.1</td>
<td>31.3 - 34.9</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>30.4</td>
<td>2.0</td>
<td>27.8 - 33.3</td>
</tr>
<tr>
<td>Coastal 2</td>
<td>9</td>
<td>32.8</td>
<td>2.2</td>
<td>29.7 - 36.8</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>30.0</td>
<td>0.2</td>
<td>29.4 - 30.3</td>
</tr>
<tr>
<td>Trans - Pecos 2</td>
<td>4</td>
<td>29.7</td>
<td>2.2</td>
<td>26.9 - 32.2</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>29.1</td>
<td>0.9</td>
<td>28.3 - 30.1</td>
</tr>
<tr>
<td>Historic 2</td>
<td>6</td>
<td>31.4</td>
<td>1.9</td>
<td>29.1 - 34.1</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>30.1</td>
<td>1.1</td>
<td>28.7 - 32.3</td>
</tr>
</tbody>
</table>

1 These measurements are based on reconstructed lengths following Steele (1970).

2 These measurements were obtained from Doran (1975).
Table 31. Comparison of mean tibiae length.

<table>
<thead>
<tr>
<th>Site\Cultural Area</th>
<th>N</th>
<th>X</th>
<th>S.D</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue Bayou 1</td>
<td>2</td>
<td>38.7</td>
<td>1.9</td>
<td>37.3 - 40.0</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>34.5</td>
<td></td>
<td>34.5</td>
</tr>
<tr>
<td>Central Texas 2</td>
<td>14</td>
<td>39.2</td>
<td>1.7</td>
<td>35.6 - 41.8</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>35.8</td>
<td>1.6</td>
<td>33.0 - 37.8</td>
</tr>
<tr>
<td>Caddo 2</td>
<td>11</td>
<td>38.5</td>
<td>1.9</td>
<td>34.2 - 41.4</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>35.3</td>
<td>1.6</td>
<td>34.2 - 37.1</td>
</tr>
<tr>
<td>Coastal 2</td>
<td>9</td>
<td>37.9</td>
<td>1.4</td>
<td>35.8 - 39.7</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>37.0</td>
<td>1.4</td>
<td>35.1 - 38.4</td>
</tr>
<tr>
<td>Trans - Pecos 2</td>
<td>5</td>
<td>37.4</td>
<td>1.2</td>
<td>35.5 - 38.7</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>35.6</td>
<td></td>
<td>35.4 - 35.8</td>
</tr>
<tr>
<td>Historic 2</td>
<td>6</td>
<td>37.7</td>
<td>2.8</td>
<td>34.6 - 42.3</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>34.9</td>
<td>0.8</td>
<td>33.6 - 35.7</td>
</tr>
</tbody>
</table>

1 These measurements are based on reconstructed lengths following Steele (1970).

2 These measurements were obtained from Doran (1975).
Comparison of mean mid-shaft circumference of the femur

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>X</th>
<th>S.D.</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faramagou</td>
<td>6</td>
<td>90.7</td>
<td>4.2</td>
<td>87.0 - 96.0</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>84.0</td>
<td>0.0</td>
<td>84.0</td>
</tr>
<tr>
<td>Palm Harbor</td>
<td>5</td>
<td>92.4</td>
<td>2.3</td>
<td>90.0 - 96.0</td>
</tr>
<tr>
<td>F</td>
<td>1</td>
<td>----</td>
<td>----</td>
<td>81.0</td>
</tr>
</tbody>
</table>

1 Data obtained from Comuzzie et al. (1986) and personal observation.
Again, the extent of expression of these characters does not differ between the sexes. Also there was a noticeable difference in the strong indication of sexual dimorphism (C. in 1971; C. et al. in 1986). The difference in shape and size of the mandible has been reported as a difference in the two sexes from Palm Harbor (C. in 1971; C. et al. in 1986). However, for the two sexes from the Waukegan, Ill., sample, the males and females appeared to be very similar to those described by previous workers. Based on a visual assessment, the differences in the mandibles of the various samples were given the most emphasis during qualitative observations. The general size of size of muscles and attachment throughout the skeleton reflects the degree of sexual dimorphism, characteristics of the skull and those characters which are typically regarded as being the most pronounced between males and females for the metrical data. Based on both visual assessment and a stratigraphic comparison between the Waukegan, Ill., sample and the metrical data, this estimation of the degree of sexual dimorphism to be a stratigraphic sample, this sample displays a greater degree of robusticity compared with the apparent robusticity of the metrical data.
of differences observed appears to be very similar to that reported for this same feature for other prehistoric populations from the site (Comuzzie et al., 1986; Wilkinson, 1973, 1977; Aten, 1967). Comuzzie et al. (1986) have also suggested that there may be sexually related differences in the shape of the cranium of individuals at Palm Harbor and Oso Creek. However, these differences do not appear to be present in the Blue Bayou sample.

The size and shape of the mandible was of particular interest since it has commonly been considered an indicator of sexual dimorphism (Wilkinson, 1977; Anderson et al., 1977; Milner, 1982). The means for males and females from Blue Bayou were compared statistically with respect to length of mandibular body, minimum breadth of ramus, and gonial angle (Table 21). Based on this analysis it was found that the male means for all three of these measurements was significantly greater than that of the females. It is the result of these metrical differences between the sexes which contribute greatly to the structural differences of the mandible on visual assessment. It is interesting to note, however, that for those cranial measurements for which statistical comparisons could be made, frontal chord, frontal arc, and mastoid length (Table 20), there were no significant differences between the sexes. While there is no statistical difference between the mean mastoid lengths of males and females the male mastoids still appeared larger and more developed than those of the females. It is highly possible, due to the limited size of the sample analyzed, that there may actually be more variability in mastoid lengths between the sexes than the
suggest. The lack of significance in the means of frontal and frontal arc may be a reflection of the possible homogeneity of cranial shape between the sexes.

Statistical comparisons were also made for the male and female groups for the humerus, femur and tibia (Tables 22, 24, 25). For the humerus the mean maximum length and mean minimum circumference were compared between the sexes and not found to be significantly different. It has been suggested that the size of the femoral head and neck as well as the width of the epicondyle are a very accurate indicator of an individual's total body mass and sexual dimorphism (Van Gerven, 1972; Hirsch and Frankel, 1960; Jolicoeur, 1963) while midshaft measurements tend to be slightly less useful. Unfortunately, the femur measurements recorded for the Blue Bayou sample, which were applicable for comparison between the sexes, were restricted to measurements of the midshaft. These included the anterior–posterior diameter of the midshaft and mid-shaft circumference (Table 24). There is no significant difference in the means of the anterior–posterior mid-shaft diameter but those for mid-shaft circumference are significant. Of the two measurements, that of mid-shaft circumference is a much better indicator of sexual differences, as demonstrated by Black (1978a). Measurements for the tibia, anterior-posterior diameter of mid-shaft, medial-lateral diameter of the mid-shaft, anterior-posterior nutrient foramen diameter, and medial lateral nutrient foramen diameter, were also compared between the sexes (Table 25). The only means which proved significantly different were those for the anterior-posterior
of the mid-shaft. In general both the visual and morphological analysis suggest the presence of a relatively large degree of sexual dimorphism in this sample comparable to that found for other prehistoric populations from this same region of Italy (Comuzzi et al., 1986; Wilkinson, 1973, 1977; Aten, 1963).

Several studies conducted on living populations have suggested that there might be a connection between the amount of sexual dimorphism displayed within a population and the quality of the subsistence level of that population (Stini, 1969, 1972, 1982; Brauer, 1982; Tobias, 1972). From an archaeological perspective, recent authors (Milner, 1982; Doran, 1975; Comuzzi et al., 1986) have begun to suggest that perhaps the degree of sexual dimorphism seen in skeletal samples from archaeological sites might also be a reflection of health and subsistence in prehistoric populations as well. This argument is based on the assumption that body size in terms of large muscle mass will be reflected in the robusticity of the sites of origin and insertion of the muscle. It has also been suggested that females tend to be evolutionarily buffeted against shifts in body size due to the requirements of child bearing so that it is the body mass of the male which is going to respond in growth efficiency to the quality of the subsistence available (Brauer, 1982). As a result the greater the size difference between males and females of a sample the better the subsistence base, while decreased sexual dimorphism would indicate a poorer level of subsistence. This same idea has been proposed for the interpretation of skeletal populations (Doran, 1975). Based on the comparison of long bones
(1975) has suggested that of all the cultural areas he
studied, the material from the Trans-Pecos region showed the
amount of sexual dimorphism while the samples from central
and the coast showed the greatest sexual dimorphism. Doran
further states the environmental and archaeological data tend
to suggest a much less successful subsistence pattern for the Trans-
Pecos sample than that of the populations for the central Texas and
coastal areas. Given that the Blue Bayou sample tends to express a
similar degree of robusticity and sexual dimorphism as that seen in
the coastal samples from Palm Harbor (Comuzzi et al., 1986), Shell
Point (Wilkinson, 1973), Jamaica Beach (Aten, 1963), and Oso Creek
(Wilkinson, 1977) it is possible to suggest similar findings to those
of Doran (1975). It would appear then that the subsistence pattern
for the Blue Bayou population provided a relatively strong dietary
base and contributed to a generally high level of health, a condition
supported by the data for pathology and demographics. This is
significant since it again suggests a hunter-gatherer pattern of
subsistence might be more successful than it has often times been
CHAPTER V

PATHOLOGY, TRAUMA, AND ANOMALIES

Identification and interpretation of pathological conditions, traumatic injuries, and physical anomalies has long been a focal point of the analysis of osteological samples from archaeological sites (Steinbock, 1976; Ortner and Putschar, 1981; Ubelaker, 1978; El-Najjar and McWilliams, 1978; Jarcho, 1966; Morse, 1978; Steele and Bramblett, N. D.; Shipman et al., 1985). The types and prevalence of these conditions is a primary measure for the quality of life in a population. The analysis of pathological conditions has been used by Rathbun et al. (1981), El-Najjar et al. (1978), Harris et al. (1980), Patterson (1984), and Rose et al. (1978) as a means of assessing how well a population has adapted to its environment. Other studies have utilized the types of traumatic injuries present as indicators of specific cultural practices (Ubelaker, 1979; Ubelaker et al., 1969). The integration of this type of information with that of sex, age, and physique, therefore, can provide an excellent foundation for the understanding of the biological aspect of these early populations. A description of the pathologies, trauma, and anomalies encountered by individual for the Blue Bayou sample is provided in appendix A.
As a result of their density and compact size the elements of the dentition were generally the best preserved. Fortunately, analysis of the dentition is relatively easy and offers a wealth of biological information. The analysis of the teeth and associated structures has been shown to have much to offer as an indicator of chronic disease and metabolic stress in individuals and populations (El-Najjar et al., 1978; Rose et al., 1978; Sciulli, 1978; Patterson, 1984; Jablonski, 1983). The attrition of the dentition also reflects patterns of usage associated with food and material processing (Comuzzie and Steele, 1987; Brace and Molnar, 1967; Cybulski, 1974; Molnar, 1968, 1970, 1971, 1972) as well as cultural practices (Ubelaker et al., 1969; Comuzzie et al., 1986).

In terms of pathologies the teeth of individuals of the Blue Bayou sample were analyzed for indicators of chronic disease and metabolic stress as well as diseases specific to the oral cavity. This analysis revealed symptoms of infectious disease along with evidence of possible episodes of metabolic stress in a relatively large portion of the sample. Of the forty individuals identified a total of 11 individuals exhibited evidence of oral pathology or enamel defects generally associated with chronic disease or metabolic stress (El-Najjar et al., 1978; Rose et al., 1978; Sciulli, 1978; Jablonski, 1983; Patterson, 1984). Of these individuals, 7 exhibited signs of periodontal infection (100, 160, 200, 230, 240, 250, 290), often with associated resorption of the alveolar bone (Fig. 5). Four of the individuals, (010, 200, 210, 250), exhibited signs of carious
Figure 5. Caries. a. Left M\textsuperscript{1} with carious activity on mesial surface. b. Left I\textsuperscript{1} with carious activity on the labial surface. c. Right M\textsubscript{2} with carious activity on mesial lingual portion of occlusal surface. d. Right M\textsubscript{2} with carious activity on mesial lingual portion of occlusal surface.
activity (Tables 33 and 34), some of which was also associated with periodontal infection (Fig. 6). One of the individuals, (010), exhibited a tooth with sufficient decay to have caused damage to the root (Fig. 6). Three individuals, (200, 250, and 290), exhibited evidence of hypercementosis, perhaps associated with severe attrition (Spouge, 1973; Comuzzi and Steele, 1987) (Fig. 3). One individual, (240), had lost much of the hard palate as a result of a generalized infection apparently caused by a traumatic injury (Fig. 7).

