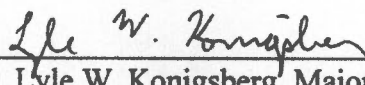
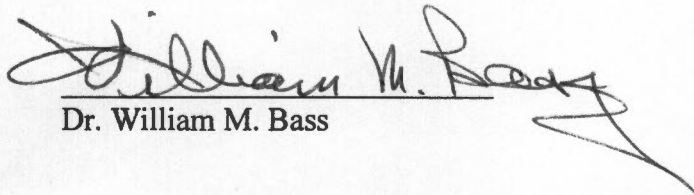


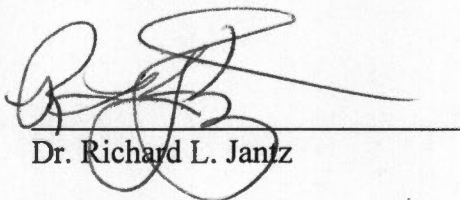
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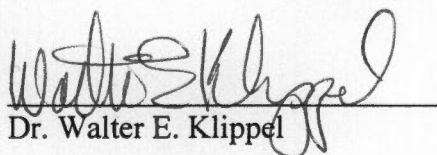
I am submitting herewith a thesis written by Bradley J. Adams entitled "The Use of the Lincoln/Petersen Index for Quantification and Interpretation of Commingled Human Remains". I have examined the final copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Arts, with a major in Anthropology.


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Associate Vice Chancellor and
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**THE USE OF THE LINCOLN/PETERSEN INDEX FOR QUANTIFICATION
AND INTERPRETATION OF COMMINGLED HUMAN REMAINS**

A Thesis
Presented for the
Master of Arts Degree
The University of Tennessee, Knoxville

Bradley J. Adams
August 1996

ACKNOWLEDGMENTS

First and foremost, sincere thanks needs to go to Nick Herrmann for spending an ungodly amount of time assisting me with computer problems and answering an endless barrage of stupid questions. If it was not for his help, this thesis would probably never have seen its completion.

Thanks also deserves to be given to all of my pals who tolerated mood swings and provided encouragement. Two weasels (Derek Benedix and Dalford Owens) were extremely helpful by assisting me with the Larson Cemetery samples in exchange for idle promises of beer.

I would also like to thank my major professor, Lyle Konigsberg, for suggesting this research as a possible thesis topic and for providing computer programs which made it all possible. Also, I am appreciative to the other members of my committee, William Bass, Richard Jantz, and Walter Klippel, for their suggestions and assistance throughout this ordeal.

Larson cemetery was excavated under grants from the National Science Foundation (GS837 and GS1635) and a grant from the National Geographic Society (699,912), all to Dr. William M. Bass.

ABSTRACT

This thesis concerns the use of the Lincoln/Petersen Index (LI) for quantification studies of commingled human remains. A wide variety of quantification techniques are available to the faunal analyst, but physical anthropologists tend to focus entirely on the Minimum Number of Individuals (MNI) as the only alternative for dealing with commingled human remains. As will be discussed, the LI has been effectively used in the zooarchaeological research and literature for determining the *original* number of individuals represented by the osteological assemblage, as opposed to many other quantification techniques which only estimate the *recovered* assemblage. Prior to the completion of this thesis, no published study of commingled human remains was discovered which utilized the LI, but the results included here have proved it to be an ideal quantification technique for dealing with commingled/ossuary situations that are encountered during archaeological excavations and possibly forensic investigations. The LI calculated for human skeletal remains, while subject to some biases, is not affected by many of the criticisms that are applicable to faunal remains.

Two skeletal collections from the Larson site (39WW2), which are currently curated at the University of Tennessee, Knoxville, were utilized as part of a test for the reliability of the LI. Larson Village is an Arikara site which consists of individuals who were massacred somewhere around the year A.D. 1700. Due to natural taphonomic occurrences, their remains became commingled and provided an ideal opportunity to implement the LI. Larson Cemetery is associated with the village and consists of 621 primary interments. This sample

was used to create a “blind” test of pair-matching abilities to gauge the feasibility of the technique. As a final test of the potential of the LI, computer simulated data sets were created with varying percentages of recovery rates and original numbers of individuals to observe the behavior of the LI compared to the MNI.

Results from the hypothetical tests revealed that the LI is an effective estimator of the *original* population when greater than 20% of the complete assemblage is present and data loss is a random occurrence. This is quite different from the MNI which is shown to be totally dependent on the recovery rate. Two methods are proposed which can be used to accurately approximate the recovery rate and demonstrate the effects of taphonomic forces on quantification estimates. Furthermore, results from the Larson site skeletal samples show that with good preservation, pair-matching can be accurately performed and the quantification estimates will be reliable.

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CHAPTER 1: TAPHONOMY

General Introduction to Taphonomy

Taphonomy is defined as the “science of the laws of embedding or burial” (Lyman 1994:1). The field of taphonomic study involves *any* organism and its geological context, but only vertebrate animal remains will be the focus of this section. It is often assumed that taphonomic forces begin with the death of an animal and cease after recovery, but bone assemblages can undergo significant changes after data collection. These post-excavation biasing factors are referred to as *curational taphonomic forces*.

An accurate understanding and recognition of the potential taphonomic changes that can occur to skeletal remains prior to recovery is essential for a meaningful interpretation of the assemblage, especially for quantification studies. It would be an extremely rare occurrence for 100% of the elements deposited at a site to be recovered during excavation. Whether data loss occurs from chemical breakdown of the bone, transport away from the site, or recovery bias, data loss is nearly impossible to avoid. The study of taphonomy is based on the belief that forces acting on bones today are essentially the same as forces which altered archaeologically recovered bone. This assumption is referred to as the *uniformitarian principle* and is used in contemporary research to gain a better understanding of preservational forces and site assemblage formation (Klein and Cruz-Uribe 1984; Lyman 1994).

For example, the simple fact that unpaired and fragmentary bones may be present in any commingled assemblage requires an understanding of the taphonomic forces responsible

for creating this situation, as will be specifically discussed in regards to the skeletal material of Larson Village (39WW2). Failure to acknowledge these taphonomic forces can result in quite erroneous interpretations.

Taphonomic Processes

Lyman (1987, 1994) outlines four general taphonomic effects which occur after death: *disarticulation*, *scattering/dispersal*, *fossilization*, and *mechanical alteration*. Also, a viable factor which is worthy of consideration is the effect of *curational biases* which can occur after field recovery. At each of these stages there is the potential for data loss.

Disarticulation involves the removal of soft tissue from the skeletal elements and could result from human butchery, animal scavenging, or natural putrefaction processes. *Scattering /dispersal* occurs simultaneously with *disarticulation*, but is expressed in varying degrees depending on the distance between previously articulated elements. This could be observed as only a few millimeters or hundreds of miles. *Dispersal* may result from human transport, animal transport, fluvial transport, or combinations of these agents. Badgley (1986) refers to two types of accumulating processes, *active* and *passive*. Active transport involves the movement of complete or disarticulated carcasses significant distances from the site of death. Passive transport does not involve significant disassociation and is often characteristic of normal attritional mortality and deposition near the death location. Either of these processes could be due to human involvement or natural occurrences, the key factor is the degree of relocation.

Fossilization (also referred to as diagenesis) is dependent on the type of soil matrix

and its pedogenic processes, temperature, ground water saturation, and the subsequent alteration of bone chemistry which occurs after deposition. Gordon and Buikstra (1981), for example, have shown how the pH level of the soil is directly related to the state of preservation encountered at mortuary sites. The fossilization process, which includes weathering, can lead to fragmentation.

Mechanical alteration results in fragmentation and/or abrasion due to mechanical or physical processes (i.e. fluvial transport, compression, etc.). Fragmentation occurs by the loading of force on a bone and its failure to withstand the pressure, while abrasion is the result of frictional forces on the bone surface. *Mechanical alteration* can occur at any time between death (possibly associated with death) and recovery/curation. It is very plausible that deeper buried bones will be more fragmentary than more superficial ones due to the increased compression of the overlying sediment. Bone porosity and density are important factors for preservation during both *fossilization* and *mechanical alteration*. Brain (1976), Waldron (1987), and Lyman (1993, 1994) have shown that the larger and denser elements have a better chance of survival than the delicate specimens.

Finally, data loss can occur during the *recovery*, *curation*, and *analysis* of a bone assemblage. Sample bias can occur as a result of recovery strategies which exclude the collection of some elements. For example, water screening through a fine mesh will provide higher counts than a visual recovery. Also, it is often impossible to excavate an entire site, so the sampling strategy will automatically disregard a portion of the complete assemblage. After recovery further bias and data loss may occur due to fragmentation, inability to identify small fragments, and data management problems. Bias can also result during analysis if only

a portion of the cataloged assemblage is used for drawing conclusions. In essence, results are being drawn from a fraction of an already sampled, and therefore incomplete assemblage.

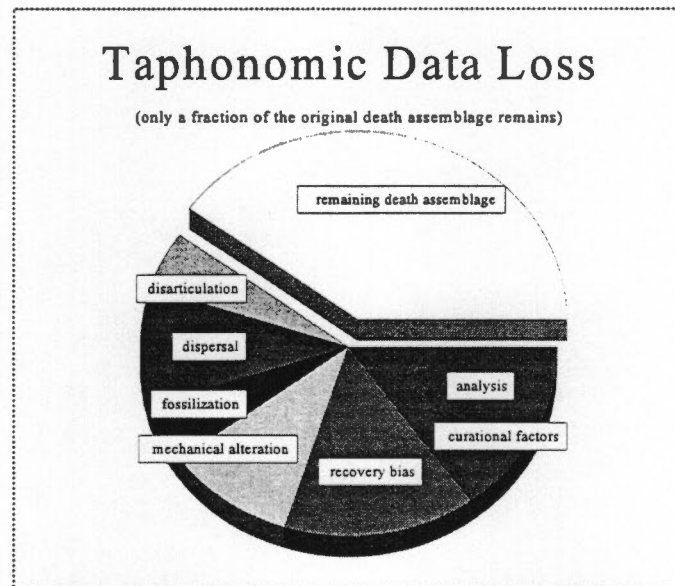


Figure 1: Chart of the Factors Which Contribute to Data Loss From a Complete Bone Assemblage

In general, taphonomic history starts with the biotic community and ends with the published record. At each stage after death, the recoverable remains often become fewer and fewer, in turn hindering the eventual analysis and possibly providing misleading results. Figure 1 provides a completely hypothetical illustration of the factors which potentially remove data from the once complete assemblage and leave only a fraction of the specimens at the time of recovery.

The disposal areas often encountered with human remains are not random locations. Accumulation will occur in bounded cemeteries, ossuary pits, mounds, or within habitation areas. As a result, it is relatively easy to attain good recovery of the existing assemblage which will facilitate an accurate analysis. Faunal remains, while commonly discovered in

distinct features, will not be as predictable during recovery as human remains and could present more serious analytical problems.

The Observed Taphonomic Effects on the Larson Village (39WW2) Sample

Many of the previously discussed taphonomic factors are apparent with the Larson Village skeletal remains. Each taphonomic process is discussed concerning this assemblage and Table 1 summarizes the observations.

Table 1: General Taphonomic History and the Larson Village Correlates

TAPHONOMIC HISTORY	LARSON VILLAGE CORRELATES
BIOTIC COMMUNITY / LIFE ASSEMBLAGE Living group	Inhabitants of Larson Village
FOSSIL RECORD / DEATH ASSEMBLAGE Mortality factors Preburial factors Burial factors Postburial factors	Massacre Disarticulation, carnivore scavenging, fire Lodge roof collapse, natural sediment accumulation Fragmentation
PUBLISHED RECORD Sampling/recovery Curation Publication	Lodge excavations Sorting, identifying, cataloging, quantifying Results of analyses

Table based on Lyman (1987)

Disarticulation at Larson Village

At Larson Village, *disarticulation* of the human remains was primarily a result of carnivore scavenging. This was demonstrated by numerous examples of tooth puncture marks on the bones. A second agent responsible for *disarticulation* was the human factor.

Many elements show evidence of cut marks, suggesting that parts of the victim's bodies were removed as trophies.

Scalping and dismemberment of victims during warfare is not an uncommon event on the Great Plains, as is evident by the literature documenting this type of trauma from the ethnographic and osteological record (Catlin 1989; Denig 1961; Grinnell 1910; Hollimon and Owsley 1994; Olsen and Shipman 1994; Owsley et al. 1977; Owsley 1994; Willey 1982). Scalping may be the most widely recognized type of mutilation associated with Native American warfare, but hands, feet, heads, noses, and limbs were also removed from the recently deceased as trophies. Sometimes the violence and dismemberment was quite extensive, as is exemplified by the Crow Creek massacre where 1/4 of the victims were decapitated (Willey 1982). At Larson Village there is evidence that heads, hands, and possibly feet were removed from several individuals. These disarticulated parts would most likely have been transported away from the massacre site as a record of the event, hence biasing the assemblage and providing a viable rationale for excluding these elements from any type of quantification study aimed at reconstructing the original killed population.

Scattering/Dispersal at Larson Village

The *dispersal* and eventual commingling of the elements seems to be the result of multiple individuals being killed or placed within a small area (inside a lodge), compounded with the apparent scavenging that occurred soon afterward. A study by Hudson (1993) showed that limb bones tend to dominate animal scavenged assemblages. This is an important pattern to acknowledge, especially for quantification techniques such as the LI

which rely on paired elements. Similarly, Marean and Spencer (1991) showed through an actualistic study of carnivore ravaging that the ends of limb bones are often destroyed while the shafts are preserved. When carnivore activity is apparent, they stress the need to include long bone shafts into quantification procedures and not to rely solely on the more easily identifiable epiphyses.