A high percentage of the dental elements recovered from Blue Hilly also possessed a relatively heavy accumulation of calculus. The presence of calculus, or plaque, is generally believed to be a primary causative agent in the development of periodontal infection as well as tooth decay (Shafer et al., 1974; Hill, 1949; Gorlin and Goldman, 1970; Boyle, 1955). Several studies (Boyle, 1955; St. Hoyme and Koritzer, 1976; Davies, 1972) have suggested that the high levels of attrition characteristically seen in prehistoric populations, along with a diet typically low in simple carbohydrates played a major role in preventing a build up of plaque. Attrition has been considered a primary factor in helping to prevent periodontal infection and tooth decay by literally abrading away any cracks or crevices in which food particles could become lodged along with the surface of the teeth polished (St.Homye and Koritzer, 1976; Hall, 1976). The appearance of agriculture along with a trend toward increased civilization in many populations has been correlated with a marked increase in the amount of carious activity (Boyle,
### Caries per tooth type.

<table>
<thead>
<tr>
<th>Tooth Type</th>
<th># of Caries</th>
</tr>
</thead>
<tbody>
<tr>
<td>I₁</td>
<td>1</td>
</tr>
<tr>
<td>P₁</td>
<td>1</td>
</tr>
<tr>
<td>P₂</td>
<td>1</td>
</tr>
<tr>
<td>M₁</td>
<td>1</td>
</tr>
<tr>
<td>M₂</td>
<td>2</td>
</tr>
<tr>
<td>M₃</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>7</strong></td>
</tr>
</tbody>
</table>
Table 34. Number of caries per individual.

<table>
<thead>
<tr>
<th># of Caries</th>
<th># of Individuals</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>

*Only represents those individuals with associated dentition.*
Figure 6. Periodontal infection. a-c. Periodontal infection and resorption of buccal margin of mandible. d. Periodontal infection and alveolar resorption of lingual margin of mandible.
Figure 7. Hypercementosis/traumatic damage. a. Right $M_1$ and $M_2$ showing possible evidence of hypercementosis. b. Hard palate of maxilla showing loss of bone associated with infection caused by traumatic loss of right $I_1$. 
The increase in caries of agriculture based populations is attributed to the increased use of processed carbohydrates in their diet.

There appears perhaps to be a difference in the frequency of carious activity between the Blue Bayou sample and that of Palm Harbor (Comuzzie et al., 1986), Shell Point (Wilkinson, 1973) and Jamaica Beach (Aten, 1965) (Table 35). For these sites carious activity was only identified in one individual per sample and limited to a single tooth. The degree of attrition seen at Blue Bayou, Palm Harbor (Comuzzie et al., 1986), Shell Point (Wilkinson, 1973), and Jamaica Beach (Aten, 1965) appear to be relatively equal. This is important since it has been shown that populations with high levels of attrition tend to have low levels of caries (St. Hoyme and Koritzer, 1976) and as a result it would seem that the frequencies of caries should be relatively equal for all of these samples. However, other studies have shown that this difference in the frequency of carious activity between coastal and inland groups is quite common (Dunning, 1953; Davies, 1972). These differences in frequency might suggest that there was some fundamental difference in dietary components between the Blue Bayou sample and these more coastally adapted groups. It is possible that the Blue Bayou sample might have been relying more heavily on simple carbohydrates than these other populations. However, this should not be taken to imply the practice of agriculture with this population since there was no cultural evidence recovered to suggest its presence.

Teeth of four individuals (010, 080, 100, 120, and 190) along
Table 35. Comparison of caries by site.

<table>
<thead>
<tr>
<th>Site</th>
<th># of Individuals</th>
<th># of Caries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bayou</td>
<td>251</td>
<td>7</td>
</tr>
<tr>
<td>Harbor</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>Mica Beach</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Pel Point</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>Sand</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

1 Only represents the number of individuals with associated dentition.
With several surface collected teeth show what appears to be evidence of enamel hypoplasia. Several studies have shown the correlation of enamel defects to chronic disease or metabolic stress during an individual's developmental years (El-Najjar et al., 1978; Rose et al., 1978; Sciulli, 1978; Jablonski, 1983; Patterson, 1984). Hypoplastic lines are left in the enamel whenever the individual experiences sufficient stress to cause an arrest in growth. It is the size and number of these lines which can serve as an indicator of the quality of health within a population.

Based on the enamel defects observed in the Blue Bayou individuals it appears that this sample may have been subjected to occasional periods of mild to pronounced metabolic stress, perhaps as a result of a fluctuation in the level of subsistence, or disease. This interpretation is suggested by the fact that five individuals exhibited at least one relatively well defined hypoplastic line in the enamel of a tooth. The presence of hypoplastic lines has not been reported for other samples from this region most probably as a result of the small sample sizes previously analyzed along with the relative recency of research into the prehistoric records of dental hypoplasia.

In terms of traumatic injuries associated with the dentition, the most common condition encountered was attrition. This is not unusual since marked levels of attrition appear to be characteristic of hunter-gatherer societies (Hinton, 1981). All the mature individuals with associated dentition, (010, 020, 080, 090, 100, 120, 140, 160, 170, 180, 200, 230, 240, 250, 290, 300), from Blue Bayou
played some degree of attrition, with 12 of these individuals described as exhibiting moderate to severe levels (Fig. 8). While there has been an increasing trend to view attrition as a natural process (Hinton, 1981; Berry, 1976; Mills, 1976; Hall, 1976; Lavelle, 1969), it still constitutes a degenerative change in the structure of the tooth as a result of external forces. Recent works have pointed out the relationship between attrition and the maintenance of proper occlusion through the formation of the ocicoidal plane (Hall, 1976; Hall and German, 1975; Roydhouse, 1975). However, in those situations where the levels of attrition exceed that which is necessary to maintain proper occlusion pathological conditions may result (Comuzzi and Steele, 1987; Berry, 1976; Lavelle, 1973). Severe levels of attrition can often result in the displacement or reorientation of the affected tooth (Reinhardt, 1983) along with major changes in the occlusal surface (Comuzzi and Steele, 1987).

It has been suggested that hypercementosis may be a pathological response to traumatic levels of attrition (Spouge, 1973; Comuzzi and Steele, 1987). This is of interest since the three individuals from Blue Bayou which display evidence of hypercementosis, (200, 250, 290), also were described as exhibiting heavy levels of attrition. In all three individuals it is one of the first molars which displayed evidence of hypercementosis as well as the beginnings of a distinctive wear pattern which has also been described for individuals with severe levels of attrition from the Texas coast (Comuzzi et al., 1986; Comuzzi and Steele, 1987) as well as
Figure 8. Attrition levels. a. Mandible displaying slight to moderate attrition. b. Maxilla displaying moderate attrition. c. Mandible displaying heavy attrition. d. Maxilla displaying severe attrition.
where (Rheinhardt, 1983; Taylor, 1963). Past studies have suggested that such patterns of wear and attrition may be associated with special dietary practices (Campbell, 1925; Taylor, 1963; Smith, 2; Hinton, 1981) or cultural utilization of the dentition (Campbell, 1925; Cybulski, 1974; Dahlberg, 1963; Davies, 1963; Marin, 1970, 1971, 1972).

Another unusual pattern of wear was encountered on the lingual surface of the upper incisors of six individuals (010, 020, 080, 170, 0, and 250) (Fig. 9). Associated with this is the presence of marked wear facets on the occlusal surface of the incisors on several individuals (Fig. 9). When possible the maxillary and mandibular dentition were placed in normal occlusion which, however, failed to explain these patterns as a result of normal mastication. It is suggested therefore, that these wear facets are most likely the result of dietary or cultural practices involving the use of the incisors to grasp or prepare materials.

Only two individuals from Blue Bayou (100, and 240) displayed evidence of traumatic damage most probably resulting from aggressive or accidental injury. In the case of individual 100 the damage was limited to the chipping of the right second maxillary molar. In individual 240 the right central and lateral maxillary incisors appear to have been broken in life and subsequently infection and abscessing of the hard palate in the region of the tooth occurred (Fig. 7).

Considering physical anomalies, the dental sample from Blue Bayou exhibited several interesting variations. The most common
Figure 9. Wear facets on incisors.  a. Left $I^1$ with unusual wear facet on lingual base.  b. Incisor exhibiting wear facets on lingual surface.
variation encountered in this sample was the presence of extremely shovel shaped incisors. While this condition is generally not seen in most populations it is characteristic of Amerindian groups (Dahlberg, 1949). One of the individuals, (230), possessed impacted mandibular third molars causing twisting and overlapping of the anterior dentition as a result of crowding (Fig. 10). While impacted third molars can be common in both modern and prehistoric groups of many ethnic backgrounds (Taylor, 1978) they generally have not been reported for prehistoric populations from the coastal bend of Texas. Davies (1972) suggested that impacted third molars are rare among Amerindian groups due to the generally high level of interproximal attrition which creates sufficient space for their eruption. The low frequency of malocclusion among Texas coastal populations could be a result of the relatively small number of individuals from this region which have been extensively analyzed to date.

Two individuals examined (090 and 230) each possessed an enamel pearl on a molar tooth (Fig. 11). Enamel pearls are quite common anomalies within a population (Taylor, 1978). There is also evidence of atypically small and peg shaped third molars in two individuals (090 and 120), a condition which Taylor (1978) has reported as being relatively rare (Fig. 11). Both mandibular canines of one individual (200), exhibited double roots, another dental variation described as rare (Alexandersen, 1963; Taylor, 1978) (Fig. 11). Individual (250) exhibited a gap of approximately 4.0mm between the left and right central maxillary incisor a condition listed as somewhat rare by Taylor (1978) (Fig. 11). It is possible that the presence of this
Figure 10. Impacted third molars. a. Impacted lingual $M_3$. b. Crowding and overlapping of anterior dentition resulting from impacted $M_3$. 
Figure 11. Dental anomalies. a. Enamel pearl on third molar. b. Double rooted mandibular canines. c. Atypically small and peg shaped $M^1$ with normal $M^2$ for comparison. d. Maxillary dentition with gap between right and left $I^1$. 
collection of relatively rare dental anomalies within this sample might be a reflection of an isolated breeding population since it is generally common for gene flow between populations to reduce the occurrence of rare physical variations (Turner, 1967; ElNajjar, 1978; Leslie, 1977).

SKELETON

While the skeletal material from Blue Bayou was examined for evidence of pathology, trauma, and anomalies it did not yield as much information as the dentition. This is partly due to the fact that the elements of the skeletal system were typically incomplete or recovered in fragmented condition. Furthermore, the skeletal system does not generally record episodes of metabolic stress or chronic disease as well as the teeth. Even with these problems the skeletal material from Blue Bayou did exhibit some pathological conditions.

For evidence of pathological conditions in prehistoric populations to be recovered, the diseases present must have some direct effect on the skeletal system of an individual (Steinbock, 1977; El-Najjar and McWilliams, 1978; Shipman et al., 1985; Steele and Bramblett, N.D.). Unfortunately a great majority of diseases leave no record on the skeletal elements. However, two diseases which do leave such evidence, arthritis and either osteomyelitis or periostitis, are present in this sample.

Two individuals (050, and 450) display evidence of arthritis (Fig. 12). In both cases the condition is manifested as arthriticipping of the articular ends of the affected bones. In individual
Figure 12. Arthritis. a. Metatarsals showing arthritic lipping of the distal articular surface. b. Ulna exhibiting arthritic growth on articular surface.
this condition was noted in the middle phalanges of the foot, and in the proximal joint of the right ulna. While the development of arthritic lipping of the joints is generally a reflection of age, it can also result from repeated stress to a joint (Ortner and Putschar, 1981; Steinbock, 1976; Jurmain, 1980). In the case of individual 050, this condition is most probably a result of the aging process since 050 was assessed as an adult/old adult, the age category in which degenerative arthritis often begins to occur (Ortner and Putschar, 1981; Jurmain, 1980). However, the age of individual 450 is estimated to be in his late teens to early twenties, thereby suggesting that the arthritic lipping seen is most probably the result of severe stress resulting from repeated injury or constant utilization (Steinbock, 1976; Ortner and Putschar, 1981; El-Hajjar and McWilliams, 1978; Ubelaker, 1978; Shipman et al., 1985; Steele and Bramblett, N.D.).

The development of arthritis appears to be a fairly common phenomenon in most prehistoric hunter-gatherer societies due to the constant stress and strains of everyday life (Ortner and Putschar, 1981). In comparison with other samples from this region of Texas, the number of individuals reported from this sample as exhibiting evidence of arthritic activity is low. However, this difference in numbers of individuals is most probably a direct reflection of the lack of articular ends for most of the material recovered from Blue Jayou and not a reflection of significant differences in lifestyles. Also present in this sample is evidence of possibly either osteomyelitis or periostitis. Both of these conditions can be caused
by a wide range of pathological agents but are generally indicative of wide spread infection in the individual involved (Ortner and Putschar, 1981; Steinbock, 1977). The evidence for these conditions at Blue Bayou come from the presence of secondary bone growth on the femurs of two individuals (060, and 440). In the case of individual 060 there is a large mass of secondary bone located on the lower medial surface of the right femur measuring approximately 30mm x 12mm (Fig. 13). In individual 440 there is evidence of reactive bone growth on the posterior aspect of the left femur (Fig. 13).