Evidence of burning is present at the site which could have added to the fragmentation and subsequent dispersal of the elements. Bowers (1963, report # 4) states that the lodges were standing for perhaps one or two years prior to burning. If this assessment is correct, it implies that animals had a lengthy amount of time to scavenge the human remains prior to the destruction of the lodges by fire. All of the elements examined for this study exhibited either no thermal alteration or slight scorching (dark brown/blackened color with no warpage). This is consistent with minimal burning at low temperatures (Buikstra and Swegle 1989) and suggests that thermal alteration was not a significant biasing factor to this study. A possible explanation for the observed thermal alteration is that it occurred after burial (collapse of the lodge roofs). Picha et al. (1991) have shown that prairie fires which pass over archaeological sites can cause minimal burning to the buried material.

Fossilization and Mechanical Alteration at Larson Village

Fossilization and mechanical alteration of the bones from Larson Village did not have a profound effect on any of the studied elements. The overwhelming majority of the bones are in an excellent state of preservation and exhibit minimal fragmentation,

weathering, or abrasion. If small fragments were not collected during excavation, this could be an artifact of the recovery methodology (see Casteel 1972; and Payne 1975 for a discussion), but this seems unlikely due to the relative completeness of the majority of the elements.

During data collection for this project the six stage degree of weathering was scored as outlined by Behrensmeyer (1978). With the exception of several burials that were recovered from a beach survey (and for this reason were not included with the study), all of the elements from the village sample show little to no evidence of extensive weathering or disintegration.

Curational Taphonomy

Larson Village provides an excellent example of the problems which can arise during and after excavation. With this sample a significant amount of commingling occurred during the recovery and subsequent curational stage of data management. While the exact sampling methodology was not investigated, notes accompanying the specimen catalog for Dr. Bowers' collections from Larson Village (Blakeslee 1965) explain that bags were unlabeled, mislabelled, had been exposed to moisture, or had broken open upon delivery from the field, causing confusion and loss of provenience. An example of the poor data management techniques at Larson Village is made very apparent through a quote concerning the field provenience information as it reached the laboratory: "Other bag labels were illegible, incomplete, inconsistent, contradictory, and nonsensical. Some of them appeared to have been scratched onto the bags with a sharp instrument" (Blakeslee 1965).

The confusion which occurred with the Larson Village material is a good example for the importance of detailed field notes, excavation records, maps, and photographs. In 1965 the museum aid in charge of cataloging Larson Village wrote, "Information from Dr. Bowers' field notes, feature sheets, and site maps would have been of assistance in determining in what order the material should have been arranged, but as of today's date (5/24/65) we have received none of these in spite of repeated requests" (Blakeslee 1965). A similar sentiment is true today in that, with the exception of burial forms for six individuals from Lodge 1, the field notes still could not be located at the time of this thesis.

CHAPTER 2: QUANTIFICATION TECHNIQUES

Throughout the rest of this thesis several terms will be used that may need clarification. *Element* refers to a complete bone, while *specimen* can refer to complete or fragmentary bones. *Conjoining* is used to signify that fragments of the same element were found to make a perfect match. *Pair-matching* involves the association of right and left specimens from a single individual.

General Introduction to Quantification

In this section, several quantification techniques will be discussed, but some are strictly of utility for the interpretation of zooarchaeological remains and will be only briefly mentioned. The primary focus will be a detailed examination of the LI, as well as a review of the MNI and the NISP due to the popularity of these techniques. Of particular interest for human remains is the comparison between the LI and the MNI since the overwhelming majority of studies rely solely on the MNI estimates.

Two methodological perspectives are focused upon in the literature concerning the quantification of faunal remains: 1) the paleozoological, and 2) the zooarchaeological (Ringrose 1993). These two points of view are not mutually exclusive in that they share quantification techniques, but the goals of their analyses are distinct.

Literature which deals with the zooarchaeological point of view is primarily concerned with quantifying the deposited/recovered faunal assemblage, and from this data providing information about past hominid behavior. The results of such studies attempt to

draw conclusions concerning human diet, animal procurement strategies, and predator-prey relationships (Lyman 1987). Some examples of these techniques which are often employed are the NISP, MNI, Minimum Number of Elements (MNE), and Minimum Animal Units (MAU) (Ringrose 1993). Often, the primary concern is for comparability of results between sites to explore similarities or differences in human behavior. For this outcome, *relative* abundances can be used to demonstrate substantial variation between sites, and the *actual* number of individuals is often irrelevant.

Literature concerning the paleozoological point of view is directed towards quantifying the recovered faunal assemblage in order to reconstruct the living community of animals. The results of these types of studies attempt to draw conclusions concerning faunal turnover and succession, reconstruction of paleoenvironmental conditions, and geographic faunal patterns (Lyman 1987). Several of the more popular techniques utilized for this type of analysis are the NISP, MNI, LI, Krantz method, and Total Minimum Animal Units (TMAU) (Ringrose 1993). For the paleozoological studies, a reconstruction of the *actual* number of individuals is of more utility than a relative abundance. Grayson (1981) has been very critical, and correctly so, of paleoenvironmental reconstructions based on MNI or NISP estimates. His concern is that the relationship between the archaeological assemblage and the actual population is unknown and therefore meaningless as a quantifier of taxonomic abundance. Grayson concludes that the only acceptable approach to paleoenvironmental reconstruction is the use of presence/absence studies. This viewpoint seems a bit extreme when a technique such as the LI exists that can deal with missing data.

The quantification of commingled human remains has basically the same goals as the

paleozoological studies and, therefore, skeletal biologists, forensic anthropologists, and physical anthropologists in general should be aware of the various techniques which can be implemented. The extent of discussions concerning commingled human remains almost exclusively revolves around which variant of the MNI to apply. No evidence of a published study which attempted to quantify the *original* number of individuals (i.e people) that contributed to the recovered osteological sample was encountered prior to this study. Perhaps this is due to the relative infrequency of large commingled samples which are encountered in a good state of preservation, but equally plausible is the lack of knowledge surrounding other alternatives. Physical anthropologists need to borrow techniques presently utilized for faunal analysis, a field in which the debate over the best methodologies has been extensively researched and published. The MNI is *not* the only alternative for the quantification of human remains.

Explanation of the Lincoln/Petersen Index

The LI has been almost exclusively utilized and discussed concerning zooarchaeological remains and population studies of living animals (Allen and Guy 1984; Chapman 1951; Chase and Hagaman 1987; Fieller and Turner 1982; Horton 1984; Klein and Cruz-Urbe 1984; Plug 1984; Ringrose 1993; Seber 1973; Turner 1980, 1983, 1984; Turner and Fieller 1985; Wolter 1990; and many others). The LI was first developed for population studies of living animals based on capture-recapture techniques, and was later adapted to be applied to zooarchaeological faunal assemblages. There is some debate as to who actually initiated the use of this technique. Fishery biologists refer to it as 'Petersen's Method' which

was used by C.G.J. Petersen in 1889, while ornithologists and mammalogists call it the 'Lincoln Index' due to its use by F.C. Lincoln in 1930 (LeCren 1965). Although the distinction may be trivial, it is important to be aware that both names refer to the same technique.

Accurate estimates of the original population can be derived with the LI from samples in which taphonomic biasing has occurred. The theoretical basis of the formula is that it is used on populations in which all of the animals (living or dead) need not be observed. This is of particular utility with archaeological samples in which site sampling takes place and remains are recovered which have already been exposed to taphonomic forces. Turner (1983: 318) states,

“Post-depositional processes of differential decay and fragmentation need not militate against the use of the Petersen Index. ... This is so because the method estimates the original *absolute* abundances from which the sample was drawn, thereby overcoming the effects which have altered the *relative* abundances encountered in the sample.”

Of course, estimates will be more precise with high levels of recovery, but it is extremely important to realize that this technique does account for data loss.

A case study by J. Allen and J.B.M. Guy (1984) compares the results of an MNI count with an estimate derived from the LI. For their experiment, an archaeological sample of wallaby mandibles and parrotfish dentaries was utilized. The LI estimated a wallaby population of 1100 individuals, with a 90% chance that the population was between 700 and 1500. The MNI derived for the wallabies was 242. In this example, there is a 90% chance that the original population is between 2.9 and 6.2 times greater than the MNI.

The results derived for the parrotfish assemblage provide similar conclusions. The LI suggested a population size of 356, while the MNI was 120. From their study, Allen and Guy (1984:44) conclude that "...the use of the MNI figure as a basis for calculating unknowns in archaeological analyses...is fraught with the danger of serious underestimation." Furthermore, they state that the LI provided "...a more realistic impression of the size of the original population than the MNI statistic and thereby provided a firmer basis for interpretation than before" (Allen and Guy 1984:44).

In theory, any paired element in the body could be used for the calculation of the LI. This is applicable to bones as well as teeth. In practice, though, particular parts of the skeleton will be more useful than others. Teeth would be hazardous elements to utilize due to the variability of wear possible on one individual, the chance of congenital absences or asymmetric loss, and the potential for poor recovery. All of these factors would greatly hinder pair-matching. Important criteria to consider for choosing appropriate skeletal elements are their size, presence of distinct morphological traits, potential for age and sex determination, and likelihood of survival. For human remains, some of the best bones to include would be the femur, tibia, humerus, and os coxa, which are considered here to be the best candidates for use with the LI.

A study by Waldron (1987) using data from a 2nd to 4th century Romano-British cemetery in London showed results similar to Brain's (1976) study of animal remains concerning preservation. Dense, heavy bones are well represented after recovery, while small, fragile bones are not as ubiquitous. Waldron's study revealed that the recovery rates for the femora were between 50-62% of the expected (i.e. complete) total, the tibiae 44-50%,

the humeri 47-58%, and the pelves 53-71% (excluding the pubic symphysis). It is unclear how consistent these percentages would be with other sites, but on a general level this study supports the somewhat obvious tendency for large, dense bones to be the most prevalent in recovery.

Calculation of the Lincoln/Petersen Index

In capture-recapture studies, a group of n_1 animals is initially trapped. These animals are then tagged and returned to the wild. Some time later, a second group of n_2 animals is captured. The number of tagged animals which is recaptured from the initial catch is then counted as m . With the assumption that the proportion of initially tagged animals present in the second sample is roughly the same for the entire population, the estimated population size ($\hat{N}$) can be derived by the simple equation:

$$\hat{N} = n_1 n_2 / m. \quad (1)$$

The formula from the capture-recapture studies has been adapted for the same purpose of determining population size with zooarchaeological faunal remains. By using the bones of dead animals, the technique can achieve results similar to those obtained from the living animals. The goal of the implementation of the LI is to estimate the *actual* population that is represented by the skeletal assemblage, that is, the size of the community at death instead of at recovery. The bones from one side of the skeleton, e.g. left (L), are analogous to the initial stage of the capture-recapture procedure (n_1). The bones from the other side of the skeleton, e.g. right (R), are analogous to the second stage of the capture-recapture procedure (n_2). Of course, it is irrelevant which side of the skeleton is treated as the initial

"catch". The number of elements which can be matched from the right and left sides as coming from the same individual (P) is analogous to the recapture of initially tagged animals (m). An estimate of the original death assemblage ($\hat{N}$) represented by the skeletal elements is:

$$\hat{N} = LR/P. \quad (2)$$

In the event that no pairs are discovered, Fieller and Turner (1982) and Turner (1983, 1984) suggest that the formula should be modified to:

$$\hat{N} = (L+1)(R+1). \quad (3)$$

Several modifications to equation (1) have been proposed and are discussed by Seber (1973) concerning capture-recapture studies. These suggestions can be easily applied to equation (2) for use with skeletal material. Comparisons of the standard LI (equation 2) versus these modifications will be discussed in the results section. Alterations to equation (2) are necessary to account for bias in this estimate, especially resulting from small sample size. It is suggested that the following guidelines should be followed:

$$\text{if } L+R \geq \hat{N} \text{ then } N^* = \frac{(L+1)(R+1)}{(P+1)} - 1 \quad (4)$$

$$\text{if } L+R < \hat{N} \text{ then } N^* = \hat{N}(1-b) \text{ where } b = \exp\{-(L+1)(R+1)/\hat{N}\} \quad (5)$$

With the LI it is possible to calculate confidence intervals. Through computer assistance, confidence intervals can be derived using cumulative hypergeometric

probabilities which provide a more realistic perspective of the actual population size, a feature not available for Minimum Number of Individuals (MNI) estimates. Seber (1973) outlines the necessary procedures for the derivation of confidence intervals employing the hypergeometric distribution:

$$f(P|L,R) = \frac{\binom{L}{P} \binom{N-L}{R-P}}{\binom{N}{R}} \quad (6)$$

An approximate confidence interval can be calculated for N^* using the following variance

equation:
$$v^* = \frac{(L+1)(R+1)(L-P)(R-P)}{(P+1)^2(P+2)} \quad (7)$$

For quantifying subpopulations, such as by sex or age, Chapman (1951) proposes a separate equation which is less variable than a summation of the subgroups using equation (4). This equation is:

$$N^*_x = \frac{L_x + R_x - P_x}{L + R - P} \times \frac{(L+1)(R+1)}{(P+1)} \quad (8)$$

where subscript x is the subgroup, for example males.

The variance of equation (8) is computed as:

$$Var[N^*_x] = N^{*2}_x \left[\frac{1}{P} + \frac{2}{P^2} + \frac{6}{P^3} \right] + \frac{N^*_x (N^* - N^*_x)}{L + R + 1} \quad (9)$$

Equations (4) and (8) were first proposed by Chapman (1951), while equation (5) was proposed by Robson and Regier (1964). Equations (6) and (9) are discussed by Seber (1973) and will be used in this thesis for deriving confidence intervals. Although it may be a slight misnomer, the corrected LI (N^*) will often be referred to as “Seber’s LI” throughout this thesis due to the work contained in his 1973 book. This is not implying that Seber is responsible for the modifications, only that he provides a detailed synthesis of the Chapman (1951) study and the Robson and Regier (1964) study, as well as other statistical properties associated with capture-recapture quantification.

Notice that equations (3) and (4) are very similar when no pairs are encountered. Since the corrected LI (N^*) can account for small sample sizes or lack of pairs with less bias than the standard LI ($\hat{N}$), its use is recommended at all times. Robson and Regier (1964) suggest that bias in the modified LI (N^*) will be negligible if the number of pairs is greater than seven. Otherwise, confidence intervals will become quite large if few pairs are present. An example of the problems which can occur as a result of small numbers of pairs and small sample sizes will be discussed pertaining to the remains collected from Lodges 1 and 23 from Larson Village.

Potential Biases of the Lincoln/Petersen Index Estimates

Most of the potential limitations and biases which could affect the LI estimates are more of a concern for zooarchaeological remains than for human skeletal remains. One potential problem discussed in the faunal literature is that a biasing effect could occur due to differential deposition of body parts as a result of butchery or transport (Fieller and Turner 1982; Gilbert and Singer 1982). Although this may be a viable concern for utilitarian animal remains which are differentially modified for food and tools, it is not likely to be a significant factor with human skeletal remains. While it is not uncommon for human remains to be moved after initial deposition and decomposition for secondary burial, the larger, distinct elements which would be used for the calculation of the LI are likely to be transported together (i.e. femora). Of more relevant concern with human remains are the effects of carnivore scavenging, soil chemistry, geodynamic process, and thermal alteration, all of which can create bias.

The LI, as an inherent feature of its derivation, accounts for some degree of data loss due to these factors. This study will show the technique to be an accurate estimator of the original population as long as recovery is greater than 20% (see Results and Discussion chapter). Ringrose (1993) states that if both sides of an element were initially deposited on a site or transported to it, and neither was subsequently transported away, then the LI would be an effective tool. He concludes that this technique "...is perhaps the best way we have of trying to get back to the Death Assemblage" (1993:129). A similar conclusion is drawn by Fieller and Turner (1982:59) who state that:

"...if matches can be made and if bias in selection has not operated, then the method is capable of reconstructing the original death assemblage size even though a number of selection processes may have operated. This is of particular importance to the archaeologist dealing with material which has been subjected to selection during initial deposition, preservation and eventual recovery."

A problem which is often stressed, and is of equal concern with faunal remains and human remains, is the danger involved with misidentification of pairs. Because of the multiplicative nature of the LI, it is more vulnerable than other methods to fragmentation and misidentification of pairs (Allen and Guy 1984; Fieller and Turner 1982; Grayson 1984; Horton 1984; Ringrose 1993; and others). This hazard should be substantially alleviated by accurate field excavation notes, consideration of general morphology, and taphonomic similarities. Of course, extensive osteological experience will be one of the most important factors for an accurate analysis. Any quantification technique dealing with skeletal material must only be employed by an experienced osteologist or questionable results are certain to be attained. The LI, more than any other technique, is susceptible to drastic miscalculations if incorrect identifications and pair-matches are made. In extremely fragmentary situations, thorough pair-matching may be impossible and the LI should not be utilized. Currently, the only option in this situation would be an MNI estimate combined with the Number of Identified Specimens (NISP) to show the extent of fragmentation (discussed later). This ratio should not be considered a count of the original death population, as estimates of this figure are next to impossible in extreme situations.

Grayson (1984) warns that all potentially matched pairs must be retrieved from the site. He states (1984:88) that "... an unmatched bone whose partner has simply not been

collected has very different meaning from an unmatched bone whose partner has disappeared.” This concern may be relevant in cases of extremely minimal sampling, but his reservations are overstated. The LI accounts for data loss regardless of its cause. Natural taphonomic factors, as well as human sampling strategies, can be accommodated by this technique. Fortunately, excavations of commingled human remains will often have definable boundaries which facilitate a complete recovery and, in turn, provide relatively precise confidence limits for the LI estimate.

To summarize, many of the potential criticisms of the LI are not as applicable to human remains as they are to utilitarian animal remains. Possible exceptions to this rule could occur in the rare examples of cannibalism (see White 1992), but otherwise this method is an ideal quantification technique for commingled/ossuary circumstances. Generally, commingled human remains should be easier to quantify and interpret than faunal remains, due simply to the number of animals which are being analyzed. The physical anthropologist is only dealing with one species (*Homo sapiens*), while the zooarchaeologist must be aware of potentially hundreds of species at one site.

The primary concern for the implementation of the LI is the danger of inaccurate results due to extensive fragmentation or incorrect pair-matching. Allen and Guy (1984:45) state that as long as accurate pair-matching can be accomplished, the LI can effectively "...be used to calculate probable populations of a wide range of animals recovered in various archaeological situations." There is no reason to believe that the "animals" referred to in this quote excludes human beings.

Potential Applications of The Lincoln/Petersen Index

Due to recent legislation and contemporary Native American concern, extensive excavations of Native American ossuaries such as have been completed in the past, e.g. Crow Creek (Willey 1982) and the ossuaries from the Juhle site (Ubelaker 1974), are not as likely to occur today. State and federal laws concerning the excavation of human remains regularly lead to avoidance in place of recovery. Even if excavation is undertaken, sufficient time for analysis is often not allowed. Furthermore, many collections currently being curated at institutions across the United States are in danger of being lost due to repatriation laws (see Ubelaker and Grant 1989 for an overview of the reburial arguments and legal aspects).

Even though these concerns exist, it is important to be aware that options are available to deal with commingled human remains besides the MNI. The LI is a more accurate estimator of the original population, in turn providing a more reliable reconstruction of the past. In the event that such an archaeological situation should arise in the U.S., this method should not only be acknowledged, but also utilized. More likely scenarios would include archaeological excavations outside of the U.S. (e.g. Mesoamerica) where public/political concern is not so prevalent. Also, this technique could be extremely valuable in more recent forensic situations. For example, it could be applied by physical anthropologists to the excavation/interpretation of mass graves resulting from human rights violations which are occasionally dealt with around the globe.

With large enough samples, it is anticipated that the LI could be calculated for each age cohort in a life table, in turn providing more accurate results for demographic reconstructions. This could prove problematic for adult age groups due to less precise gross

aging techniques of long bones, but histological methods such as osteon counting may prove helpful. Unfortunately, the relatively small sample size at Larson Village prohibited the implementation of a detailed lifetable analysis for this study, although estimates based on sex and general age brackets were determined for Lodge 21. This will be addressed in the Results and Discussion chapter.

Description of Other Quantification Techniques Used in Skeletal Analysis

MNI

The Minimum Number of Individuals (MNI) is arguably the most popular method of quantification in any type of commingled osteological analysis. Many researchers credit T.E. White (1953) with its initial use for abundance studies in archaeology. For interpreting population size from a skeletal assemblage, MNI (as the name suggests) presents the minimum, and therefore unlikely, estimate for the number of individuals. Fieller and Turner state (1982:56), "...the very presence of unmatched bones indicates that the MNI estimate is necessarily an underestimate of the number comprising the death assemblage." The MNI simply states how many animals would have been necessary to provide the recovered skeletal elements, but says nothing about the original death population. For this reason, the MNI is of limited value for the interpretation of osteological assemblages and can account for unjustified interpretations (Turner 1980). Several variations for the calculation of the MNI exist:

$$\text{Max (L,R)} \quad (10)$$

$$(L+R)/2 \quad (11)$$

The Max(L,R) method is simply obtained by sorting elements into lefts and rights and then taking greatest number as the estimate. It is equivalent to assuming that all of the lesser observed bones are paired with the greater observed bones, and subsequently provides a rather unlikely estimate. This method is the most commonly employed MNI technique used in any type of analysis. The variant $(L+R)/2$ is the most conservative of the three MNIs in that it will usually provide the most minimal counts. It is an average for a paired element and, unless the lefts and rights are equal, it will always be less than the maximum side. For example, if you had 30 left femora and 2 right femora then the Max(L,R) would be 30 individuals, but the $(L+R)/2$ would only be 16, which is obviously an underestimate of the population. This technique is very similar to the MAU in which the number of complete animals is irrelevant. The primary concern of the MAU is the study of subsistence patterns through specific bone segments. The L+R-P method usually provides a higher estimate than the other two options because unpaired bones from different sides are assumed to come from different individuals. The $(L+R)/2$ method will always be less than or equal to Max(L,R), while L+R-P will usually be greater than the other techniques. Horton (1984) refers to equation (12) as the Grand Minimum Total. The basic principle of an MNI estimate, regardless of the variant employed, is to avoid counting the same individual twice.

In order to deal with fragmentary remains, specific segments of an element (i.e. distal femur) can be used for the calculation of the MNI. Every fragment must share a unique landmark to ensure that fragments of the same part-element of the same individual are not counted as two distinct animals.

The various methods for estimating the MNI often result in the incompatibility of results from different studies, which has been a point of methodological criticism (Casteel 1976/77, 1977; Klein and Cruz-Urbe 1984; and Ringrose 1993). Grayson (1973, 1979) and Casteel (1977) have also criticized the MNI because it varies depending on the way in which the total assemblage is divided into smaller aggregates. If all the material from a site is treated as one aggregate, the numbers will be quite different than if they are divided by stratigraphic levels. This also leads to difficulty in the comparison of abundances between sites. As a solution, Grayson (1973) suggests standardizing MNI estimates by basing them on stratigraphic breaks within the site, without regard to the excavation unit in which the remains were collected.

Grayson (1978) tentatively suggests using the value of MNI/NISP in order to control for the exaggeration which occurs from very small sample sizes and the MNI estimate. His concern is that the abundance of rare taxa will be exaggerated because MNIs calculated for small samples will contribute proportionately more individuals than MNIs derived from large samples (also see Holtzman 1979). For example, two bones from one taxon may have an MNI of two, while 350 bones of another taxon may have an MNI of only ten. In this example, the infrequently encountered taxon will appear more prevalent than is probably true. While Grayson is critical of the MNI/NISP ratios, he suggests that this may provide adequate adjustments to the lone MNI estimates until better quantification techniques can be applied.

Many of the biases which will be discussed in the next section for the NISP are not applicable to the MNI. For example, the use of the MNI would quantify several bones from

one individual as representing only one individual instead of multiple animals. Also, the number of elements present in a living animal is irrelevant to the calculation of the MNI for interspecies comparisons because only one specific element is used for its derivation. Finally, the *schlepp effect* (Perkins and Daly 1968), which occurs due to differential butchery and transport, will not bias the MNI.

In essence, the MNI provides estimates that are too low, while the NISP will be shown to provide estimates that are too high.

NISP

Perhaps the simplest method of quantification, next to presence/absence studies, is the Number of Identifiable Specimens, or NISP. This technique is based on a count of the number of specimens (fragments and complete elements) which are identified to a particular taxon. This method is sometimes used as an estimate of the *actual* death assemblage, but more commonly it is used to compare *relative* abundances between several types of animals. Unfortunately, the NISP is fraught with biases and problems.

With faunal remains a bias is presented by the simple fact that some animals have more skeletal elements in their body than others. Interspecies comparisons could show unjustifiable differences which are based solely on the number of bones present in a living animal and have nothing to do with species abundance. Also, some animals have more easily identifiable elements than others. For example, more bones of an armadillo (*Dasypus novemcinctus*) are likely to be identified to species than bones of canids (i.e. dogs, coyotes, wolves) which often can only be assigned a general identification of *Canus spp*. Thus, a

similar initial bias exists for interspecies comparison before data collection has even begun.

Further concern for the NISP comes from the transport of whole animals versus previously butchered animals. Large animals are often butchered at the kill site and sections are transported back to the habitation area, while smaller animals are more likely to be transported whole. This pattern of leaving unwanted parts of the carcass at the kill site has been labeled the *schlepp effect* (Perkins and Daly 1968). An analysis comparing large and small animals transported in this fashion would exaggerate the importance of the smaller animal.

With the NISP, it is assumed that all specimens of all species being considered were equally affected by breakage and chance preservation. With utilitarian remains, it is very possible that butchery techniques will fragment some bones more than others. A comparison using this quantification technique will reflect butchery patterns more than animal abundance (Grayson 1984). Along the same line, preservation is dependent on bone density and porosity (see the Taphonomy chapter) and the counts derived from an assemblage today may not represent an accurate relationship to the deposited assemblage. Counts which would have been statistically similar at deposition may become significantly different upon recovery due to differential fragmentation (Grayson 1984).

Of course, since an analysis of human remains would only be concerned with the abundance of one species (*H. sapiens*), the analytical procedure would be somewhat simplified, but still relatively uninformative. Many of the previously mentioned biases of the NISP may be unique to faunal remains, but a relevant concern with both human and non-human remains comes from the degree of fragmentation. With the NISP, 10 complete bones

would be counted the same as one bone broken into 10 pieces. Similarly, 100 specimens from a single animal would be counted the same as 100 specimens from 100 different animals. Grayson (1973:432) refers to this as the "problem of element interdependence." In order to compensate for this potentially gross overestimate, it has been suggested that the NISP figure could be divided by the number of identifiable elements in one articulated individual (Shotwell 1955), or by dividing the NISP by the number of representative bones collected at the site (i.e. the most prevalent elements encountered from the skeleton of a single individual, perhaps only the axial elements) (Perkins 1973). Both modifications to the NISP improve the estimate but cannot remove enough bias to provide reliable counts of the original killed assemblage.

Grayson (1984) is critical of both MNI and NISP estimates, but favors NISP as the more accurate technique of the two. He states that "... the number of identified specimens per taxon provides the best unit we have available for measuring the relative abundances of vertebrate taxa in archaeological and paleontological sites" (1984:92). He acknowledges that specimen interdependence (counting the same animal more than once) and transport bias are problematic for NISP estimates, and that these factors are not a concern for the MNI. Even though the MNI compensates for these weaknesses, he sees detrimental factors which outweigh the benefits. First, he is extremely concerned with the aggregation problems inherent in MNI estimates. Counts depend on how the assemblage is subdivided or grouped, and substantial variations in the MNI estimates can occur. Second, he graphically demonstrates that the MNI values can be accurately predicted based on NISP counts. This relationship between the MNI and NISP has also been discussed by Casteel (1976/77). Since

the two estimates are correlated, Grayson proposes that there is little reason to spend the time and effort in computing the MNI. Plug and Plug (1990) are in agreement with all of the criticisms presented by Grayson concerning the MNI and they suggest that the use of MNI estimates in scientific work is difficult to defend.