In the case of osteomyelitis the causative agent is a bacteria, typically *Staphylococcus*, which can be introduced to the bone by several means (Steinbock, 1976; Ortner and Putschar, 1981). This introduction is generally brought about by the infection of traumatic injuries, either in the immediate proximity to the affected bone, or from remote sites of infection by passage through the blood stream (Steinbock, 1976; Ortner and Putschar, 1981).

The etiology of periostitis is even more enigmatic. Periostitis is typically not a disease in itself but rather a reaction to pathological conditions by the bone involved (Steinbock, 1977; Ortner and Putschar, 1981). Periostitis can arise in response to infection and inflammation of the periosteum as a result of traumatic injury as well as the result of several osteologically unidentifiable diseases. Therefore, it is not possible to suggest more than the presence of severe and perhaps widespread infection or trauma in these two individuals (060, and 440) as a cause for the conditions noted.

Evidence of traumatic injury was limited to one individual in
Figure 13. Osteomyelitis/Periostitis. a. Femur fragment exhibiting possible evidence of osteomyelitis. b. Reactive bone growth possibly associated with periostitis.
Blue Bayou sample. This individual, (160), was recovered with a point in tight association with the vertebral column. Based on proximity and orientation of the point to the vertebral column it appear that the individual was shot from behind. Since the it was recovered in context with the remains it is felt to most likely have been the cause of death. This could perhaps tend to rest that there might have been at least some limited aggressive activity between this population and another on occasion.

In comparison to the dental material the anomalies encountered in the skeletal material is very limited. Two individuals (160, and 192) exhibit what appears to be an incomplete fusion of the metopic suture (Fig. 14). In most individuals this suture, which is located in the frontal bone, has fused by early childhood. The recognizable absence of this suture beyond the second year of life is considered to be relatively rare (El-Najjar and McWilliams, 1978; Breathnach, 1955). Studies have shown that the presence of an unfused metopic suture is often associated with other anomalies of the skull and hands (Hess, 1946; Montague, 1937). Other research has suggested that the retention of the metopic suture is a dominant trait (Torgersen, 1951) and one that tends to be slightly more common in females (Ossenberg, 1969; Akabori 1934). Since this is a genetically determined characteristic its presence or absence in other groups suspected of being related to the population of Blue Bayou might prove useful in assessments of biological affinity (Turner, 1967; Leslie, 1977; Finnegan and Marcik, 1979).
Figure 14. Adult frontal exhibiting the presence of the mytopic suture.
CHAPTER VI

SUMMARY

Blue Bayou is one of the largest prehistoric huntergatherer samples from the central Texas coast to be analyzed to date. The sample consists of a total of 40 individuals of both sexes and all ages. While the skeletal samples from Oso Creek (Jackson, 1935), and Morhiss (Campbell, 1976), are larger, there have been no detailed biological analyses done on the Morhiss sample and only one study on the Oso sample, published 50 years ago. The majority of the prehistoric coastal sites which have been studied have generally consisted of fewer than 10 individuals (Comuzzie et al., 1986; Aten, 1963; Wilkinson, 1973; Mallof and Zaveleta, 1979). Yet it is from these small samples that our current understanding of the physical anthropology of this region is based. The analysis of the Blue Bayou sample then provides needed support for most of the previously held views, as well as offering several new ones, concerning the biology of the prehistoric inhabitants of the Texas coastal bend.

The statistical analysis of the sex ratio for the Blue Bayou sample suggests that the number of males to females is not significantly different. There is also no statistical difference in the number of females to the number of males within each of the age categories were sex could be assessed. Ten individuals from a sample of 22 individuals assessed to sex were identified as female and 12 were identified as male. It would appear that there were no selective forces, either biologically or culturally, operating on the
sis of sex in this sample. This is important since it has been reported that several of the historic populations from this region may have practiced female infanticide (Hester, 1980; Newcomb, 1961; ten et al., 1976), a custom which can lead to a change in the expected sex ratio of a population. The presence of a 1:1 sex ratio for this sample also tends to suggest that there was no preferential treatment of individuals with regards to burial practices on the basis of sex.

The age distribution appears to be similar to distributions reported for other hunter-gatherer populations. It was possible to estimate the age of 36 of the forty individuals recovered with 5 classified as early childhood, 1 as adolescent, 5 as adolescent/adult, 19 as adult, 4 as adult/old adult, and 2 as old adult. There were no individuals recovered assignable to the late childhood age category. This may either represent a bias in recovery or may be a reflection of a lowered mortality rate for this group. Statistical analysis of this age distribution with respect to sex showed no significant difference in the number of males to females within each age category. Based on the statistical analysis of the distribution of individuals between age categories it appears that the number of individuals classified as adult, 19, is significantly higher than all the others. As a result the mean age at death in this population is approximately 35 - 40 years of age. From this distribution it appears that early childhood was a relatively stressful period. A decrease in mortality is seen in late childhood and adolescence. However, upon reaching maturity, adolescent/adult,
mortality rate again begins to increase reaching its maximum in the adult age category with the population having suffered an elevated mortality rate by this time.

A limited assessment of the possible biological affinity of the Blue Bayou sample was also made in attempt to place this sample in context with other prehistoric populations within this region. The Blue Bayou material from Blue Bayou was compared with a sample from Palm Harbor, a Late Prehistoric coastal population identified as possibly representing precontact Karankawan (Comuzie et al., 1986), along with a sample from San Juan Capastrano, a historic sample identified as being Coahuiltecan (Humphreys, 1971). The Palm Harbor sample, from Aransas county, Texas, was chosen because it is the best documented and analyzed sample from this region. The San Juan Capastrano sample, from Bexar county, Texas, was utilized primarily as an outlying group since it is historic in age and from an adjacent inland area.

The comparisons were made using both the characteristics suggested by Wilkinson (1977) for the identification of precontact Karankawans as well as the analysis of discrete cranial characteristics as presented by Finnegam and Marcasik (1979). It appears that the Blue Bayou sample is similar to the Palm Harbor material with respect to architecture of the mandible and skull, and noticeably different than the individuals from San Juan Capastrano. A comparison of discrete characteristics also suggests a similarity between the Blue Bayou sample and the coastal material from Palm Harbor. However, the presence of enamel pearls, double rooted
dibular premolars, small peg-shaped third molars, and impacted second molars, genetically controlled and relatively rare dental characteristics, in the Blue Bayou sample suggests that this population might have been fairly isolated with respect to gene flow (Najjar, 1978; Leslie, 1977; Turner, 1967).

The stature and general physique of the sample was estimated in an effort to possibly determine biological affinity and the quality of health and subsistence in this population. Stature estimates were made following Genoves (1967). It was decided to utilize the formulae of Genoves (1967) since the mean lengths of the long bones for the population he used in deriving the formulae corresponded more closely to those from Blue Bayou than did those of Trotter and Gleser (1952). However, before stature estimations could be conducted it was first necessary to reconstruct the lengths of the long bones from Blue Bayou following Steele (1970). This was required due to the fragmented condition of the elements recovered.

The mean stature for males at Blue Bayou was estimated to be 164.64 +/- 6.05 (cm) while that of the females was 154.19 +/- 5.77 (cm). While the Blue Bayou material is felt to possibly be related in someway to the coastal populations of this time it shows a significant difference in terms of stature. A statistical comparison of the mean statures of males from Blue Bayou to those from Shell Point and Oso Creek (Wilkinson, 1973) suggests that the Blue Bayou population is significantly shorter.

The question of robusticity in this sample was also addressed. It has been suggested that the prehistoric coastal populations from
Region are characterized by a marked degree of robusticity. Although the stature for Blue Bayou appears somewhat shorter than that of the coastal samples, a statistical comparison of other physical criteria suggests that they are fairly similar in robusticity. A comparison of mean values for males of the midshaft diameter of the femur between Blue Bayou and Palm Harbor (Foszie et al., 1986) showed no statistical difference. This is significant since Palm Harbor has been described as a relatively robust population and is fairly representative of the physical structure of the prehistoric coastal populations from this area. An interpretation of robusticity of the Blue Bayou sample is also suggested by a visual assessment of these remains. The sample from Blue Bayou exhibits well defined browridges, pronounced sites of muscle attachment, and a large well developed mandible, traits which are typical of prehistoric Texas coastal populations.

Even though both sexes in this sample appear relatively robust, there seems to be a pronounced degree of sexual dimorphism present. This conclusion is based on the statistical comparison of metrical parameters as well as a visual assessment of the material. The males are taller in stature with larger and more well developed long bones. Male members of each sex exhibit the presence of browridges they appear much more pronounced in the males.

The presence of a discernable degree of sexual dimorphism may serve to indicate the overall health and quality of subsistence in this population. Several studies have shown that in living populations suffering from chronic disease or nutritional stress that
degree of sexual dimorphism expressed is greatly reduced or non-
tent (Brauer, 1982; Stini, 1969, 1972). Doran (1975) has
suggested that the same may be true for prehistoric samples as well.
This is indeed the case then the findings on the Blue Bayou sample
suggest that this population may have been fairly free
from chronic disease and other metabolic stresses. This concept is
further supported by the general lack of any osteological evidence
of widespread disease or nutritional deficiencies.

The analysis of the dental remains from this sample revealed a
relatively low level of pathogenic activity. Seven individuals
examined exhibited evidence of periodontal infection. This is not
surprising given the amount of calculus observed on many of the
dental elements. What is interesting, however, is the presence of
large quantities of calculus given the high levels of attrition
demonstrated in this sample. It has been suggested (St.Hoyme and Koritzer,
1977) that high levels of attrition in prehistoric populations served
to remove deposits of calculus thereby greatly reducing the chance of
periodontal infection.

Five individuals were also encountered with sites of carious
activity. This is significant again because a high rate of attrition
generally helps to prevent the development of tooth decay. It is
also significant because it may suggest a slightly higher frequency
of caries in this population than seen in those samples from the
coast. It has been suggested (Davies, 1972) that inland populations
tend to experience a higher rate of carious activity than coastal
groups even if they are of the same ethnic background. The Blue
A sample seems to support Davies (1972) conclusion.

The teeth of this sample were also analyzed for evidence of metabolic stress in the form of enamel hypoplasia. Several studies have shown the correlation of these enamel defects with periods of endemic disease or nutritional stress during an individual's developmental years (El-Najjar et al., 1978; Rose et al., 1978). Of the teeth examined four exhibited signs of enamel hypoplasia. These were all characterized as single relatively large defects suggesting at least one episode of marked metabolic stress during the developmental years of the individual. It might be possible that the individuals which possess these enamel defects represent the survivors of whatever forces which were responsible for the mortality rate seen in the early childhood age category.

With the exception of attrition, traumatic damage to the dentition was very limited. While it has become increasingly common to view attrition as a normal process it still represents a modification of a structure by outside forces. Of the 25 individuals with associated teeth 16 of these were described as exhibiting evidence of attrition, with 12 of these exhibiting severe attrition. Two individuals exhibited evidence of ante-mortem damage to teeth. One case is relatively minor exhibited as a chipping of a molar while the other appears much more severe. In the second case it appears that the breakage and loss of an incisor lead to a subsequent infection which destroyed part of the hard palate.

In terms of dental anomalies there were several interesting variations exhibited in this sample. One individual possessed
impacted third molars, two individuals possessed enamel pearls, one individual possessed double rooted mandibular canines, and two others possessed third molars which appeared small and atypically pegged. All of these conditions are described by Taylor (1978) as relatively rare. It is possible, based on the presence of these relatively rare characteristics, that Blue Bayou might represent a relatively isolated breeding population (Leslie, 1977; El-Najjar, 1978; Turner, 1963).

In general the analysis of the skeletal remains did not show any evidence of rampant disease, trauma, or physical variations. Two individuals exhibited evidence of either osteomyelitis or periostitis. Both of these conditions represent infection of the periosteum as a result of traumatic injury or disease (Ortner and Otter, 1981) and cannot be distinguished from one another on the basis of osteological criteria. Their presence does suggest, however, that these two individuals might have suffered from a widespread infection, possibly as a result of traumatic injury. Only one individual from this sample exhibited undeniable proof of traumatic injury, most probably as a result of intentional aggression. This individual was recovered with an arrow point in contact with the vertebrae of the lower back which is felt to have been the most likely cause of death. In terms of physical anomalies the post cranial remains appear normal. However, two of the individuals examined exhibited a non-fusion of the metopic suture of the frontal bone. Since this condition is considered relatively rare (Breathnach, 1965; and El-Najjar and McWilliams, 1978) it too tends
to indicate that perhaps the breeding patterns of this sample might have been relatively restrictive.