While arguments can be presented in support of and against the NISP, most researchers only consider this method when the implementation of more reliable techniques is not feasible. This may occur when remains are very fragmentary or have been exposed to extensive transport (i.e. fluvial mechanisms). Perhaps the best use for the NISP is as a ratio with MNI or MNE estimates as a quantifier of the degree of fragmentation (Cruz-Uribe and Klein 1986; Klein and Cruz-Uribe 1984), although Grayson (1984:68) refers to this as “analytically treacherous”.

The benefits of the NISP come from the ease of its calculation and the ability to add data from subsequent excavations without tedious recalculation (as would be necessary with the MNI estimates). In many respects the MNI and NISP complement each other. The MNI is strong where the NISP is weak and vice versa.

MAU / MNE

Two related quantification techniques made popular by Lewis Binford are the Minimum Animal Units (MAU) and the Minimum Number of Elements (MNE) (Binford 1978, 1981, 1984). These methods were designed for the study of skeletal part representation rather than for estimating taxonomic abundance. They would be implemented in order to observe total meat intake or butchery/distribution patterns and are, essentially, not

applicable to human remains. The methods are briefly described here due to their similarity with other more relevant quantification methods, such as MNI.

The MNE is a count of the number of specimens of a particular skeletal section (i.e. distal femur) ignoring side classification, but accounting for fragmentation. It is comparable to an MNI computed on part-elements in that it accounts for every identifiable fragment and attempts to remove the chance of counting the same element more than once. The two methods differ in that side classification is not important for the MNE. With the MNI, the desired outcome is a picture of the number of individuals as a whole, while the MNE is only concerned with specific parts of the individual.

The MAU is simply the MNE divided by the number of times that element or part-element occurs in a single individual (i.e. two for paired elements or perhaps five for lumbar vertebrae). This is very similar to the Shotwell (1955) normed NISP. For paired elements, the MAU is identical to the MNI method of $(L+R)/2$. Once again, the MAU is not intended to quantify the total number of animals represented by the bone assemblage, but rather which portions of which elements are represented in the sample that can provide information concerning dietary practices.

TMAU and RF

The Total Minimum Animal Units (TMAU) is a method designed to get back to the original number of animals deposited at a site. As the name would suggest, it is a summation of several MAUs from a particular taxon which are divided by the number of MAU groups included in the calculation (see the previous section for a discussion of the MAU). Chase

and Hagaman (1987) suggest using TMAU and the LI together as a check of accuracy. If they are in close agreement, the estimate is likely to be trustworthy, a discrepancy is reason for concern. The formula presented by Chase and Hagaman (1987) has been simplified here so that the derivation of the TMAU is:

$$\frac{\sum_{i=1}^g MAU}{g} \quad (13)$$

where g is the number of groups of elements. Ringrose (1993:131) states that the TMAU is “...essentially the Shotwell normed NISP using only clearly defined elements or part elements and with grouped and paired elements dealt with in the same way as the MAU.”

A study using computer simulated data sets was done by Gilbert, Singer, and Perkins (1981) who looked at the MNI, the NISP (what they refer to as the Total Number of Fragments, or TNF), and the Relative Frequency (RF). The goal of their analysis was to see which technique is the most accurate estimator of the original population size. The RF was found to be the best and the MNI the worst. Their study is mentioned here due to the similarity between RF and TMAU. For its derivation, TMAU is based on MNE counts, while the RF uses NISP values. To calculate the RF, the NISP for a particular element is divided by the number of times this bone is present in a complete individual. This procedure is performed on multiple elements of the skeleton. Next, the average is derived by finding the sum of these corrected frequencies and dividing the total by the number of different bone types included in the summation.

The RF, in comparison to the TMAU, does not explicitly take into account the chance of counting the same individual more than once in fragmentary instances since it is based on the NISP. The TMAU, because it is based on the MNE, removes the chance of over-counting. Although they are very similar calculations, the TMAU would be preferable due to its ability to deal with fragmentation better than the RF.

When compared to the LI, the TMAU is susceptible to more bias, primarily a result of the recovery rate associated with the material. The main concern for LI estimates is that accurate pair-matching was performed. While Chase and Hagaman suggest deriving the TMAU and the LI together as a check on the validity of the results, this seems unnecessary. The LI is easier to calculate and subject to less bias, suggesting that it can stand alone.

The Krantz Method

A formula derived by Krantz (1968) was designed in order to predict the original death assemblage for faunal remains. The formula is computed as:

$$(L^2+R^2)/2P \quad (14)$$

which is very similar to the LI. Research done by Casteel (1977) suggests that the Krantz method may be effective when over 80% of the paired elements are matched. In a more recent review of quantification techniques, Ringrose states that it "...can be regarded as an inferior version of the LI..."(1993:132). The Krantz method is mentioned here due to the influence it had on the future implementation of the LI for faunal analysis, especially in the work of Fieller and Turner (1982) and Wild and Nichol (1983a).

The Lie Technique

Lie (1980) proposed using paired elements to get back at the original death assemblage by observing the variation between right and left elements. In theory, a large discrepancy between right and left bones indicates a large original population size. This method unfortunately fails to present credible results (see Fieller and Turner 1982; and Wild and Nichol 1983b for a criticism of Lie).

The Bokonyi Technique

This quantification technique is a modified MNI that attempts to get closer to the actual number of individuals than the standard MNI derivations. To begin with, bones are divided into four age groups (juvenile, subadult, adult, mature/senile). Then, the age groups are subdivided by size (small, medium, large). By dividing the assemblage in this manner, twelve groups are created and the MNI can be derived for each of these subdivisions. Different elements can be used for each of the twelve groups if necessary. Bokonyi's (1970) MNI is the sum of the MNIs for the twelve groups.

Methodological Summary

The MNI and NISP are estimates of certain characteristics of the recovered fossil assemblage and, for this reason, it is extremely dangerous to draw conclusions of species abundance based on these figures, except in instances where recovery is near 100% and fragmentation is minimal. Ironically, the MNI and NISP used together is the most viable technique for extremely fragmentary situations, but they should not be used for estimating

the original population, only for showing the degree of fragmentation. No technique exists, or is likely to be discovered, which can provide reliable absolute abundance estimates from fragmentary assemblages.

Badgley (1986) reports that the MNI may be an accurate count of the actual number of individuals if the assemblage is the result of a single event so that the individuals would have been deposited whole. In the case of extreme dispersal (i.e. resulting from fluvial activity) she suggests that the NISP should provide more accurate results. Although she acknowledges the LI, Badgley favors the MNI and NISP estimates. Curiously, she states that the LI estimates usually exceed the values determined by the NISP. This seems unlikely.

The LI is the best method to compensate for the underestimates of the MNI and the overestimates of the NISP. It has the potential to provide an accurate reconstruction of the original killed population from the recovered assemblage. Criticism of this technique primarily concerns transport bias (i.e. left and right bones were not transported to the site so the initial population is not composed of paired left and rights) and the potential for inaccurate pair-matching. As has already been discussed, transport bias is of little concern when dealing with commingled human remains due to the infrequency of this occurrence, while accurate pair-matching is a viable concern.

CHAPTER 3: SAMPLES AND METHODOLOGY

General Introduction to the Samples

Three distinct samples of data were incorporated into this study to test the utility, as well as the accuracy of the LI: 1) a *hypothetical simulation of commingled bones*, 2) a *commingled archaeological sample of Native American remains*, and 3) a *Native American cemetery composed of fully articulated burials*.

In order to generate hypothetical samples with varying numbers of individuals and varying percentages of recovery, computer simulation was performed. To demonstrate the feasibility of the LI on an actual commingled skeletal sample, Larson Village was utilized. Finally, since it is essential to have accurate pair-matches for reliable results to be generated with the LI, a “blind” test was performed using Larson Cemetery as a gauge of matching abilities. Furthermore, Larson Cemetery was used in order to derive univariate sexing criteria for adult skeletons.

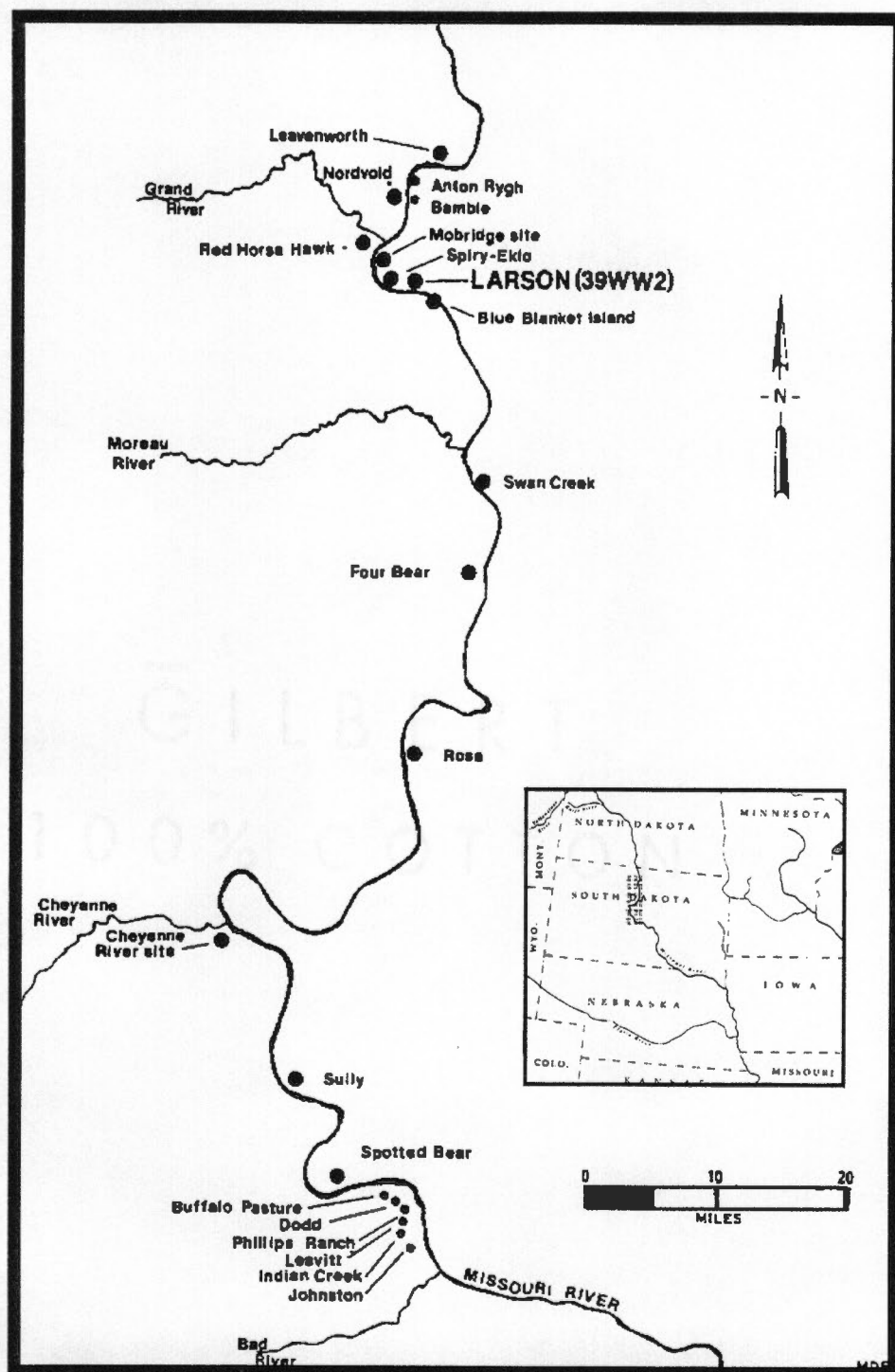
The Hypothetical Sample

A computer simulation program (SIMLIN) was written by Dr. Lyle Konigsberg at the University of Tennessee, Knoxville that enables hypothetical data sets to be created by allowing the researcher to choose the actual number of individuals (A) and the recovery rate of the sample (S). Since it has been shown that preservation is not uniform throughout an entire skeleton, especially after the dispersal of elements, some paired elements are certain to be more prevalent than others during recovery (see the Taphonomy chapter for a more

thorough discussion). This procedure simulates the recovery of one set of paired elements (i.e. right and left femora) from each of the A individuals and performs the statistics based on the selected S. In essence, this program simulates the recovery of the most frequently encountered element for the entire assemblage. For example, a run of the program with A=80 and S=.5 would simulate a 50% recovery of 160 potentially paired femora (80 left and 80 right) and produce the results based on this criteria. The test of the desired A and S is performed 1000 times and the results are saved to an output file containing: 1) $\hat{N}$, the biased LI (LR/P); 2) N^* , the corrected LI (Seber's LI); 3) the square root of variance based on N^* ; 4) the coefficient of variance for N^* ; 5) the MNI derived from Max(L,R); 6) the Number of Lefts (L); 7) the Number of Rights (R); 8) the Number of Pairs (P).

Skeletal Samples

Skeletal remains from the Larson site (39WW2) are currently curated at the University of Tennessee, Knoxville. This site is composed of two distinct samples of human skeletal remains, the village and the associated cemetery, both of which were utilized in this study. The Larson site is located in Walworth County, South Dakota on the left bank of the Oahe Reservoir in the vicinity of Mobridge, South Dakota. It is located on what was formerly a high terrace overlooking the east bank of the Missouri River near the junction with the Grand River (see Figure 2). It consists of a fortified earthlodge village with a cemetery approximately 100 yards Northeast at a slightly higher elevation (Bass and Rucker 1976). Larson is an Arikara site associated with the Post-contact Variant of the Coalescent Tradition (Owsley et al. 1977; Owsley 1994). The Arikara were a Caddoan speaking tribe



map based on Bass and Rucker (1976)

Figure 2: Location of the Larson Site (39WW2)

who constructed dome-shaped, earth-covered lodges (Bass and Rucker 1976; Catlin 1989; Denig 1961). Initial occupancy at Larson is suspected to have begun about A.D. 1680 and to have ended by A.D. 1700 (Johnson 1994).

Larson Village

Larson Village was excavated under the supervision of Alfred W. Bowers during the summers of 1963 and 1964. Excavation of the village was completed as a salvage program of the Smithsonian Institution River Basin Surveys due to the threat of inundation resulting from reservoir construction in the Missouri Basin. Although 29 circular depressions were visible on the ground surface at the village site, only three were completely excavated (Lodges 1, 21, and 23). Excavation of these lodges was completed by dividing each circular lodge depression into 4x4 foot squares with number designations on the y-axis (North/South) and letters on the x-axis (East/West). All artifacts were removed by this type of quadrant scheme (see Figures 3, 4, 5, and 6 for Bowers' field maps of the lodges). Excavation and trenching of the village briefly resumed in August 1966 under the supervision of J.J. Hoffman (Bass and Rucker 1976).

The village is situated away from the river and was dependent on a large spring for water (Bowers 1967). Evidence from excavation showed that the village was strongly fortified with a ditch and had been burned several times (Bowers 1967).

Initial discovery of scattered burials on the lodge floors led to suspicion of an epidemic disease (small pox) as a cause (see Bass and Rucker 1976), but subsequent analysis revealed extensive perimortem trauma suggesting warfare (Owsley et al. 1977). The state

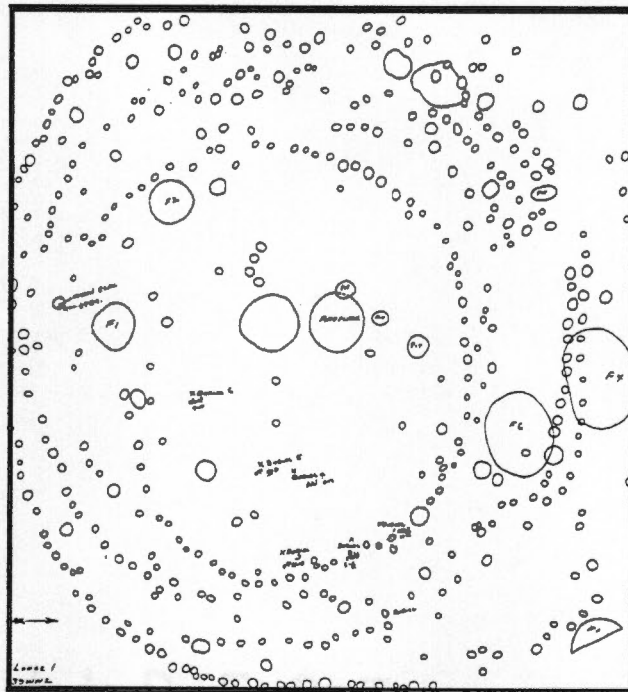


Figure 3: Lodge 1 Showing Features and Burial Locations

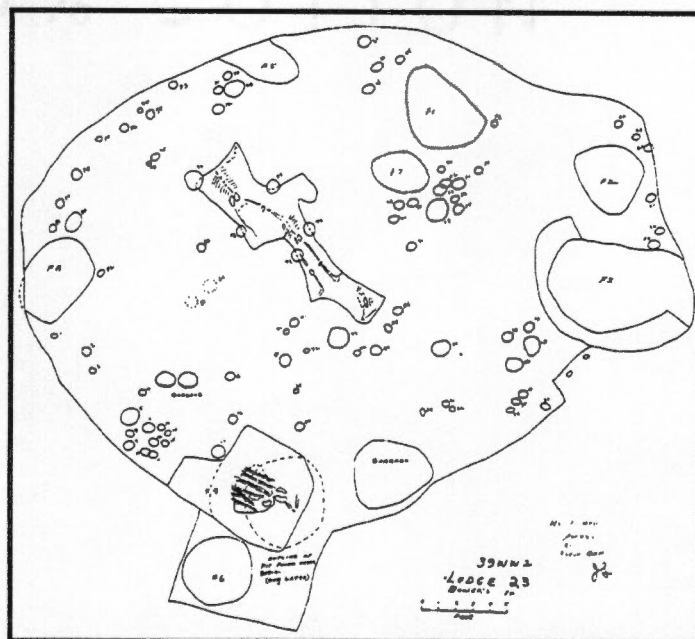


Figure 4: Lodge 23 Showing Features and Burial Locations

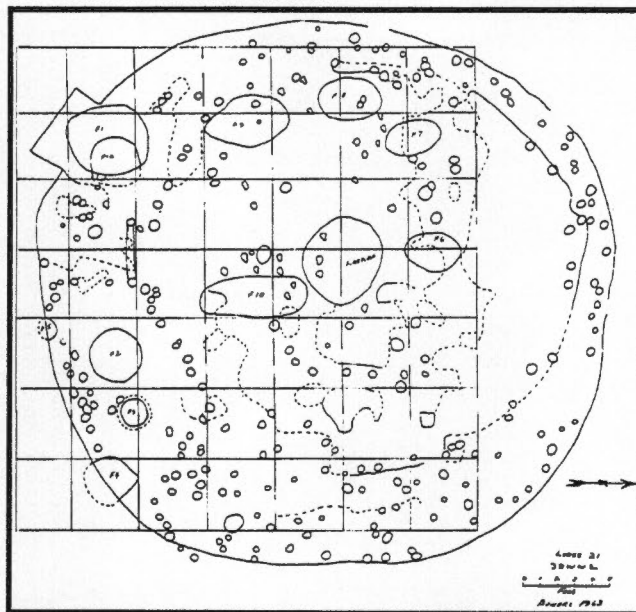


Figure 5: Lodge 21 Showing Grid and Features

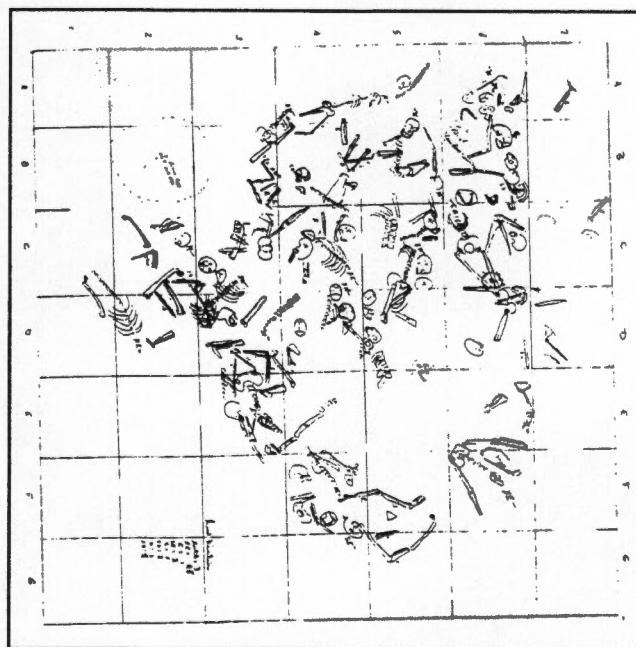


Figure 6: Lodge 21 Showing Grid and Commingled Skeletons

of the skeletons encountered within the lodges obviously implies that intentional burial did not occur. Evidence suggests that the individuals were massacred and placed within the lodges, or else they were left to decompose inside the lodges where they were killed. The massacre at Larson Village is obviously associated with the terminal occupation period of the site. Collapse of the lodge roofs was primarily responsible for the burial of the remains, but considerable commingling occurred prior to their excavation and recovery.

Owsley et al. (1977:121) state in their analysis of the warfare evident at the site, "Due to disturbance and mixture of the skeletons...it was necessary to treat the bones as if they came from an ossuary." An MNI of 61 was calculated from the skeletal elements encountered on the floors of the three excavated lodges at Larson Village: Lodge 21 with 44 individuals, Lodge 1 with 9 individuals, and Lodge 23 with 8 individuals (Owsley et al. 1977:120). Although other skeletons and random elements were discovered in the surrounding vicinity, this thesis only considered the bones recovered within the three excavated lodges as a test for the LI.

Larson Cemetery

Larson Cemetery was excavated during the 1966-1968 field seasons under the direction of William M. Bass through the University of Kansas. A total of 621 individuals were recovered (Owsley et al. 1977), and it is believed that this sample represents approximately 90% of the cemetery population (Bass and Rucker 1976; Owsley and Bass 1979). Based on the demographic analysis of the remains, the cemetery appears to have been the sole repository for the village dead (Bass and Rucker 1976). There were 267 burial pits

discovered during the excavations, most of which contained primary flexed interments with wood covering of the burials. Multiple burials were encountered with up to 10 individuals, but this was determined to be the result of intrusive burial rather than an intentionally created mass grave (Bass and Rucker 1976).

The cemetery sample was utilized in this study for deriving univariate sexing functions and to perform a test for the reliability of pair-matches from Larson Village.

Miscellaneous Larson Skeletal Material

Several burials and random elements were collected by Bowers and Hoffman during a nearby beach survey and from excavation trenches dug throughout the village. This material was cataloged as part of Larson Village, but was excluded from this study. Reference to the RBS catalog sheets provided information as to the original origin of the skeletal remains. Only elements whose provenience was definable to a specific lodge were included. This sample consists almost entirely of the remains collected by Bowers.

General Introduction to the Methodology and Procedures

For the collection of data from Larson Village, two coding forms were created. One was used in order to inventory elements, record sex, general age, distinct morphological and taphonomic traits, and measurements. The second coding sheet was used to record more specific ages for both adults and subadults whenever possible. See the Appendices for both coding sheets and explanations of their codes.

Inventory Sheet

General Provenience Data

Each complete element, or fragment, was assigned an inventory number unique to this study which was written on the bone in pencil near the original River Basin Survey (RBS) inventory number. The numbers assigned for this study were composed of the lodge number followed by a sequential number (i.e. 21-246 would be the two hundred forty-sixth bone recorded from Lodge 21). Unique numbers were necessary for this analysis due to the fact that the RBS numbers were occasionally the same for a collection of commingled elements recovered from a specific excavation quadrant. The new numbers allowed for the eventual pair-matching and conjoining of specimens between excavation quadrants without overlapping catalog designations or loss of provenience.

In order to link the new inventory numbers to the original Larson catalog sheets, the RBS catalog number was also recorded. As an additional provenience control, the box number (0-75) in which the material was located was recorded in order to facilitate conjoining and pair-matching without loss of curational provenience. Sequential numbers were written on the lower right corner of each box. Box number 0 signifies that the element had been removed from its original location and is currently being used as a teaching aid. The other box numbers were assigned for this study based solely on the order in which they were being curated. Box labels contained the excavation quadrant provenience, but the arbitrary numbers assigned for this study greatly simplified the recordation process.

General Age

A general age was assigned as either *adult*, *subadult*, or *unknown*. Any bone which showed evidence that epiphyseal fusion had not been completed was coded as a *subadult*. Roughly, this translates as individuals under 18 being coded as *subadults* and over 18 as *adults*. Diaphyseal fragments were often coded as *unknown*. Some bias could have occurred if only one epiphysis was observable and exhibited complete fusion, while the missing (unobservable) end was unfused. In this case the individual would have been incorrectly classified as *adult*. Due to the relative completeness of the bones from the Larson Village sample, this situation would have been rare. A separate coding sheet was used in order to assign more specific ages based on diaphyseal length and os coxae morphology (see Specific Age Designation Sheet section).

Sex / Measurements

When possible, sex was determined for each element (*male*, *female*, or *unknown*). This designation was based on metric analysis and general robusticity for long bones, and Phenice (1969) characteristics for the os coxae. Univariate sectioning points derived for sex determination of the Larson Village skeletons were based on measurements obtained from the existing databank compiled for Larson Cemetery by Zobeck (1983). Thus, the sectioning points were derived from a compatible sample and should provide accurate sex designations.

Measurements taken on the tibiae were *maximum epiphyseal breadth of the proximal end* (BPE), *maximum epiphyseal breadth of the distal end* (BDE), and *maximum diameter at the nutrient foramen* (APN). Measurements taken on the humeri included *maximum*

vertical diameter of the head (MDH), maximum diameter at midshaft (MDS), minimum diameter at midshaft (MDM), and epicondylar breadth (EBR). Two measurements were taken on the femora, maximum diameter of the head (VHD) and minimum shaft circumference (MSC), but the only measurement used for the sex classification of the femora was maximum diameter of the head (VHD). All the measurements were taken according the methods outlined in *Data Collection Procedures For Forensic Skeletal Material* (Moore-Jansen et al. 1994). Table 2 lists the sectioning points used for sex classification, while Tables 3-8 provide the reclassification results obtained from implementing the sectioning points on the sample from which they were derived (Larson Cemetery). Since the sex of the

Table 2: Measurements (mm) Used for Sex Determination at Larson Village

	Female	Unknown	Male
MDH	≤ 42	43, 44, 45	> 46
EBR	≤ 56	57, 58, 59	> 60
BPE	≤ 72	73, 74, 75	> 76
BDE	≤ 48	49, 50, 51	> 52
APN	≤ 33	34, 35	> 36
VHD	≤ 43	44, 45	> 46

Larson Cemetery individuals can never be known with certainty, original sex classifications were based on characteristics of the pelvis (Zobeck 1983), which has been shown to have a high degree of accuracy.