The analysis of the bioarchaeology of the Blue Bayou sample provides an interesting picture of a prehistoric hunter-gatherer society from the Texas Coastal Bend. While this sample appears slightly shorter in stature than the previously described coastal samples from this area it still seems to be fairly robust. Furthermore, despite the robust nature in general of these remains there is still a pronounced degree of sexual dimorphism discernible. The presence of this sexual dimorphism along with the general lack of osteological evidence of pathologies tends to suggest that this population might have enjoyed relative freedom from disease and metabolic stress. This is an important finding since it has been suggested that prehistoric populations exploiting these coastal environments most probably suffered from chronic disease and malnutrition (Rathbun et al., 1982; and Newcomb 1962).
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APPENDIX A

DESCRIPTION OF BURIALS

The following appendix provides a complete physical description of the material recovered from each burial. Individuals identified from each burial were given a three digit identification number. The first two digits represent the burial from which the material was recovered and the third represents the individual within that burial (i.e. 110 = burial 11 individual 0). In the case of the material from the "bone masses" this identification number always begins with a 4, the second digit represents the number of the "bone mass", and the third represents the individual (i.e. 440 = Bone mass 4 individual 0). The completeness of each element recovered in a burial is coded by a number between 1 and 5 (i.e. femur (4)): 1 - element only represented by a few fragments, 2 - element less than half intact, 3 - approximately half the element intact, 4 - element approximately three-quarters intact, 5 - element complete.

Burial 1


Context: This burial was recovered disarticulated with the elements fragmented.

Artifacts: None associated.

Inventory of Remains: UID cranial fragments (1), right I\(^1\), right I\(^2\), right C\(^-\), right PM\(^1\), right PM\(^2\), right M\(^1\), right M\(^2\), right M\(^3\), left I\(^1\), left I\(^2\), left C\(^-\), left PM\(^1\), left PM\(^2\), left M\(^1\), left M\(^2\), left M\(^3\), right femur
(3), left femur (3), several UID long bone fragments (1).

Minimum Number of Individuals: One (010).

Sex: Female. This assessment was made based on the mid-shaft circumference of the femur (Black 1978a).

Age: Adult. This assessment was made based on the presence and occlusion of the permanent dentition along with the degree of dental attrition observed. Following Miles (1963) the degree of attrition observed suggests that this individual was in their late thirties.

Stature: Indeterminate.

Pathology: The right upper central incisor shows evidence of nerve or root damage with associated discoloration and decay. Also the right upper lateral incisor shows evidence of carious activity on the lingual surface.

Trauma: There is a heavy degree of attrition on all the teeth observed with severe wear also being displayed on the occlusal surfaces of the incisors. The wear on the first molars is severe enough to have resulted in the exposure of the dentine.

Anomalies: The incisors display a marked degree of shoveling. Also the upper central incisors display an unusual wear pattern on the labial surface of the crown.

Burial 2

Coordinates: S8 - W3.
Context: This individual was recovered in a flexed position resting on its left side. The burial was oriented northwest to southeast with the skull to the southeast. Burial 2 was overlain by what was originally described in the field notes as bone masses 1 through 5.

Artifacts: None associated.

Inventory of Remains: UID cranial fragments (1), right I\textsubscript{1}, right I\textsubscript{2}, right M\textsubscript{1}, right M\textsubscript{2}, left I\textsubscript{1}, left I\textsubscript{2}, right M\textsubscript{1}, right M\textsubscript{2}, left M\textsubscript{1}, left M\textsubscript{2}, canine fragment, 5 premolar fragments, right humerus (3), left humerus (3), right radius (2), left radius (2), right ulna (2), right femur (3), left tibia (2), right second metacarpal, two second phalanges.

Minimum Number of Individuals: One (020).

Sex: Female. This assessment was made based on the relatively gracile nature of the shafts of the humerus, femur, and tibia.

Age: Old Adult. This assessment was based on the presence and occlusion of the permanent dentition along with the heavy degree of attrition on all the molars (Miles 1963).

Stature: Indeterminate.

Pathology: None discernable.

Trauma: The incisors display an unusual wear pattern on their lingual surface while the rest of the dentition
displays a relatively heavy degree of attrition in general.

Anomalies: The incisors from this individual display a marked degree of shoveling.

Burial 3

Coordinates: S9 - W3.

Context: This specimen is composed of several unidentifiable fragments recovered in a disarticulated condition.

Artifacts: Two Scallorn points were recovered in association with this burial.

Inventory of Remains: Several UID long bone fragments.

Minimum Number of Individuals: One (030).

Sex: Indeterminate.

Age: Mature. Due to the overall size of these fragments it is felt that they represent a mature individual but it is impossible to be certain of the exact age range.

Stature: Indeterminate.

Pathology: None discernable.

Trauma: None discernable.

Anomalies: None discernable.

Burial 4


Context: This burial was recovered in a semi-flexed position resting on its left side. The burial was oriented northeast to southwest with the skull to the
southwest. Bone to bone contact between burial 4 and burial 6 was encountered and based upon the archaeological evidence is felt to suggest simultaneous interment.

Artifacts: Two Scallorn points were recovered in association with this burial.

Inventory of Remains: Pelvis fragments (4) (shattered in matrix), right radius (4), left radius (4), right femur (4), left femur (4), right tibia (4), left tibia (4), left patella (4), several UID hand fragments.

Minimum Number of Individuals: One (040).

Sex: Male. This assessment was made based on the robusticity of the femur and tibia fragments along with the mid-shaft circumference of the femur. (Black 1978a).

Age: Mature. The remains of this individual represent those of a mature individual based on the fusion of the epiphysis of the pelvis but it is not possible to determine if the individual was adult or old adult due to the limited nature of the remains.

Stature: Indeterminate.

Pathology: None discernable.

Trauma: None discernable.

Anomalies: None discernable.

Burial 5

Context: This burial was recovered in an extended position with its legs drawn up resting on its back and left side. The burial was oriented northwest to southeast with the skull to the southeast. Burial 5 is directly overlain by burials 1, 2, 4, 6, and 7 as well as what was described in the field notes as bone masses 1 through 5. As a result of all of the overlaying burials it is felt that burial 5 may represent one of the older burials in the sample.

Artifacts: None associated.

Inventory of Remains: UID cranial fragments (1), right PM\(^1\), right PM\(^2\), right M\(^1\), right M\(^2\), right M\(^3\), left PM\(^1\), left PM\(^2\), left M\(^1\), left M\(^2\), left M\(^3\), right I\(_1\), right I\(_2\), right C\(_1\), right M\(_1\), right M\(_2\), UID rib fragments (1), UID vertebral fragments (1), UID innominate fragments (1), sacral fragments (1), left scapula fragment (1), right humerus (3), left humerus (3), right radius (2), left radius (2), right ulna (3), left ulna (3), right femur (4), left femur (4), right tibia (4), left tibia (4), right fibula (4), left fibula (4), right patella (5), several UID long bone fragments (1), 4 UID metacarpal fragments (1), left talus (4), right navicular (2), left navicular (4), left first cuneiform (5), left second cuneiform (5), left third cuneiform (4), 10 metatarsal, 18 phalanges.
(intrusive remains: young adult); right mandibular fragment (2), right I₂, right PM₁, right PM₂, right M₂, right M₃. (intrusive remains: old adult); left mandible fragment (2), left I₂, left C₁, left PM₁, left PM₂, left M₁, left M₂, left M₃.

Minimum Number of Individuals: Three (050, 051, and 052).

Sex: (050) Male. Individual 050 is felt to be male based on the well developed sites of muscle attachment, mid-shaft femur circumference (Black 1978a), the relatively thick cross-section of the cranial fragments, and the general overall robusticity of the remains. (051 and 052) Indeterminate.

Age: (050) Adult to Old Adult. This assessment was made based on the presence and occlusion of the permanent dentition along with the degree of attrition displayed by the molars (Miles 1963). Based on the extent of attrition present it is felt that this individual was in their late thirties to early forties (Miles 1963). (051) Adult. This assessment is based on the low degree of attrition displayed and the non-eruption of the third molars. Both of these suggest an individual in their early twenties (Miles 1963, Schour and Massler, 1940). (052) Old Adult. This assessment is based on the degree of attrition displayed by the molars (Miles 1963).

Stature: (050) 160.40 +/- 6.38 cm. The stature of 050 was
estimated by first reconstructing the length of the left femur following Steele (1970) giving a reconstructed femur length of 41.6 +/- 1.31 cm which was then used in the stature formula developed by Genoves (1967).

Pathology: Individual 050 displays evidence of several pathological conditions most of which appear to be associated with degenerative conditions. Three of the middle phalanges of the foot display evidence of arthritic lipping. The distal portion of the left fibula displays evidence of laminar bone growth. The left femur displays a large and abnormally developed site of muscle attachment on its proximal dorsal surface.

Trauma: All the teeth of individual (050) display a relatively heavy degree of attrition.

Anomalies: The incisors of 050 display marked shoveling.

Taphonomy: The right tibia and fibula of 050 displays evidence of rodent gnawing.

Burial 6


Context: This burial was encountered in a semi-flexed position resting on its left side. Bone to bone contact existed between burial 6 and burial 4 as well as between burial 6 and burial 7 possible indicating
simultaneous interment.

Artifacts: None associated.

Inventory of Remains: left ulna fragment (1), right femur fragment (3), left femur fragment (4), right tibia fragment (1), left tibia fragment (4).

Minimum Number of Individuals: One (060).

Sex: Indeterminate.

Age: Mature. Due to the limited extent of the remains recovered it is not possible to make an assignment to a specific age category but based on the fusion of the epiphysis of the remains present it can be said that this was a mature individual.

Stature: 157.62 +/- 5.52 cm (female)/166.86 +/- 5.51 cm (male).

The stature estimate for this individual was obtained by reconstructing the length of the tibia utilizing the method developed by Steele (1970). The reconstructed tibia length was 34.5 +/- .74 cm (female)/37.3 +/- 1.38 cm (male) these lengths were then used in the stature estimation formula developed by Genoves (1967). Stature for both male and female were calculated since the actual sex of this individual could not be assessed.

Pathology: The right femur exhibits an irregular bone growth on its lower medial surface (approximately 30mm x 12mm).

Trauma: None discernable.
Anomalies: None discernable.

Burial 7


Context: This burial was encountered in a semi-flexed condition resting on its left side. Bone to bone contact existed between burial 7 and burial 6 possible indicating simultaneous interment.

Artifacts: None associated.

Inventory of Remains: femur fragments (1), right tibia (3), left tibia (2), left fibula (2).

Minimum Number of Individuals: One (070).

Sex: Indeterminate.

Age: Mature. Due to the nature of the remains it is not possible to assign this individual to a specific age category. However, due to the size of the remains it is felt that this individual represents at the least an adult individual.

Stature: Indeterminate.

Pathology: None discernable.

Trauma: None discernable.

Anomalies: None discernable.

Burial 8


Context: This burial was encountered in a flexed position resting on its back and left side. It was oriented
northwest to southeast with the skull to the southeast.

Artifacts: A scrapper was found in context with this burial.

Inventory of Remains: cranial fragments (2), mandible (4),
right I^1, right I^2, right C^-, right PM^1, right PM^2,
right M^1, right M^2, right M^3, left I^1, left I^2, left C^-, left PM^1, left PM^2, left M^1, left M^2, left M^3,
right I^2, right PM^1, right PM^2, right M^1, right M^2,
right M^3, left C^-, left PM^1, left M^1, left M^2, left M^3,
right humerus (1), left humerus (4), left radius (4), left ulna (4), right femur (4), left femur (4),
right tibia (4), left tibia (4).

Minimum Number of Individuals: One (080).

Sex: Female. This assessment of sex was made based on the
general gracile appearance of the remains along with the mid-shaft circumference of the femur (Black 1978a) and the size of the gonial angle.

Age: Adult. This age assessment was made based on the complete fusion of all epiphysis present as well as the generally light level of attrition displayed by the molars (Miles, 1963).

Stature: Indeterminate.

Pathology: None discernable.

Trauma: There is evidence of relatively severe attrition of the dentition particularly on the occlusal and lingual surface of the incisors.
Anomalies: The incisors display a relatively marked degree of shoveling.

Taphonomy: There is a heavy mottling of a natural asphaltum on the teeth and some bones of this individual.

Burial 9


Context: This burial was encountered as a single disarticulated skull setting upright and facing southwest.

Artifacts: None associated.

Inventory of Remains: Cranium (rearticulated) (4), right C, right PM¹, right PM², right M¹, right M², right M³, left PM¹, left PM², left M¹, left M², left M³, right humerus (4).