Table 3: Reclassification of Known Sex Individuals Drawn from Larson Cemetery
(numbers represent the frequency of individuals)

Classified as:				
	Male	?	Female	Total
Male	53	19	4	76
Female	2	15	60	77
Total	55	34	64	

MDH

Table 4: Reclassification of Known Sex Individuals Drawn from Larson Cemetery
(numbers represent the frequency of individuals)

Classified as:				
	Male	?	Female	Total
Male	50	21	5	76
Female	8	21	48	77
Total	58	42	53	

EBR

Table 5: Reclassification of Known Sex Individuals Drawn from Larson Cemetery
(numbers represent the frequency of individuals)

Classified as:				
	Male	?	Female	Total
Male	63	10	4	77
Female	6	7	54	67
Total	69	17	58	

BPE

**Table 6: Reclassification of Known Sex Individuals Drawn from Larson Cemetery
(numbers represent the frequency of individuals)**

Classified as:				
	Male	?	Female	Total
Male	57	15	5	77
Female	3	17	47	67
Total	60	32	52	

BDE

**Table 7: Reclassification of Known Sex Individuals Drawn from Larson Cemetery
(numbers represent the frequency of individuals)**

Classified as:				
	Male	?	Female	Total
Male	63	8	6	77
Female	2	12	53	67
Total	65	20	59	

APN

**Table 8: Reclassification of Known Sex Individuals Drawn from Larson Cemetery
(numbers represent the frequency of individuals)**

Classified as:				
	Male	?	Female	Total
Male	50	17	1	68
Female	2	18	45	65
Total	52	35	46	

VHD

100% COTTON

Of course, sex determination was primarily applicable to those individuals classified as *adult*, but some individuals classified as *subadult* who were in their teenage years were measured due to the presence of distinguishable morphological traits and nearly completed growth.

Element and Side

Only selected paired elements were inventoried as part of this study, and they were chosen based on their utility for deriving estimates using the LI or the MNI. All humeri, tibiae, femora, fibulae, radii, ulnae, and os coxae were inventoried and their corresponding side (right or left) was recorded. It should be noted that only the humeri, tibiae, femora, and os coxae were utilized in the final analysis concerning the LI.

Cranial elements were not included in this study due to the evidence of occasional decapitation and suspected transport of the head away from the site. Furthermore, other paired bones, such as ribs and bones of the hands and feet, were excluded due to their difficulty in pairing and small size. Traumatic evidence suggesting the removal and transport of hands as trophies is also present, adding to the problems associated with these bones. Studies by Brain (1976), Waldron (1987), and Lyman (1994) have shown that bone density affects recovery, and for this reason only the most robust elements were considered.

Degree of Fragmentation

The degree of completeness of each bone was coded. For long bones each element was divided into five sections (proximal epiphysis, proximal 1/3 diaphysis, middle 1/3

diaphysis, distal 1/3 diaphysis, and distal epiphysis) and a score was assigned depending on the completeness of each section. For the os coxae, the ilium, ischium, and pubis were coded separately using the same scaled completeness codes used for the long bones. There were no fragments encountered which could not be identified to element, section of the bone, and side. This fact is evidence of the good state of preservation and completeness of the assemblage, as well as the reliability of the quantification results. Extensive fragmentation to the point of unidentifiable pieces is cause for concern in any quantification analysis.

Taphonomy

Evidence of cut marks, animal scavenging, weathering, and thermal alteration was coded. Each specimen was scored for the presence or absence of cut marks. A previous study of Larson Village was completed which documented and quantified trauma as evidence of warfare (Owsley et al. 1977), but for this study the rationale was to aid in eventual pair-matching and conjoining.

Each specimen was also coded for the presence or absence of carnivore scavenging. This consisted primarily of tooth puncture marks and chewed areas (consistent with Haglund et al. 1988). Documentation of these features helped demonstrate the presence of commingling resulting from carnivore activity, and they occasionally assisted in conjoining and pair-matching.

The degree of weathering was scored based on Behrensmeyer's (1978) six stage scheme (0-V). Due to the critical results found by Lyman and Fox (1989) concerning weathering as an indicator of time, this procedure was done solely to aid in pair-matching

and conjoining and not for any sense of temporal duration between death and burial. As has been previously mentioned, the degree of weathering was minimal to non-existent on all elements.

Finally, the degree of thermal alteration was scored as absent, smoked (dark brown/black), or calcined. All specimens exhibited either minimal scorching or complete absence of thermal alteration. This suggests that only a small number of elements were exposed to a low temperature fire(s) for a short amount of time (Buikstra and Swegle 1989). Although fire was not a significant biasing factor, it certainly contributed to some of the fragmentation and commingling of elements.

Paired Elements/Conjoined Fragments/Pathology

The presence of paired elements was coded by cross referencing each specimen with its match using the unique numbers assigned during this study. For complete os coxae, only the ilium was used to record the presence of pairs in order to avoid potential confusion. A general *comments* section was created to note any observed pathologies, to document any conjoining between fragments of the same element, and to record any general questions. The principle pathological condition noted during the inventory was the presence of periosteal reactions. Bilateral expressions of this condition occasionally aided in pair-matching.

Specific Age Designation Sheet

A separate coding sheet was created for documenting specific ages. Every bone identified as *subadult* was scored as to the degree of epiphyseal fusion and all complete

subadult diaphyses were measured for length to aid in age estimation (based on Ubelaker 1989). Adult os coxae were scored for auricular surface morphology following the procedures outlined by Lovejoy et al. (1985). Pubic symphysis morphology was recorded based on the system described by Todd (1921). Occasionally, bones were too fragmentary for the designation of a specific age estimate. Adult long bones could not be assigned an age classification other than *adult* due to the lack of gross aging techniques. Tables 9-14 provide element counts which are subdivided into age and sex categories for all three lodges.

Table 9: Results of Pair-matching and Conjoining (divided by age and sex)

Lodge 21 Tibiae				
		Pairs	Unpaired Left	Unpaired Right
Adult	Male	8	2	3
	Female	3	2	2
	Unknown	1	1	0
	subtotal	12	5	5
Subadult	0-6 yrs.	1	0	1
	6-12 yrs.	1	1	0
	12-18 yrs.	6	2	2
	unknown	0	2	6
	subtotal	8	5	9
Grand Total		20	10	14

Table 10: Results of Pair-Matching and Conjoining (divided by age and sex)

Lodge 21 Os Coxae				
		Pairs	Unpaired Left	Unpaired Right
Adult Male	18-35 yrs.	6	0	1
	35+ yrs.	3	0	1
	unknown age	1	0	0
	subtotal	10	0	2
Adult Female	18-35 yrs.	3	0	0
	35+ yrs.	1	0	0
	unknown age	0	0	0
	subtotal	4	0	0
Adult Unknown	18-35 yrs.	1	1	0
	35+ yrs.	0	0	2
	unknown age	0	1	1
	subtotal	1	2	3
Subadult	0-6 yrs.	5	3	1
	6-12 yrs.	4	0	1
	12-18 yrs.	5	1	1
	unknown age	0	2	2
	subtotal	14	6	5
Grand Total		29	8	10

Table 11: Results of Pair-Matching and Conjoining (divided by age and sex)

Lodge 21 Humeri				
		Pairs	Unpaired Left	Unpaired Right
Adult	Male	6	3	3
	Female	5	1	2
	Unknown	1	2	1
	subtotal	12	6	6
Subadult	0-6 yrs.	1	0	1
	6-12 yrs.	3	0	2
	12-18 yrs.	6	1	2
	unknown	0	2	4
	subtotal	10	3	9
Grand Total		22	9	15

Table 12: Results of Pair-Matching and Conjoining (divided by age and sex)

Lodge 21 Femora				
		Pairs	Unpaired Left	Unpaired Right
Adult	Male	10	2	3
	Female	3	2	0
	Unknown	1	4	2
	subtotal	14	8	5
Subadult	0-6 yrs.	1	0	0
	6-12 yrs.	0	1	0
	12-18 yrs.	11	1	0
	unknown	5	2	0
	subtotal	17	4	0
Grand Total		31	12	5

Table 13: Results of Pair-Matching and Conjoining from Lodge 23 (divided by general age)

	Pairs	Unpaired Lefts	Unpaired Rights
Adult			
Femora	4	2	0
Tibiae	5	2	0
Humeri	3	0	1
Os Coxae	4	1	0
Subadult			
Femora	0	0	0
Tibiae	0	0	0
Humeri	0	0	1
Os Coxae	0	1	0

Table 14: Results of Pair-Matching and Conjoining from Lodge 1 (divided by general age)

	Pairs	Unpaired Lefts	Unpaired Rights
Adult			
Femora	0	1	2
Tibiae	1	1	0
Humeri	1	2	2
Os Coxae	1	1	0
Subadult			
Femora	5	1	0
Tibiae	3	1	1
Humeri	4	0	3
Os Coxae	5	1	0

Conjoining and Pair-matching

After the inventory of the selected elements from Larson Village was completed, conjoining and pair-matching was performed. This task involved placing all specimens of a particular bone (i.e. complete and fragmentary tibiae) on a table, keeping the material from each lodge separate. Copies of the original RBS catalog sheets were obtained from the Smithsonian Institution Museum of Natural History in order to check, and double-check, the provenience of each element. Specimens which had ambiguous or unknown lodge designations after consultation of the RBS catalog notes were grouped together. The bones were further sorted by side, age, and robusticity to assist in the conjoining of fragmentary remains and eventual pairing of elements.

Conjoining of fragmentary remains was attempted prior to pair-matching. While it would be considered unlikely that conjoined or pair-matched elements would be discovered between two or more distinct lodges, all fragments and unpaired bones were compared with each other, regardless of the supposed lodge designation for this study. This procedure was followed due to the potential for post-excavation mixing resulting from poor management of the material. Several matches were discovered between bones that had been assigned a specific lodge number and bones whose provenience was lost or ambiguous prior to the initial cataloging, but there was no observed mixing between lodges.

After all potential matches between fragments were exhausted, pair-matching was performed for each lodge. A pair-match was determined based on general morphology and taphonomic indicators. Morphological indicators include robusticity, muscle markings, epiphyseal shape (especially on distal femoral and humeral condyles), bilateral expression

of a periosteal reaction, and general symmetry between elements. Taphonomic variables included the state of preservation (i.e. degree of weathering and color), presence of burning, presence of cut marks, and presence of animal damage. Because of the scattering of many elements and the potential for matched elements to exhibit differential preservation, taphonomic indicators were not weighted as heavily as gross morphological features for pair-matching.

Small fragmentary specimens which could not be conjoined with any larger specimens were disregarded in the final element counts to be used for the calculation of the LI unless they were unique so that there was no chance of counting the same element twice. For example, in the conjoining and pair-matching of the os coxae, three adult right pubic symphysis fragments were present that could not be conjoined with any other specimens, but they did not exhibit overlapping sections with their only two potential matches. In order to avoid the potential for counting the same individual twice, two of the three pubic symphysis fragments were discounted in the final element counts. Since it was impossible for the third pubic symphysis to be potentially conjoined with any other fragmentary specimen, it was counted as a complete adult right os coxa.

A Test for the Reliability of the Larson Village Pair-matches

In order to perform a verifiable test of pair-matching abilities, a random sample was drawn from Larson Cemetery. Two computer generated lists simulated a 60% recovery sample of tibiae, femora, and humeri from both adult and subadult primary burials. The samples drawn for the test consisted of both complete and fragmentary elements. The os

coxae were not included in this test due to their relative ease of pair-matching. The first list sampled from 15 individuals, while the second list was drawn from 30 individuals. The randomly selected elements were commingled on a table, their original catalog numbers covered with masking tape, and new arbitrary numbers were assigned. These procedures were performed by two graduate students in the department of anthropology at the University of Tennessee, Knoxville in order to remove any chance of bias to the researcher during the test. Furthermore, the answer key of the correct pair-matches was not made available until after the test was performed. In essence, two distinct ossuary situations were created in which the actual number of paired elements, unpaired lefts, and unpaired rights, as well as the original number of individuals could be verified only after the pair-matching test was completed. This test served as a gauge for determining the accuracy of the Larson Village pair-matches. Identical pairing procedures were performed on the "test" sample as described for the village sample.

CHAPTER 4: RESULTS AND DISCUSSION

Results of the Larson Cemetery Pair-matching Test

Since the LI is entirely dependent on accurate pair-matchings, it was imperative to determine how well this task can be performed by an analyst using only gross morphological characteristics. Although not specifically tested here, the pairing of the same element types (e.g. right and left humeri) should not be any harder than the matching of different elements from the same individual (e.g. a left humerus and a left ulna). Two pair-matching tests were performed, one with 15 individuals and one with 30 individuals (see the Samples and Methodology chapter for a complete description of the procedure).

Results of the 15 individual group drawn from Larson Cemetery showed that all femora were matched correctly, all tibiae were matched correctly, and one pair of humeri was missed (see Table 15). The error with the humeri was due to a pathological specimen which had undergone severe remodeling resulting from a probable dislocation. In the situation involving erroneous pair-matching, the MNI underestimates the true number by six individuals and the incorrect LI overestimates the actual number by almost six individuals.

Table 15: Results of the 15 Individual Pair-Matching Test (“-” signifies that no errors were made during the procedure)

	Femora	Tibiae	Humeri
Correct LI	13.3	10.2	15.0
Incorrect LI	-	-	20.5
MNI	9	7	9

Correct pair-matching would have provided a perfect estimate. It is worth observing that the MNI derived by the Max(L,R) variant is not susceptible to miscalculations from incorrect pair-matching, simply because pairs are irrelevant for its calculation. Furthermore, the miscalculation with the humeri demonstrates how important accurate pair-matching is for the LI due to the multiplicative nature of the technique. This is especially true when working with small samples. The results of the 15 individual test show that with a small sample size and good recovery, the MNI provides a reasonable, yet minimal estimate and is not subject to the potentially severe errors of the LI. Correct pair-matching with the LI will always provide more realistic counts than the MNI if any data loss has occurred.

Results of the 30 individual test revealed that one pair was missed with the humeri, one pair was missed with the tibiae, and all femora were correctly pair-matched (see Table 16). The estimates derived from this set show that the LI is more forgiving of missed pair-matches with a larger sample. Even with a missed pair, it provides results which are much closer to the actual number of individuals than the MNI. Of course, extreme errors in

Table 16: Results of the 30 Individuals Pair-Matching Test (“-” signifies that no errors were made during the procedure)

	Femora	Tibiae	Humeri
Correct LI	28.3	30.7	29.7
Incorrect LI	-	33.5	32.3
MNI	21	19	20

pair-matching will produce useless results. The LI should only be used if pair-matches can be confidently assigned.