Minimum Number of Individuals: One (090).

Sex: Male. This assessment was based on the presence of a relatively long palate, relatively large teeth, and appreciable supraorbital ridge. Furthermore, the right humerus displays a well developed site of muscle attachment.

Age: Adult. This assessment was based on the presence and occlusion of all permanent teeth as well as the degree of attrition displayed (Miles 1963).

Stature: Indeterminate.

Pathology: None discernable.
Trauma: Slight amount of attrition observable on the occlusal surface of some of the teeth.

Anomalies: An enamel pearl is present on the distal surface of the left upper third molar just below the gum line. The third molars appear smaller and squarer than might be expected.

Taphonomy: The skull is severely warped and deformed but this appears to be the result of antemortem forces such as ground pressure.

Burial 10


Context: This burial was encountered disarticulated.

Artifacts: None associated.

Inventory of Remains: cranial fragments (1), mandible (3), right I^1, right I^2, right PM^1, right M^1, right M^2, right M^3, left I^1, left I^2, left C^-, left PM^1, left PM^2, right I^1, right I^2, right C^-, right PM^1, right PM^2, right M^2, right M^3, left I^1, left I^2, left C^-, left PM^1, left PM^2, right humerus (4), left humerus (4), radius (1).

Minimum Number of Individuals: One (100).

Sex: Female. This assessment is based on the relative thinness of the cranial bones in cross-section, the roundness of the chin, and the relatively gracile nature of the post-cranial remains.
Age: Adult/Old Adult. This assessment was based on the presences and occlusion of all of the permanent teeth along with the extent of attrition displayed by the molars (Miles 1963). Based on the degree of attrition observed this individual appears to be in their mid forties (Miles 1963).

Stature: Indeterminate.

Pathology: The right first mandibular molar appears to have been evulsed antemortem with subsequent resorption of the mandible in this area. Periodontal infection may also be associated. The right second maxillary molar appears to have been broken antemortem at the root line with surrounding bone displaying evidence of periodontal infection as well.

Trauma: The right second maxillary molar displays evidence of traumatic injury. All occlusal surfaces show heavy attrition.

Anomalies: The incisors display a marked degree of shoveling.

Burial 11

Coordinates: N10 - W5.

Context: This burial was encountered on its back with the legs flexed and laying on its right side. It was oriented northwest to southeast with the skull to the southeast. It was reported in the field notes that some elements from this burial had been removed by
earth moving equipment.

Artifacts: None associated.

Inventory of Remains: left femur (4), right tibia (3), left tibia (4), right fibula (1), left fibula (1), several UID tarsal fragments (1).

Minimum Number of Individuals: One (110).

Sex: Female. This assessment was made based on the relatively gracile nature of the remains and their sites of muscle attachment as well as the mid-shaft circumference of the femur (Black 1978a).

Age: Mature. Due to the nature of the remains it is not possible to assign this individual to a specific age category. However, due to the size of the remains it is felt that this individual represents at the least an adult individual.

Stature: 150.75 +/- 6.02 cm. The stature for this individual was estimated by using a reconstructed femur length of 39.0 +/- 1.02 cm (Steele 1970) and utilizing the stature formula developed by Genoves (1963).

Pathology: None discernable.

Trauma: None discernable.

Anomalies: None discernable.

Burial 12


Context: This burial was encountered in a flexed position on its left side with hands to face. It was oriented
northwest to southeast with the skull to the southeast.

Artifacts: Four utilized flakes were recovered in context with this burial.

Inventory of Remains: Crania (articulated) (5), right I¹, right I², right C⁻, right PM¹, right PM², right M¹, right M², right M³, left M¹, left M², left M³, right I₁, right I₂, right C⁻, right PM₁, right PM₂, right M₁, right M₂, right M₃, left I₁, left I₂, left C⁻, left PM₁, left PM₂, left M₁, left M₂, left M₃, humerus (4), right femur (4), left femur (4).

Minimum Number of Individuals: One (120).

Sex: Male. This assessment was made based on the presence of a relatively square chin, a relatively long palate, large teeth, and large mastoids. Also the post-cranial elements appear relatively robust.

Age: Adult. This assessment was made based on the eruption and occlusion of all of the permanent dentition along with the moderate to heavy attrition displayed by the posterior teeth (Miles 1963).

Pathology: None discernable.

Trauma: There is a relatively severe degree of attrition expressed in the dentition of this individual.

Anomalies: The right maxillary third molar appears atypically small and peg shaped.

Taphonomy: The skull appears warped as a result of
postmortem forces of ground pressure.

Burial 13


Context: This burial was recovered in a disarticulated condition.

Artifacts: None associated.

Inventory of Remains: This individual is only represented by several UID fragments.

Minimum Number of Individuals: One (130).

Sex: Indeterminate.

Age: Mature. Due to the limited nature of these remains it is not possible to assign this individual to a specific age category, however, due to the overall size of these remains it is felt that this individual is at the minimum an adult.

Stature: Indeterminate.

Pathology: None discernable.

Trauma: None discernable.

Anomalies: None discernable.

Taphonomy: Several of the elements do exhibit strong evidence of rodent gnawing.

Burial 14
Coordinates: N9 - W5.

Context: This burial was encountered in a disarticulated condition.

Artifacts: None associated.

Inventory of Remains: left mandibular fragment (2), left C, left PM₁, left PM₂, left M₁, left M₂, left M₃.

Minimum Number of Individuals: One (140).

Sex: Male. This assessment is based on the relatively large size of the teeth as well as the overall general robusticity of the mandible itself.

Age: Adult (young). This assessment was made based on the complete eruption and occlusion of the third molar along with the only slight degree of attrition displayed by the posterior teeth.

Stature: Indeterminate.

Pathology: None discernable.

Trauma: None discernable.

Anomalies: None discernable.

Taphonomy: The dentition displays a heavy coating of what appears to be asphaltum.

Burial 15

Coordinates: N13 - W8.

Context: This burial was encountered in a disarticulated condition.

Artifacts: None associated.

Inventory of Remains: Seven UID long bone fragments.
Minimum Number of Individuals: One (150).

Sex: Indeterminate.

Age: Mature. Due to the limited nature of the remains it was not possible to assign this individual to a specific age category. However, based on the overall size of the remains recovered it is felt that this individual at a minimum is an adult.

Stature: Indeterminate.

Pathology: None discernable.

Trauma: None discernable.

Anomalies: None discernable.

Burial 16

Coordinates: N4 - W8/N4 - W9/N5 - W8/N5 - W9.

Context: This burial was encountered in an extended position resting on its left side. The burial was oriented northeast to southwest with the skull to the southwest.

Artifacts: A fragmented arrow point was found in tight association with the vertebrae of this burial along with a larger and unidentified point.

Carbon Date: 1490 +/- 90 b.p., corrected age 1660 +/- 90 b.p.

This carbon date was obtained from the long bones of the lower body.

Inventory of Remains: frontal (4), right parietal (4), left parietal (4), right temporal (3), left temporal (2), occipital (3), right zygomatic (5), left zygomatic
(4), right maxilla (3), left maxilla (4), mandible (4), right PM¹, right PM², right M¹, right M², right M³, left I¹, left I², left C⁻, left PM¹, left PM², left M¹, left M², left M³, right M₁, right M₂, right M₃, left M₁, left M₂, left M₃, axis (1), left lunate (5), left triquetral (5), left hamate (5), left scaphoid, some metacarpal fragments (2), several UID foot fragments (1).

Minimum Number of Individuals: One (160).

Sex: Male. This assessment was made based on the size of the gonial angle along with the relatively pronounced nature of the temporal ridge, nuchal crest, and the supraorbital ridge. The zygomatic arches appear thick, the palate long, the chin square, and the mastoids large and robust. Also all the bones of the cranium appear thick in cross-section.

Age: Adult. This assessment was made based on the complete eruption and occlusion of the permanent dentition along with the slight to moderate degree of attrition displayed by the posterior teeth (Miles 1963).

Stature: Indeterminate.

Pathology: There is evidence of possible periodontal infection associated with the mandibular first and second molars.

Trauma: Based on the association of the arrow point fragment with the vertebrae and the suggested angle of entry it
is felt that death most probable was the result of
violent aggression. Also all but the third molars
display a relatively heavy degree of attrition.
Anomalies: This individual displays what appears to be an
incomplete fusion of the metopic suture.

Burial 17

Coordinates: N4 - W9/N5 - W9.

Context: This burial was encountered lying on its back with
the left leg extended and the right leg flexed. It
was oriented northwest to southeast with the skull to
the southeast.

Artifacts: There were several scrapers and flakes found in
association with this burial along with a fragment of
scapula from a deer (Odocoilus virginianus) comingled
with the remains.

Inventory of Remains: frontal (1), right parietal (2), left
parietal (4), temporal (1), occipital (1), right
zygomatic (3), mandible (3), right I₁, right C₁, right
PM₁, right I₁, right M₁, right M₂, right M₃, right
femur (4), left femur (4), right tibia (4), left tibia
(4), right fibula (4), left fibula (4), right patella
(4), left calcaneus (5), 2 left metatarsal (5).

Minimum Number of Individuals: One (170).

Sex: Male. This assessment was made based on the pronounced
sites of muscle attachment for the masseter and the
square appearance of the chin along with the general
overall robusticity of the remains and the mid-shaft circumference of the femur (Black 1978a).

Age: Adult (young). This assessment was made based on the complete eruption and occlusion of all the permanent teeth along with the slight to moderate degree of attrition displayed by the posterior dentition (Miles 1963).

Stature:  158.81 +/- 6.38 cm (left femur), 159.72 +/- 6.38 cm (right femur), 172.15 +/- 5.51 cm (left tibia), 171.37 +/- 5.51 cm (right tibia). The stature of this individual was estimated using the reconstructed lengths of the left femur 40.9 +/- 1.31 cm, right femur 41.3 +/- 1.31 cm, left tibia 40.0 +/- 1.38 cm, right tibia 39.6 +/- 1.38 cm. (Steele 1970) an utilizing these in the stature estimating formula developed by Genoves (1967).

Pathology:  None discernable.

Trauma: The dentition displays a moderate degree of attrition.

Anomalies: The right Il displays an unusual wear pattern on the labial surface.

Taphonomy: All long bones of this individual display evidence of rodent gnawing.
Burial 18

Coordinates: S8 – W3.

Context: This burial was encountered basically in a
disarticulated condition and described in the field
notes as a bundle burial. Burial 2 and bone masses 2
and 4 were directly over burial 18. The feet of
burial 5 were covered by burial 18.

Artifacts: None associated.

Inventory of Remains: frontal (4), right parietal (4), left
parietal (4), right temporal (3), left temporal (2),
occipital (4), left zygomatic (2), right maxilla (4),
left maxilla (3), mandible (3), right I\(^1\), right M\(^1\),
right M\(^2\), right M\(^3\), left I\(^2\), left C\(^-\), left PM\(^1\), left
PM\(^2\), left M\(^1\), left M\(^2\), right M\(^2\), right clavicle (4),
left humerus (4), left ulna (4), right femur (2), left
femur (4), right tibia (4), left tibia (1), right
fibula (1), left calcaneus (1), left talus (2), left
third cuneiform (5), 1 metatarsal (2), 4 phalanges(3).
(intrusive; juvenile), right femur (4).

Minimum Number of Individuals: Two (180 and 181).

Sex: (180) Male. This assessment was made based on the
pronounced nature of the nuchal crest, relatively long
palate, large teeth, square chin, pronounced supra
orbital ridge, and large and robust mastoid. This
assessment is further supported by the general
robusticity of the post-cranial remains and the
mid-shaft circumference of the femur (Black 1978a).

(181) Indeterminate.

Age: (180) Adult/Old Adult. This assessment was based on
the complete eruption and occlusion of the permanent
teeth along with the slight to heavy attrition
displayed by the posterior dentition. This individual
also displays evidence of some fusion and obliteration
of the sagittal and coronal sutures. (181)
Indeterminate.

Stature: 158.14 +/- 6.38 cm (180). The stature of this
individual was estimated by using a reconstructed
length of 40.6 +/- 1.31 cm for the left femur (Steele
1970) in the stature estimating formula developed by
Genoves (1967).

Pathology: There is what appears to be secondary bone growth
in the superior portion of both external auditory
meatuses of individual 180.

Trauma: The dentition of 180 displays slight to heavy
attrition particularly associated with the posterior
dentition.

Anomalies: Individual 180 exhibits the protrusion of the
roots of the right maxillary first molar into the
floor of the maxillary sinus. The incisors also
display a marked degree of shoveling.

Burial 19

Coordinates: S3 - W8.
Context: This burial was encountered in a flexed position resting on its left side. It was oriented northwest to southeast with the skull to the southeast. Burial 19 rests directly above burial 20 and is separated by 5 cm of soil.