The two samples drawn from Larson Cemetery show that, of the long bones tested, femora are the most accurately pair-matched. This is presumably a result of the obvious differences in length, robusticity, and overall distinct morphology of the femur. As previously stated, the os coxae were not tested with the cemetery sample, but are regarded as the most easily paired element in the human body. Tibiae are considered a reliable element for pair-matching, but they do not have as many distinctive traits as the femora or os coxae. Finally, humeri are the hardest bones for pair-matching considered as part of this test. The potential difficulty with the humeri probably results from the differential morphology caused by handedness. It is common for true paired elements to significantly vary in length and robusticity. Ranking the elements utilized in this thesis from the most easily paired to the most difficult, they would be: Os coxae, Femora, Tibiae, and Humeri.

Results of the Larson Cemetery pair-matching test suggest that it is more likely for errors in pair-matching to occur from overlooking true pairs, as opposed to the pairing of unrelated elements. It is suspected that this tendency may change if the sample size is substantially increased since variation between individuals may not be as obvious. The main reason for any difficulty in pair-matching is that fragmentation, even minimal, can obliterate key areas used for identifying a match. Subsequently, the results obtained here show that errors in the calculation of the LI will tend to overestimate the actual number of individuals by inflating the unpaired elements used in the multiplicative portion of the equation and diminishing the number of pairs which is used as the divisor. Generally, if a group of commingled bones is recovered in a good state of preservation, the primary concerns for incorrect/missed pair-matches are due to pathological elements and asymmetric morphology.

This situation is suspected to be of little concern due to the infrequency of occurrences which would be drastic enough to mask legitimate matches.

Overall, the Larson Cemetery pair-matching test provided encouraging results. If pair-matching and conjoining is performed by an experienced osteologist, accurate results can be derived. Of greatest utility for implementing the LI on human remains is the os coxae due to the relative ease of pair-matching and demographic information which it provides. Although this element would be preferable, other bones which may occur with greater frequency can still be effectively utilized. The greatest number of pairs is of utmost importance when computing the LI due to the increased reliability of the estimate.

Hypothetical Results Obtained from Computer Simulation

As has been discussed in this thesis, the recovery of skeletal elements from any type of situation is dependent on the taphonomic forces acting on the bones, as well as on the methodology employed through excavation techniques. Some degree of data loss will occur almost universally. This section will discuss simulated results derived from the computer program SIMLIN.

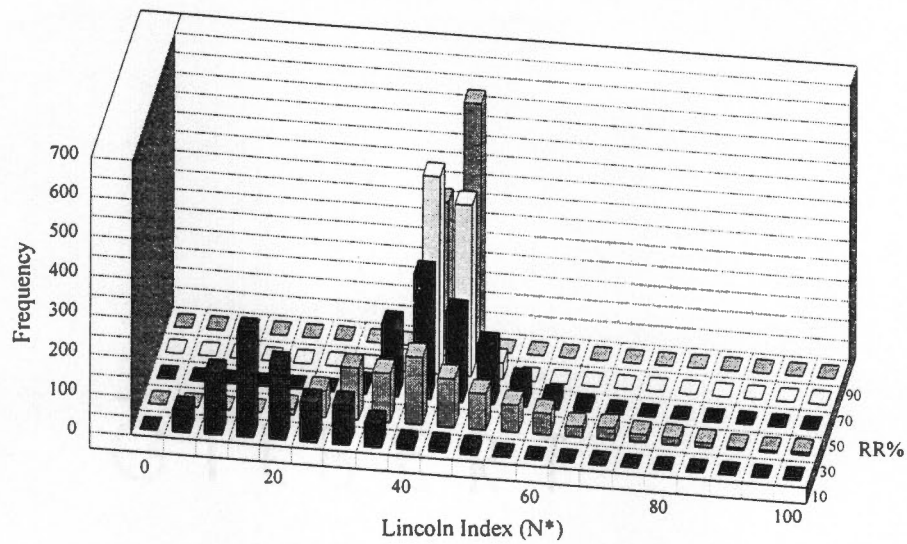
Histograms of the behavior of the MNI, derived by the Max(L,R) method, clearly show that this estimate is completely dependent on the percentage of recovered elements. For example, if the original sample was composed of 100 individuals but only 10% of the elements were recovered, the expected MNI would be 10 individuals. Similarly, if 90% of the elements were recovered the estimate would be close to 90 individuals. Granted that the original population estimate determined through the recovery of ancient remains can almost

never be verified, but the general trend of the MNI's behavior proves the need for caution with its use as a quantifier of abundance. Even in circumstances of near complete recovery, it will still be an underestimate of the *original* population. The histograms in Figure 7 show this obvious relationship based on a hypothetical original population of 40 individuals and various degrees of recovery. Also, Figure 7 shows the trends present in Seber's LI estimates with different recovery rates. It is very apparent that these estimates are not as dependent on a high degree of recovery as is the MNI.

Histograms associated with the LI show that relatively accurate estimates can be derived from samples in which recovery rates are as low as 20% of the total death assemblage. Notice in Figures 7 and 8 that the LI generally underestimates the original population when recovery rates are 10%, but at 20% the range of estimates surrounds the actual number. It is also very evident in these histograms that the precision of the LI is greater when recovery rates are high. This pattern is related to the fact that confidence intervals associated with the LI become smaller as the number of pairs increases. Obviously, more pairs will be discovered when recovery reaches 90% than when recovery is only 10%. It is worth re-mentioning that Waldron's 1987 study of a London cemetery showed preservation of large elements to generally be greater than 50 percent.

Through the hypothetical data sets it was apparent that two separate methods could be used to estimate the recovery rate of an assemblage. The first method is based on the relationship between the MNI and the original number of individuals. Since it has been shown that the MNI is completely dependent on the recovery rate and that the LI is an

Seber's LI (N^*) VS. Recovery (based on 40 individuals)



MNI VS. Recovery (based on 40 individuals)

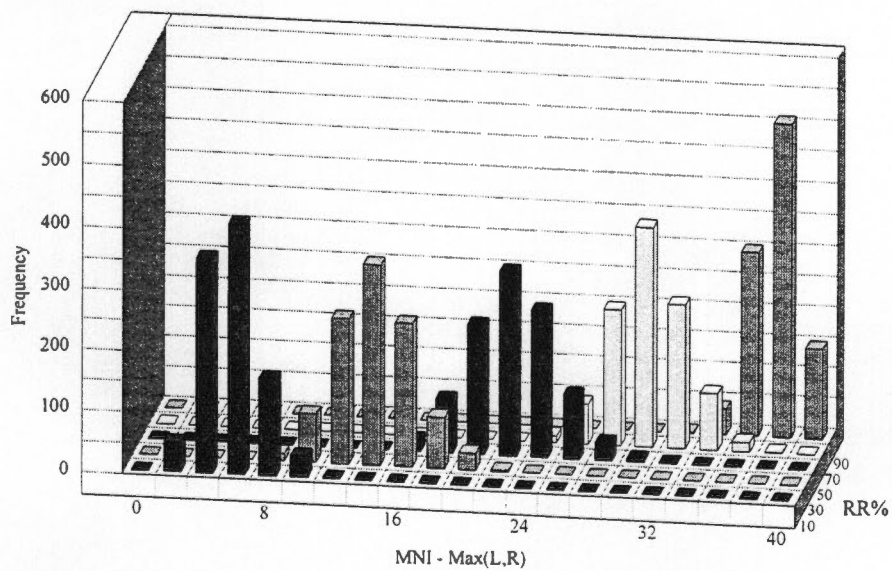


Figure 7: Comparison of LI and MNI with Varying Recovery Rates (RR)

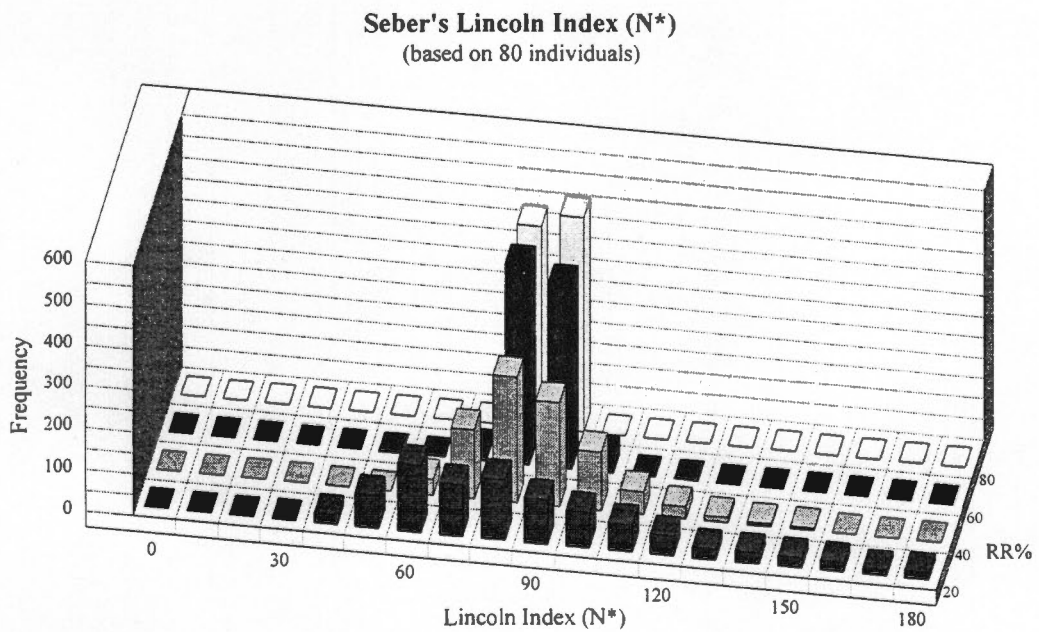
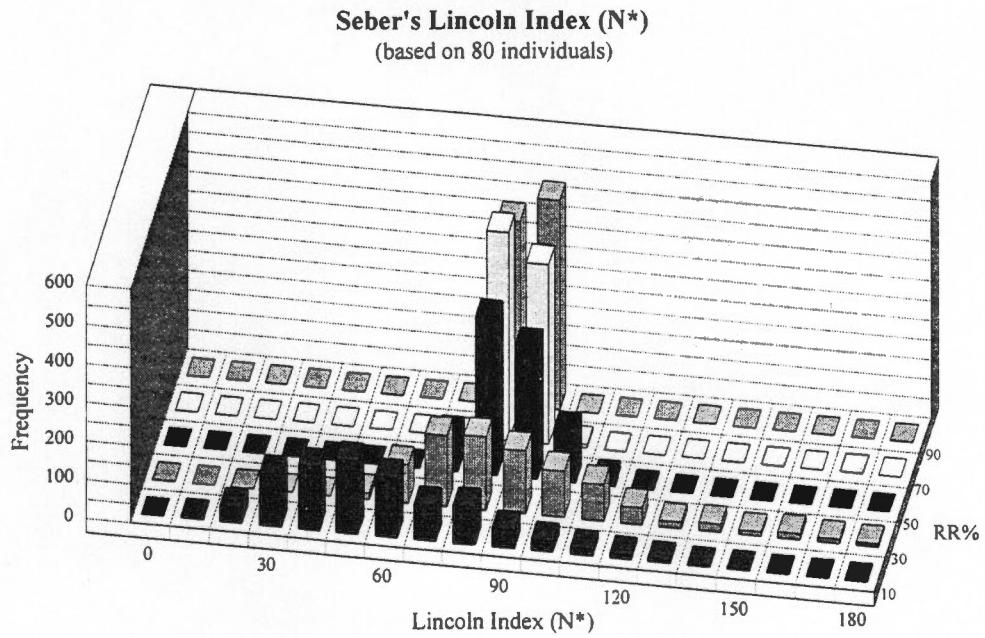


Figure 8: Comparison of Seber's LI with Varying Recovery Rates (RR)

accurate estimate of the original population, a logical ratio which will reveal the recovery rate is:

$$\frac{MNI}{N*} \quad (15)$$

The second method for estimating the recovery rate is based on the relationship between the number of left and right bones and the number of pairs. It can be derived by calculating:

$$\frac{P}{(L+R)/2} \quad (16)$$

Equation (16) will usually be less than (15), but both should provide similar results. Problems with equation (16) may arise due to small sample sizes or lack of pairs. Figure 9 shows the accuracy of the two methods based on varying degrees of recovery, while table 17 provides the averages of the estimated recovery rates across 1000 runs of SIMLIN derived by both equations. Notice that the average recovery rate estimated by equation (15) is incorrect when the actual recovery is only 10%. This is likely a reflection of the inaccuracy of the LI estimates which occur when recovery is below 20%.