Artifacts: Six cockle shells were found in association with this burial and were suggested in the field notes to have possibly been used during the original preparation of the graves.

Inventory of Remains: right parietal (4), left parietal (4), right temporal (2), left temporal (2), occipital (4), sphenoid (1), right zygomatic (5), right maxilla (3), left maxilla (3), mandible (4), right il, right i\(^2\), right c\(^-\), right pm\(^1\), right pm\(^2\), left i\(^1\), left i\(^2\), left c\(^-\), left pm\(^1\), left pm\(^2\), right c\(_-\), right pm\(_1\), right pm\(_2\), left c\(_-\), left pm\(_1\), left pm\(_2\), (present but unerupted) right M\(^1\), left M\(^1\), right M\(_1\), right M\(_2\), right M\(_3\), left M\(_1\), rib fragments (1), vertebral fragments (1), right clavicle (4), left clavicle (4), right humerus (3), left humerus (4), UID femur fragments (1), right tibia (4), fibula (4), UID long bone fragments (1).

Minimum Number of Individuals: One (190).

Sex: Indeterminate.

Age: Early Childhood. This assessment was made based on the small and gracile nature of the remains as well as the
presence of a completely deciduous dentition. It is felt that this individual is near six years of age since all the deciduous teeth are present but the first permanent molars have not yet erupted (Schour and Massler 1940).

Stature: Indeterminate.
Pathology: None discernable.
Trauma: None discernable.
Anomalies: The incisors display a marked degree of shoveling.

Burial 20

Coordinates: S3 - W8.
Context: This burial was encountered in a semi-flexed position resting on its left side with hands to the face. It was oriented northwest to southeast with the skull to the southeast.

Artifacts: None associated.
Carbon Date: 1590 +/- 210 b.p., corrected age 1810 +/- 220 b.p.
This date was obtained by radiocarbon techniques utilizing the long bones of the lower body.

Inventory of Remains: (rearticulated crania); frontal (4), right parietal (4), left parietal (4), right temporal (4), left temporal (4), occipital (4), mandible (4), right I^1, right I^2, right C^-, right PM^2, right M^3, left I^1, left I^2, left C^-, left PM^1, left PM^2, left M^1, left M^2, left M^3, right I_1, right I_2, right C_-, right M^1, right M^2, right M^3, right I_1, right I_2, right C_-, right M^1, right M^2, right M^3, right I_1, right I_2, right C_-. 
right PM₁, right PM₂, right M₁, right M₂, right M₃, 
left I₁, left C, left PM₁, left PM₂, left M₁, left 
M₂, left M₃, rib fragments (1), right humerus (4), 
left humerus (4), right radius (4), left radius (4), 
right ulna (5), left ulna (4), 1 left second 
metacarpal, 1 UID metacarpal fragment, 3 phalanges.

Minimum Number of Individuals: One (200).

Sex: Male. This assessment was made based on the 
pronounced nature of the nuchal crest, supra orbital 
ridges, and origin and insertion of the masseter. 
This individual also displays relatively thick 
zygomatic arches, a square chin, and large and robust 
mastoids. The gonial angle of this individual is also 
strongly suggestive of a male.

Age: Adult/Old Adult. This assessment was made based on the 
fusion and obliteration of the sagittal and coronal 
sutures along with the complete eruption and occlusion 
of all the permanent teeth in conjunction with the 
moderate to heavy degree of attrition displayed by all 
the dentition (Miles, 1963).

Stature: Indeterminate.

Pathology: There is evidence of both carious activity and 
periodontal infection in this individual. The right 
mandibular second molar, right maxillary third molar, 
and right mandibular second premolar all display 
evidence of dental decay. In addition the right
mandibular second molar shows evidence of abscessing and resorption exposing nearly the entire lingual root most probable as a result of subsequent periodontal infection. There is also exposure of the roots of both the right and left mandibular first molars below the gum line of both the buccal and lingual surfaces accompanied by the possible development of a hypercementosis of the roots.

Trauma: The dentition of this individual displays a relatively heavy degree of attrition on all occlusal surfaces.

Anomalies: Both the mandibular canines possess double roots, and the incisors display a marked degree of shoveling.

Burial 21

Coordinates: S3 - W7.

Context: This burial was encountered in a flexed position resting on its left side. It was oriented north to south with the skull to the south.

Artifacts: Six cockle shells were found in association with this individual and have been suggested as possible having been used in the initial preparation of the grave.

Inventory of Remains: (rearticulated crania); frontal (3), right parietal (4), left parietal (4), right temporal (1), left temporal (3), occipital (4), right zygomatic (5), mandible (1), (dentition in occlusion); right 1
right \text{i}^2, \text{right c}^-, \text{right pm}^1, \text{right M}^1, \text{left i}^1, \text{left i}^2, \text{left c}^-, \text{left pm}^1, \text{left pm}^2, \text{right i}_1, \text{right i}_2, \text{right c}_-, \text{(present but non-erupted)}; \text{right PM}^2, \text{right M}^2, \text{right M}^3, \text{left M}^1, \text{left M}^2, \text{left M}^3, \text{right PM}^1, \text{right PM}^2, \text{right M}_1, \text{right M}_2, \text{right M}_3, \text{left I}_1, \text{left I}_2, \text{left c}_-, \text{left PM}^1, \text{left PM}^2, \text{left M}_1, \text{left M}_2, \text{left M}_3, \text{rib fragments (1)}, \text{vertebral fragments (1)}, \text{right humerus (3)}, \text{right radius (3)}, \text{right ulna (3)}, \text{right femur (3)}, \text{right tibia (3)}, \text{left tibia (4)}, 4 \text{UID long bone fragments (1)}.

Minimum Number of Individuals: One (210).

Sex: Indeterminate.

Age: Early Childhood. This assessment was made on the general gracile nature of the remains along with the presence of a strictly deciduous dentition.

Stature: Indeterminate.

Pathology: The right maxillary first premolar displays evidence of carious activity on its occlusal surface.

Trauma: None discernable.

Anomalies: There is evidence to suggest a possible incomplete fusion of the metopic suture, and the lower incisors display a marked degree of shoveling.

Burial 22

Coordinates: S3 - W7.

Context: This burial was encountered resting on its left side. It was oriented south to north with the skull to
the north.

Artifacts: Six cockle shells were recovered in association with this burial and were suggested in the field notes to possible have been used in the initial preparation of the grave.

Inventory of Remains: crania fragments (1), (deciduous dentition); right i₁, right i₂, right c-, right m₂, left i₂, right i₁, right i₂, right c-, right m₁, right m₂, (permanent dentition non-erupted); right M₁, right I₁, right I₂, right M₁, left I₁, 3 molar buds, rib fragments (1).

Minimum Number of Individuals: One (220).

Sex: Indeterminate.
Age: Early Childhood. This assessment was made based on the general gracile nature of these remains along with the presence of a deciduous dentition. The deciduous mandibular central incisor is still in place suggesting an individual less than seven years of age (Schour and Massler, 1940).

Stature: Indeterminate.
Pathology: None discernable.
Trauma: None discernable.
Anomalies: The incisors of this individual display a marked degree of shoveling.

Burial 23

Coordinates: S3 - W7.
Context: This burial was encountered in a semi-flexed position resting on its right side. It was oriented northeast to southwest with the skull to the southwest. The lower limbs of the primary individual in this burial, (230), were left in situ in the wall of the excavation.

Artifacts: None associated.

Inventory of Remains: frontal (4), right parietal (4), left parietal (4), right temporal (3), left temporal (3), occipital (3), sphenoid (1), right zygomatic (4), left zygomatic (1), right maxilla (3), left maxilla (4), mandible (4), right I^2, right C^2, right PM^1, right PM^2, right M^1, right M^2, right M^3, left I^1, left I^2, left C^1, left PM^1, left PM^2, left M^1, left M^2, left M^3, right I^1, right I^2, right C^2, right PM^1, right PM^2, right M^1, right M^2, right M^3, left I^1, left I^2, left C^2, left PM^1, left PM^2, left M^1, left M^2, left M^3, rib fragments (1), vertebral fragments (1), pelvis fragments (1), right scapula (1), right clavicle (4), left clavicle (4), right humerus (4), left humerus (4), right radius (4), left radius (4), right ulna (4), left ulna (4), fibula (1), triangular (5), 2 UID hand fragments (1), 4 metacarpals (2), 18 phalanges (1). (intrusive remains); left mandibular fragment, right maxillary fragment, right humerus fragment, right clavicle, left clavicle, non-erupted premolar,
permanent premolar, 2 UID fragments.

Minimum Number of Individuals: Three (230, 231, 232). The principle individual (230) is represented by cranial remains, ribs, pelvis fragments, elements of the upper limbs, fragments of lower limbs, and elements of the hands. Individuals 231 and 232 consist of several intrusive remains including maxillary and mandibular fragments, humerus fragment, clavicles, and two loose teeth.

Sex: (230) Female. This assessment was made based on the absence of a perceivable nuchal crest, supraorbital ridge, the origin and insertion for the masseter and the size of the gonial angle. Also the chin appears rounded, the mastoids small, and the palate relatively short. The sites of muscle attachments on the post-cranial elements appear relatively gracile as well. (231 and 232) Indeterminate.

Age: (230) Adolescent/Adult. This assessment was made based on the presence of all the permanent dentition along with slight to moderate degree of attrition displayed by the posterior dentition. Furthermore, the third molars are open rooted suggesting an individual approximately 18 to 22 years of age. (231) Adult. This assessment is made based on the size of the remains along with the presence of a permanent dentition. (232) Sub-Adult. This assessment was based
on the relatively smaller size of these remains.

Stature: Indeterminate.

Pathology: The left maxillary fragment assigned to individual 231 displays evidence of rampant periodontal infection with subsequent tooth lose. The only tooth structure remaining present in this maxillary is a fragment of molar root which itself displays evidence of severe attrition.

Trauma: There is evidence of only a slight degree of attrition on the first molars.

Anomalies: The lower third molars of this individual appear to be impacted as a result the mandibular dentition appears crowded with several of the anterior teeth twisted and overlapping. This individual also possess an enamel pearl on the mesial surface of the left maxillary second molar. There is also an unusual wear facet on the lingual surface near the base of the left Il. There is also possible evidence of a perforation of the olecranon fossa of the right humerus.

Taphonomy: There is evidence of extensive rodent gnawing on the right fibula.

Burial 24

Coordinates: S2 - W7.

Context: This burial was encountered in a semi-flexed position resting on its back. It was oriented east to west with the skull to the east.
Artifacts: Two mussel shell pendants, a bone awl (possible hairpin), and the left half of a deer antler were recovered in direct association with this burial.

Carbon Date: 1120 +/- 80 B.P., corrected age 1330 +/- 90 B.P. This date was obtained from radiocarbon techniques utilizing the long bones of the lower body.

Inventory of Remains: (rearticulated crania); frontal (4), right parietal (3), left parietal (4), right temporal (3), left temporal (4), occipital (3), sphenoid (1), right zygomatic (3), left zygomatic (5), right maxilla (4), left maxilla (4), mandible (5), right I², right C⁻, right PM¹, right PM², right M¹, right M², right M³, left I¹, left I², left C⁻, left PM¹, left PM², left M¹, left M², left M³, right I¹, right I², right C⁻, right PM¹, right PM², right M¹, right M², right M³, left I¹, left I², left C⁻, left PM¹, left PM², left M¹, left M², left M³, rib fragments (1), vertebral fragments (1), innominate fragments (1), sacral fragments (1), right scapula (1), left scapula (1), right clavicle (4), right humerus (4), left humerus (4), right radius (4), left radius (4), right ulna (4), left ulna (5), right lunate (5), right triangular (5), right scaphoid (5), right trapezoid (5), right trapezium (5), right hamate (3), left hamate (5), right capitate (3), 9 metacarpals (4), 27 phalanges (4), right calcaneus (5), right talus (5),
right navicular (4), right first cuneiform (2), right second cuneiform (5), 4 right metatarsal (5), 4 left metatarsal (2), 4 phalanges (4). (intrusive adult); left zygomatic (5), right maxilla (2), sphenoid (1). (intrusive child); frontal (4), parietal (1), left temporal (3), 1 incisor bud, left radius (4), left ulna (4), left femur (4), left tibia (4).

Minimum Number of Individuals: Three (240, 241, 242).

Sex: (240) Male. This assessment was made based on the relatively pronounced nature of the nuchal crest, supraorbital ridge and sites of attachment of the masseter along with the size of the gonial angle. Also the mastoids are relatively large and robust with the chin appearing square and the palate long. Furthermore, the post-cranial elements assigned to this individual also appear rather robust. (241 and 242) Indeterminate.

Age: (240) Adult (young). This assessment was made based on the eruption and occlusion of all the permanent dentition along with the slight degree of attrition displayed by the posterior teeth (Miles 1963). (241) Adult. This assessment was made based on the relative size of the remains along with the presence and occlusion of the permanent dentition. (242) Sub-Adult. This assessment was made on the relative small size and gracile nature of the remains.
Stature: Indeterminate.

Pathology: Individual 240 displays evidence of infection and abscessing of the anterior portion of the right half of the maxilla (hard palate) from what appears to be traumatic damage to the maxillary right central and lateral incisors. Individual 241 displays evidence of infection of the right maxillary associated with the premolars and suggests the possibility that this intrusive fragment might belong with the maxillary fragment of individual 231.

Trauma: Individual 240 appears to suffered traumatic injury to the maxillary right central and lateral incisors resulting in the antemortem loss of the crown of the central incisor and resulting in a subsequent infection and abscessing of the hard palate. There is evidence of only a slight degree of attrition.

Anomalies: The incisors of 240 display a marked degree of shoveling.

Burial 25

Coordinates: S3 - W7.

Context: This burial was encountered with skull oriented to the south. The skull was all that was removed from this burial the remainder of the elements were left in situ.

Artifacts: None associated.

Inventory of Remains: (rearticulated crania); frontal (4),
right parietal (4), left parietal (4), right temporal (4), left temporal (4), occipital (4), sphenoid (1),
left lacrimal (1), right nasal (3), left nasal (3),
right zygomatic (5), left zygomatic (1), right maxilla (3), left maxilla (3), mandible (4), right I¹, right I², right C⁻, right PM¹, right PM², right M¹, right M², right M³, left I¹, left I², left C⁻, left PM¹, left PM², left M¹, left M², left M³, right I₁, right I₂, right C⁻, right PM₁, right PM₂, right M₁, right M₂, right M₃, left I₁, left I₂, left C⁻, left PM₁, left PM₂, left M₁, left M₂, left M₃.
Minimum Number of Individuals: One (250).

Sex: Female. This assessment was made based on the relative gracile nature of the nuchal crest, supraorbital ridge, the sites of attachment of the masseter, the apparent roundness of the chin, the relative shortness of the palate, and the size of the gonial angle.

Age: Adult. This assessment was made based on the presence and occlusion of the permanent dentition and the moderate to heavy degree of attrition displayed by the posterior teeth (Miles 1963).

Stature: Indeterminate.

Pathology: There is evidence of carious activity associated with the left maxillary first molar. There is also exposure of the roots of several of the maxillary teeth below the gum line on the labial surface. Also
the roots of the first molars appear to suggest the possible presence of hypercementosis.

Trauma: There is evidence of a moderate to heavy degree of attrition.

Anomalies: This individual displays a relatively large gap between the right and left central maxillary incisors (approximately 4mm) along with a marked degree of shoveling of the incisors.

Burial 26

Coordinates: S3 - W7.

Context: this burial was excavated but left in situ.

Artifacts: None associated.

Inventory of Remains: This burial was left in situ.

Minimum Number of Individuals: Based upon field observations this burial appears to consist of a single individual (260).

Sex: Indeterminate.

Age: Adult. Based on field observations of the relative size of the remains this individual is felt to be an adult (Wesolowsky 1982).

Stature: Indeterminate.

Pathology: There were no pathological conditions recorded during field observations (Wesolowsky, 1982).

Trauma: There were no traumatic injuries recorded during field observations (Wesolowsky 1982).

Anomalies: There were no anomalies recorded during field
observations (Wesolosky 1982).

Burial 27

Coordinates: S2 - W7.

Context: This burial was encountered in a southeast to northwest orientation with the skull to the southeast. However, following excavation the burial was back filled and the remains left in situ.

Artifacts: None associated.

Inventory of Remains: This burial was left in situ.

Minimum Number of Individuals: Based on field observations (Wesolosky 1982) it is felt that a single individual (270) is represented in this burial.

Sex: Indeterminate.

Age: Neonate. Based on field observation this individual was recorded in the field notes as a neonate (Wesolosky 1982).

Stature: Indeterminate.

Pathology: No pathological conditions were recorded during field observations (Wesolosky 1982).

Trauma: No traumatic injuries were recorded during field observations (Wesolosky 1982).

Anomalies: No anomalies were recorded during field observations (Wesolosky 1982).

Burial 28

Coordinates: S2 - W8.
Context: Following excavation of this burial the remains were left in situ and the unit was back filled.

Artifacts: None associated.

Inventory of Remains: This burial was left in situ.

Minimum Number of Individuals: Based on field observations a single individual is felt to be represented in this burial.

Sex: Indeterminate.

Age: Early Childhood. This assessment was based on the relatively small size of these remains as seen during field observations (Wesolosky 1982).

Stature: Indeterminate.

Pathology: There were no pathological conditions reported during field observations (Wesolosky 1982).

Trauma: There were no traumatic injuries reported during field observations (Wesolosky 1982).

Anomalies: There were no anomalies reported during field observations (Wesolosky 1982).

Burial 29

Coordinates: S8 - W1.

Context: This burial was encountered resting on its right side oriented north to south with the skull to the south. With the exception of the right half of the skull and a few phalanges the rest of the elements in this burial were destroyed by earth moving equipment.

Artifacts: None associated.
Inventory of Remains: The right half of an articulated
skull, right I₁, right I₂, right C⁻, right PM¹, right
PM², right M¹, right M², right M³, left I₁, left I₂,
left C⁻, left PM¹, left PM², left M¹, left M², left
M³, right I₁, right I₂, right C⁻, right PM₁, right
PM₂, right M₂, right M₃, left I₁, left I₂, left C⁻,
left PM₁, left PM₂, left M₁, left M₂, left M₃, several
phalanges (2).

Minimum Number of Individuals: One (290).

Sex: Male. This assessment was made based on the square
appearance of the chin, the relatively long palate,
the relatively large size of the teeth, and the size
of the gonial angle.

Age: Old Adult. This assessment was made based on the
eruption and occlusion of the permanent dentition
along with the extremely heavy degree of attrition
displayed by the posterior teeth (Miles 1963).

Stature: Indeterminate.

Pathology: There is evidence of a severe periodontal
infection of the right portion of the mandible. The
resorption of the bone from this infection has
resulted in the exposure of the buccal roots of the
mandibular second premolar, the first molar, and the
second molar. There is also evidence of possible
hypercementosis associated with the right M¹.

Summary: There is evidence of heavy attrition resulting in the
anterior dentition taking on a peg shaped appearance.

Anomalies: The incisors display a marked degree of shoveling.

Burial 30

Coordinates: Not reported in field notes.

Context: Not reported in field notes.

Artifacts: None associated.

Inventory of Remains: frontal (1), right parietal (4), left parietal (4), right temporal (4), left temporal 4), occipital (5), sphenoid (1), right ethmoid (1), left ethmoid (1), right lacrimal (1), left lacrimal (1), right nasal (5), left nasal (5), right zygomatic (5), left zygomatic (1), right maxilla (4), left maxilla (4), mandible (4), right I2, right C−, right PM1, right PM2, right M1, right M2, right M3, left PM2, left M1, left M2, left M3, right M2, right M3, left I1, left I2, left C −, left PM1, left PM2, left M1, left M2, left M3, rib fragments (1), thoracic fragments (1), right scapula (1), left humerus (2).

Minimum Number of Individuals: One (300).

Sex: Female. This assessment was made based on the moderate to small size of the nuchal crest and sites of attachment for the masseter, along with a relatively small mastoids. Furthermore, the gonial angle is indicative of a female. Also the post-cranial remains appear rather gracile on inspection.

Age: Adult. This assessment was made based on the eruption
and occlusion of the permanent dentition along with the moderate to heavy degree of attrition displayed by the posterior teeth (Miles 1963).

Stature: Indeterminate.
Pathology: None discernable.
Trauma: There is evidence of moderate attrition limited primarily to the occlusal surfaces of the teeth.
Anomalies: None discernable.

Bone Mass 1

Coordinates: S8 - W3.
Context: These remains were recovered in a disarticulated condition laying above burial 2.
Artifacts: None associated.

Inventory of Remains: UID crania fragments (1), right I^1, right C^−, fibula fragments (1), pisiform (1), left scaphoid (4), right third metacarpal (4), right fifth metacarpal (4), 5 UID phalanges (1), left first metatarsal (4), left first middle phalange of foot (5), left first distal phalange of foot (5).

Minimum Number of Individuals: One (410).
Sex: Indeterminate.
Age: Adult. This assessment was made based solely on the size of the remains which suggest a mature individual.
Stature: Indeterminate.
Pathology: None discernable.
Trauma: None discernable.
Anomalies: The incisors display a marked degree of shoveling.

Bone Mass 2

Coordinates: S8 - W3.

Context: This assemblage was encountered in a disarticulated condition lying above burial 2.

Artifacts: None associated.

Inventory of Remains: UID cranial fragments (1), left temporal (1), right M₂, right M₃, right radius (2), right femur (3), right tibia (4), left tibia (2), right fibula (2), 4 UID metacarpal fragments (1), 6 phalange fragments (2), (intrusive juvenile remains); left femur (4), left tibia shaft (4).

Minimum Number of Individuals: Two (420 and 421).

Sex: (420) Female. This assessment was made based on the relative gracile nature of the remains and the mid-shaft circumference of the femur (Black 1978a).

(421) Indeterminate.

Age: (420) Adult (young). This assessment was made based on the presence of the permanent dentition with the exception of the third molars which themselves have just begun to erupt. (421) Sub-Adult. This assessment was made based on the relative small size of the remains.

Stature: Indeterminate.

Pathology: None discernable.

Trauma: None discernable.
Anomalies: None discernable.

Bone Mass 3

Coordinates: S8 - W3.

Context: This assemblage was encountered in a disarticulated condition lying above burial 2.

Artifacts: None associated.

Inventory of Remains: UID skeletal fragments (1), right C⁻, right PM¹, right PM², right M¹, right M², left PM².

Minimum Number of Individuals: A single individual (430) is represented in this assemblage.

Sex: Indeterminate.

Age: Adult. This assessment was made based on the general size of the fragments, the presence of permanent dental elements, and the degree of attrition displayed by the posterior teeth.

Stature: Indeterminate.

Pathology: None discernable.

Trauma: None discernable.

Anomalies: None discernable.

Bone Mass 4

Coordinates: S8 - W3.

Context: This assemblage was encountered in a disarticulated condition lying over burial 2.

Artifacts: None associated.
Inventory of Remains: frontal (3), right parietal (3), left parietal (2), right M\textsubscript{1}, right M\textsubscript{2}, right M\textsubscript{3}, right I\textsubscript{2}, right PM\textsubscript{2}, right M\textsubscript{1}, right humerus (2), right radius (3), left femur (3). (intrusive remains); frontal (3), left temporal (4).

Minimum Number of Individuals: Two (440 and 441).

Sex: (440) Female. This assessment was made based on the relatively small nature of the supraorbital ridge and mastoid process along with the general gracile nature of the post-cranial elements in general despite the mid-shaft circumference of the femur. (441) Indeterminate.

Age: (440) Adolescent. This assessment was made based on the fact that the third molar is present but unerupted and all of the rest of the permanent dentition are erupted and occluding. (441) Sub-Adult. Due to the limited nature of the remains it is not possible to assign these remains to a specific age category but due to their relatively small size they are not felt to belong to a mature individual.

Stature: Indeterminate.

Pathology: There is evidence of additional cancellus bone growth on the posterior aspect of the left femur of individual 440.

Trauma: None discernable.

Anomalies: None discernable.
Bone Mass 5

Coordinates: S8 - W3.

Context: This assemblage was encountered in a disarticulated condition lying above burial 2.

Artifacts: None associated.

Inventory of Remains: cranial fragments (1), right $I^1$, right $I^2$, right $C^-$, right $PM^1$, right $PM^2$, right $M^1$, right $M^2$, right $M^3$, left $I^1$, left $I^2$, left $C^-$, left $PM^1$, left $PM^2$, left $M^1$, left $M^2$, left $M^3$, right $I_1$, right $I_2$, right $C_-$, right $PM_1$, right $PM_2$, right $M_1$, right $M_2$, right $M_3$, left $I_1$, left $I_2$, left $C_-$, left $PM_1$, left $PM_2$, left $M_1$, left $M_2$, left $M_3$, rib fragments (1), right radius (2), left radius (2), right ulna (3), left femur (4), (intrusive remains); UID long bone shaft (possible juvenile).

Minimum Number of Individuals: One (450).

Sex: Male. This assessment was made based on the large and relatively robust sites of muscle attachment along with the mid-shaft circumference of the femur (Black 1978a).

Age: Adolescent/Adult. This assessment was made based on the presence of the permanent with the exception of the third molars which are present but unerupted.

Stature: 169.66 +/- 6.38 cm. This stature estimate was obtained by using a reconstructed length for the femur of 45.7 +/- 1.31 cm (Steele 1970) in the formula
developed by Genoves (1967).

Pathology: The right ulna displays evidence of possible arthritic lipping on the surface of the semilunar notch near the coronoid process.

Trauma: None discernable.

Anomalies: None discernable.

Bone Mass 6

Coordinates: Not recorded in the field notes.

Context: This assemblage was encountered in a disarticulated condition. This assemblage was recovered still embedded in the matrix since it was too fragile to be removed.

Artifacts: None associated.

Inventory of Remains: This assemblage consists of fragments of both a right and left adult foot.

Minimum Number of Individuals: One (460).

Sex: Indeterminate.

Age: Adult. This assessment was made based on the relatively large size of the remains.

Stature: Indeterminate.

Pathology: None discernable.

Trauma: None discernable.

Anomalies: None discernable.
APPENDIX B

DESCRIPTION OF MEASUREMENTS

The following appendix provides a description of the measurements taken and the instruments used.

CRANIAL MEASUREMENTS (from Rogers 1984)

Maximum Length - Distance from glabella to opisthocranion. Measured by use of spreading calipers.

Maximum Breadth - Maximum distance perpendicular to the median sagittal plane and above the supramastoid crest. Measured by use of spreading calipers.

Auricular Height - The length of a perpendicular erected from a line between the poria to the bregma. Measured by use of spreading calipers.

Horizontal Circumference - The circumference measured above the brow ridges and on the most prominent point of the occiput. Measured by use of a tape.

Parietal Chord - Distance from the bregma to the lambda. Measured by use of sliding calipers.

Parietal Arc - Surface distance from the bregma to the lambda. Measured by use of a tape.

Frontal Chord - Minimum distance from the nasion to the bregma. Measured by use of sliding calipers.

Frontal Arc - Minimum distance on the surface of the skull between the nasion and bregma. Measured by use of a tape.
Occipital Chord - Minimum distance between lambda and opisthion. Measured by use of sliding calipers.

Occipital Arc - Surface distance from bregma to opisthion. Measured by use of a tape.

Parietal thickness - The thickness of the parietal taken in the vicinity of the euryon, one centimeter above and along the squamous suture. Measured by use of spreading calipers.

Simotic Chord - Minimum breadth of the nasal bones taken along the maxillonasal suture. Measured by use of sliding calipers.


Mastoid Length - Maximum distance from the superior margin of the external auditory meatus to the bottom of the mastoid process. Measured by use of sliding calipers.

MANDIBULAR MEASUREMENTS (from Rogers 1984)

Length of Body - Distance between the most anterior point on the front margin of the chin and a plane defined by the posterior margins of the two rami. Measured by use of a mandibulometer.

Height of Ramus - Distance from the gonion to the highest point on the condyle. Measured by use of a mandibulometer.
Height of the Mandible Symphysis - Distance from the gnathion to the infradentale. Measured by use of sliding calipers.

Minimum Breadth of Ramus - Least distance between the anterior and posterior borders of the ramus. Measured by use of sliding calipers.

Gonial angle - Angle made by the junction of the body of the mandible and the ascending ramus. Measured by use of a mandibulometer.

Biganial Breadth - Distance between the most lateral points of the two gonia. Measured by use of sliding calipers.

MEASUREMENTS OF THE HUMERUS AND ULNA (from Montague, 1960)

Maximum Diameter of the Head - Measured by use of sliding calipers.

Anterior-Posterior Mid-shaft Diameter - Measured at middle of shaft by use of sliding calipers.

Medial-lateral Mid-shaft Diameter - Measured at middle of shaft by use of sliding calipers.

Maximum Medial-lateral Distal Diameter - Measured at the epiphyseal end immediately above its associated processes by use of sliding calipers.

Minimum Circumference - Measured at thinnest point near mid-shaft by use of a tape.

Mid-shaft Circumference - Measured at the point of maximum circumference at the mid-shaft by use of a tape.
MEASUREMENTS OF THE FEMUR AND TIBIA (from Montague 1960, Black 1978a)

Subtrochanteric Anterior-posterior Diameter - Measured just below the lesser trochanter by use of sliding calipers.
Subtrochanteric Medial-lateral Diameter - Measured same as above.
Anterior-posterior Diameter of the Mid-shaft - Measured by use of sliding calipers.
Medial-lateral Diameter of the Mid-shaft - Same as above
Mid-shaft Circumference - Measured at maximum circumference of mid-shaft by use of a tape.
Anterior-posterior Nutrient Foramen Diameter - Diameter of shaft at nutrient foramen measured by use of sliding calipers.
Medial-lateral Nutrient Foramen Diameter - Same as above.

MEASUREMENTS OF THE CALCANEUS AND TALUS (from Steele 1976)

Maximum Length - Measured by use of sliding calipers.
Minimum Width - Measured by use of sliding calipers.
Body Height - Measured by use of sliding calipers.
APPENDIX C

DESCRIPTION OF QUALITATIVE OBSERVATIONS

The following appendix provides descriptions of all qualitative observations made and how they were scored.

CRANIAL ELEMENTS

Temporal Ridge - Assessed as to its degree of prominence; absent, slight, moderate, pronounced.

Nuchal Crests - same as above.

Masseter Origin and Insertion - Same as above

Zygomatic Arches - Assessed as to their robusticity; slight, moderate, or pronounced.

Superior Margins of the Orbits - Assessed as to the shape of the margin; sharp or round.

Palate - Assessed as to relative shape; long or short.

Teeth - Assessed as to relative size; small, medium, large.

Chin - Assessed as to shape; single or bilobed, and robusticity; slight, moderate, or pronounced.

Frontal Sinuses - Assessed as to relative size; small medium or large.

Supraorbital Ridges - Assessed as to degree of prominence; absent, slight, moderate, or pronounced.

Suprameatal Crests - Assessed as to degree of prominence; absent, slight, moderate, or pronounced.
Mastoid - Assessed as to its relative size and robusticity; small, medium, or large.

Degree of Suture Fusion - Assessed as to the extent of suture obliteration; non-fused, partial fusion, complete fusion.

POST CRANIAL

Robusticity of the Sites of Muscle Attachment - Assessed as to their degree of prominence; absent, slight, moderate, or pronounced.
APPENDIX D

CALCULATED VALUES FOR STATISTICAL COMPARISON

This appendix provides the calculated values for ChiSquare, T, and D, which were utilized for the statistical analysis of data for significance. An asterisk (*) is used to denote a significant difference between observed and expected values. All test utilized a .05 level of confidence.

Number of Males to the Number of Females: Compared by use of Chi-Square analysis. $D.F. = 21, \chi^2 = 0.18$.

Number of Males to Females Per Age Category: Compared by use of Kolmogorov - Smirnov Goodness of Fit. $N = 9, D = 0.3889$.

Statistical comparison for significance between the means for both inter sample and intra sample (between sexes) were made by use of a two tailed T-test. Inter sample comparisons were limited to the mean values of the male measurements due to the lack of comparative female data. Furthermore, whenever possible the measurement of the left element was utilized.

Comparison of Mean Stature Between Shell Point and Oso Creek: $d.f. = 5, T = 1.32$

Comparison of Mean Stature Between Blue Bayou and Shell Point: $d.f. = 5, T^* = 3.47$

Comparison of Mean Minimum Breadth of Ascending Ramus with Palm Harbor: $d.f. = 2, T^* = 5.00$

Comparison of Mean Gonial Angle with Palm Harbor: $d.f.=$
3, T = 1.55

Comparison of Mean Height of Ascending Ramus with Palm Harbor: d.f. = 2, T = .62

Comparison of Mean Mandibular Length with Palm Harbor: d.f. = 2, T = .462

Comparison of Mean Mastoid Length with Palm Harbor: d.f. = 4, T = .230

Comparison of Mean Mastoid Length with San Juan Capastrano: d.f. = 4, T = 2.04

Comparison of Mean Parietal Thickness with Palm Harbor: d.f. = 3, T* = 1.71

Comparison of Mean Parietal Thickness with San Juan Capastrano: d.f. = 2, T = 3.06

Comparison of Mean Maximum Cranium Length with Palm Harbor: d.f. = 3, T = 2.86

Comparison of Mean Maximum Cranial Breadth with Palm Harbor: d.f. = 3, T = 1.73

Comparison of Mean Horizontal Circumference with Palm Harbor: d.f. = 3, T* = 6.17

Comparison of Minimum frontal Breadth with Palm Harbor: d.f. = 2, T* = 9.27

Comparison Mid-shaft Circumference of the femur with Palm Harbor: d.f. = 9, T = 1.33

Comparison of Mean Humerus Length:

Blue Bayou/Central Texas: d.f. = 21, T = .776

Blue Bayou/Caddo: d.f. = 10, T = 1.42
Blue Bayou/Coastal: d.f. = 9, T = .738
Blue Bayou/Trans-Pecos: d.f. = 4, T = 1.13
Coastal/Trans-Pecos: d.f. = 11, T* = 2.35

Comparison of Mean Femur Length:

Blue Bayou/Central Texas: d.f. = 20, T* = 3.48
Blue Bayou/Caddo: d.f. = 17, T = 1.22
Blue Bayou/Coastal: d.f. = 12, T* = 2.61
Blue Bayou/Trans-Pecos: d.f. = 6, T = 0.0

Comparison of Mean Tibia Length:

Blue Bayou/Central Texas: d.f. = 14, T = .392
Blue Bayou/Caddo: d.f. = 11, T = .137
Blue Bayou/Coastal: d.f. = 9, T = .697
Blue Bayou/Trans-Pecos: d.f. = 5, T = 1.132

BETWEEN SEX COMPARISONS FOR BLUE BAYOU -

Cranium and Mandible -

Frontal Chord: d.f. = 2, T = .364
Frontal Arc: d.f. = 2, T = 1.19
Mastoid Length: d.f. = 4, T = 2.00
Length of Mandibular Body: d.f. = 3, T = 2.52
Minimum Breadth of Ramus: d.f. = 2, T* = 4.65
Gonial Angle: d.f. = 3, T = 2.75

Humerus -

Maximum Length: d.f. = 2, T = 2.46
Minimum Circumference: d.f. = 4, T = 1.05

Femur -

Anterior-Posterior Mid-shaft Diameter: d.f. = 6, T =
1.79

Mid-shaft Circumference: d.f. = 7, T* = 2.67

Tibia -

Anterior-Posterior Mid-shaft Diameter: d.f. = 3, T = 2.93

Medial-Lateral Mid-shaft Diameter: d.f. = 3, T = .122

Anterior-Posterior Nutrient Foramen Diameter:
   d.f. =3, T = 1.07

Medial-Lateral Nutrient Foramen Diameter: d.f. = 2,
   T* = 5.64
APPENDIX E

DESCRIPTION OF DISCRETE CRANIAL TRAITS

The following appendix provides a description of the discrete cranial traits utilized in the analysis of biological affinity (Finnegan and Marcsik 1979). All traits were scored either as present or absent.

Highest Nuchal Line - The highest line of attachment of the nuchal muscles on the occipital of the skull.

Coronal Ossicles - Single or multiple ossicles found in the coronal suture.

Sagittal Ossicles - Single or multiple ossicles found in the sagittal suture.

Lambdoid Ossicles - Single or multiple ossicles found in the lambdoid suture.

Os Inca - (interparietal bone) The portion of the parietal which ossifies in membrane may persist as a separate bone.

Supra-Orbital Notch - The supra-orbital foramen is either complete or open (notch).

Frontal Notch - A secondary foramen which may be present lateral to the supra-orbital foramen.

Accessory Infra-orbital Foramen - One or more accessory foramina may be present immediately adjacent to the infra-orbital foramen.

Auditory Torus - A bony ridge may occur on the anterior or posterior wall of the opening of the external auditory meatus.

Asterionic Bone - A separate bone may be present at the junction of the lambdoid, occipito-mastoid and parieto-mastoid sutures.
Metopic Suture - The medio-frontal suture may fail to close well after the first two years of life.

Parietal Foramen - A foramen may sometimes be present near the sagittal suture of the parietal.

Digastric Groove - The digastric groove may at times appear bipartite.
VITA

Anthony Gean Comuzzie was born November 21, 1958 in Corpus Christi, Texas, to Dallas and Bonnie Comuzzie. He attended public school in Corpus Christi where he graduated from Tuloso-Midway High School in 1977. The fall of that same year he began studies at Del Mar College in Corpus Christi majoring in Biology. He transferred to Texas A&M University at the start of his sophomore year where he continued to major in biology and finally earned his Bachelor of Science degree in the fall of 1981. He then began graduate studies in Physical Anthropology in the spring of 1982 in the department of Anthropology at Texas A&M University. During his graduate career he was employed as both a laboratory and lecture instructor by the departments of Anthropology and Biology. He was married to Diana Crowell in May, 1984. His permanent address is 5829 Hampshire, Corpus Christi, Texas.