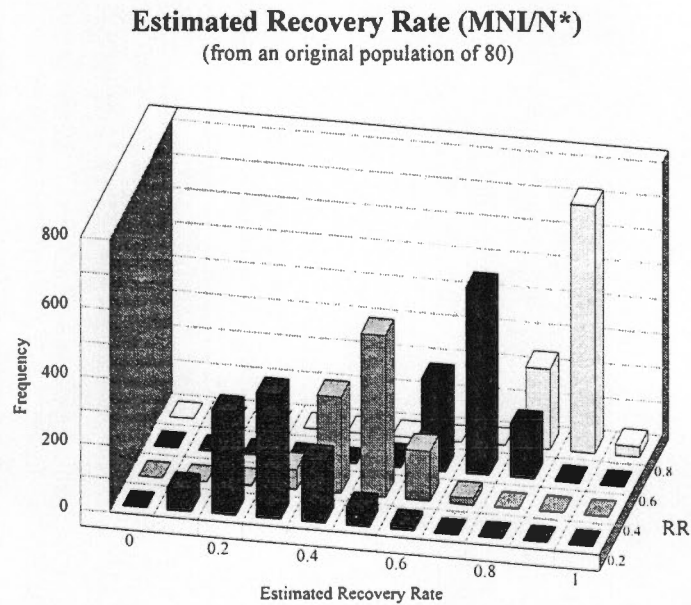
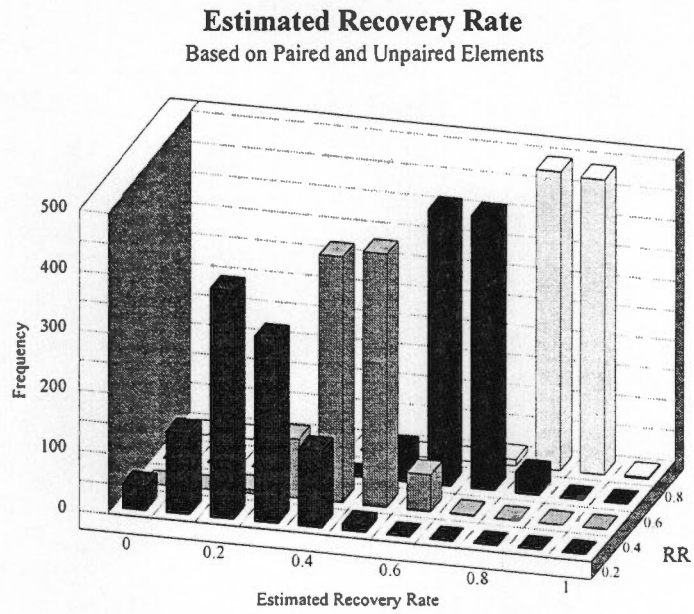


Figure 9: Approximate Recovery Rates Derived from the Two Different Methods Versus the Actual Recovery Rate (RR)

Table 17: Average of Both Methods for Estimating Recovery Rate Across 1000 Runs of SIMLIN (original number of individuals = 80)

Actual Recovery Rate	.10	.20	.30	.40	.50	.60	.70	.80	.90
Estimated Recovery Rate $\left(\frac{P}{(L+R)/2} \right)$	.096	.195	.295	.379	.495	.598	.698	.799	.900
Estimated Recovery Rate (MNI/N*)	.215	.238	.331	.430	.532	.634	.731	.827	.920

Since two primary derivations of the LI exist ($\hat{N}$ and N^* , see equations 2 and 4/5), it was necessary to test their behaviors and accuracies (see Figure 10). While both the biased LI ($\hat{N}$) and Seber's LI (N^*) provide very similar results when recovery rates are over 30%, Seber's LI is superior in all other circumstances. Seber's LI was derived specifically in order to remove bias from small sample sizes. Since actual recovery rates can only be approximated, Seber's LI is preferable in all situations. Table 18 provides 95% confidence intervals of the mean difference between the two variants of the LI and shows that the difference between the two is minimal when recovery is over 30%. These were computed by taking the *mean difference* $\pm 1.96(\text{standard error of the mean})$ across 1000 simulation runs. The *standard error of the mean* is computed as:

$$\frac{stddev}{\sqrt{N}}$$

where *stddev* is the standard deviation. When the recovery rate is suspected to be low and/or pair-matches cannot be found, it is imperative to use Seber's LI.

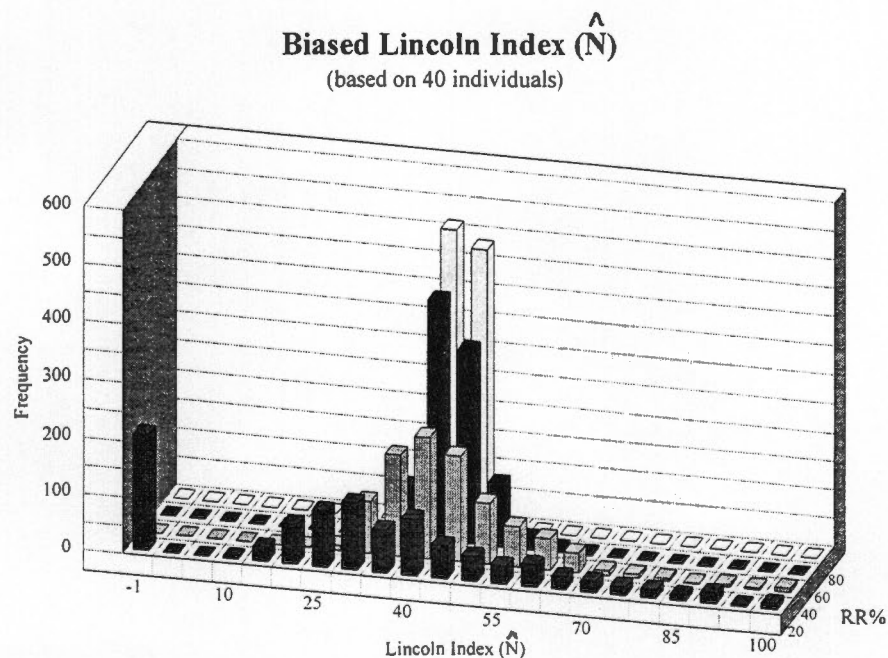
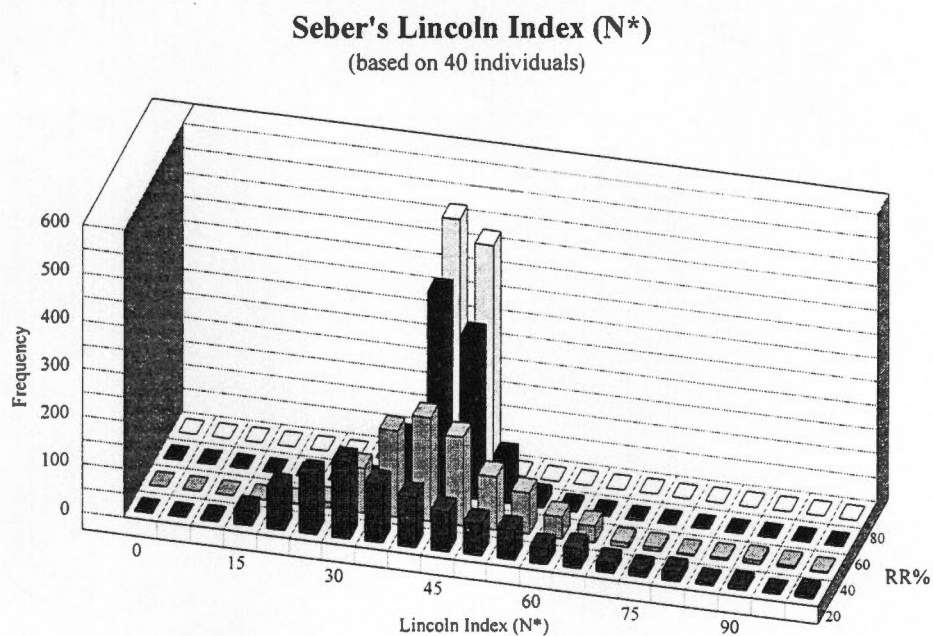


Figure 10: Comparison of Seber's LI and the Biased LI with Varying Recovery Rates (RR) * "1" signifies that no pairs were present *****

Table 18: 95% Confidence Intervals for the Mean Difference in the Two LI Methods ("N/A" signifies that the confidence interval could not be derived since pairs were often not present and the biased LI was impossible to calculate)

	20 Individuals	40 Individuals	80 Individuals
90% Recovery	.013-.015	.012-.014	.012-.013
60% Recovery	.330-.457	.341-.370	.405-.430
40% Recovery	.003-1.047	.585-1.080	.063-.109
30% Recovery	N/A	N/A	.800-1.837
20% Recovery	N/A	N/A	N/A

If recovery is below 30%, it is much more likely that no pairs will be present. This can be demonstrated by the histograms in Figure 10. All estimates within the column labeled "-1" signify that no pairs were present and the biased LI was not applicable since the divisor was zero. Turner (1983, 1984) and Fieller and Turner (1982) suggest using the formula $(L+1)(R+1)$ in this situation, but this is very similar to the formula implemented with Seber's LI, as has been previously discussed. Comparison of the two histograms in Figure 10 shows that with the biased LI, almost 20% of the runs had no pairs present when recovery was 20%, making the formula impossible to calculate. With Seber's LI, an estimate can always be derived, regardless of the presence of pairs. The power of Seber's LI is easily observable from Figure 10 in which 1000 runs of the hypothetical program SIMLIN (described in Chapter 3) never produced estimates which fell below 15 individuals when the recovery rate was 20% and the original population was 40 individuals.

In essence, Seber's LI will provide estimates that are nearly equivalent to the biased LI, or else they will be more accurate. Although Seber's derivation is slightly more complicated (see Chapter 2), it can still be easily obtained on a calculator or spreadsheet. As a basis of inferring the recovery rate and the reliability of the estimate, the two previously discussed methods can be utilized for this purpose (see equations 15 and 16). The Larson Village sample provides a good example of a high recovery rate which is very apparent through the similar LI and MNI estimates.

Comparison of the LI with the MNI: the human remains from Larson Village

The results derived from the Larson Village data are reasonably consistent with those obtained by Owsley et al. (1977) concerning MNI counts for each lodge. Owsley et al. (1977:121) state that for their study "A minimum count was obtained by counting the major bones, and dividing them into rights and lefts." This suggests the Max(L,R) variant of the MNI was employed. All of the MNI estimates derived in the present study were within one individual of the counts reported by Owsley et al. (1977). Although this difference is trivial, it is likely due to the fact that a complete inventory of all the elements was not undertaken for this thesis.

All of the LI point estimates (N^*) derived for each of the four elements inventoried from Lodge 21 are between 50 and 52 individuals (see Figures 11-14 for the point estimates and confidence intervals derived from the hypergeometric distribution), while the MNI reported by Owsley et al. is 44 individuals. By assuming independence and combining the estimates from each of the four elements, a 95% confidence interval

of 48-53 individuals was derived with a point estimate of 50 individuals (see Figure 15). The slightly higher LI estimate (~ 6 more than the MNI) provides evidence for the high recovery rate achieved at Larson Village, but it also shows that data loss did occur and that the MNI is an underestimate. By applying formula (15) for estimating recovery rate, it appears that approximately 88% of the sample was collected from Larson Village.

Because of the relatively large sample size associated with Lodge 21 compared with the other lodges, it was possible to sub-divide the assemblage according to age and sex criteria (see Table 19). These counts were derived using equation (8) as suggested by Chapman (1951). Individuals whose sex or age could not be determined were not included in these calculations. Estimates derived for the total number of adults compared

Table 19: LI Estimates for Lodge 21 (first number is the point estimate, the number in parentheses is the square root of the variance)

	Adult Males (N^*_x)	Adult Females (N^*_x)	Total Adults (N^*_x)	Total Subadults (N^*_x)	Grand Total (N^*)
Os Coxae	12.94 (3.52)	4.31 (1.80)	23.72 (5.37)	26.95 (5.91)	49.67
Femora	15.90 (3.94)	5.30 (1.98)	28.62 (5.99)	22.26 (4.98)	49.88
Tibiae	15.27 (4.62)	8.22 (3.02)	25.83 (6.86)	25.83 (6.86)	50.67
Humeri	13.79 (4.14)	9.19 (3.15)	27.58 (6.92)	25.29 (6.47)	51.87

with the total number of subadults shows that the counts are very similar. Comparison between the estimates derived for male and female adults clearly reveals that a large discrepancy exists. This may support suspicions that females were captured by the attacking group instead of being killed (Owsley et al. 1977).

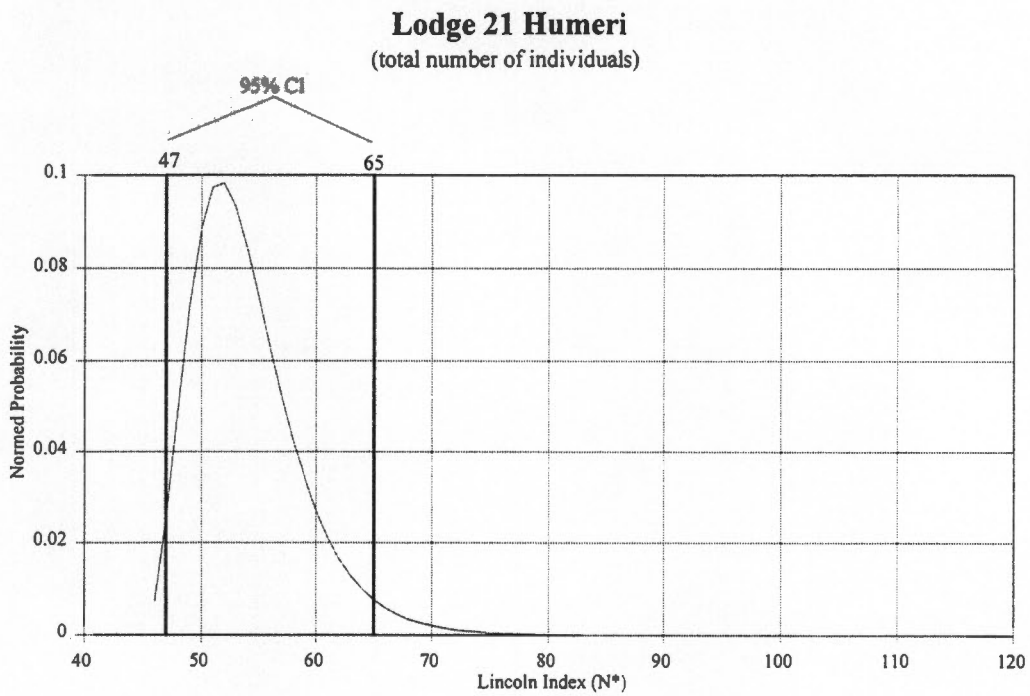


Figure 11: Total Number of Individuals from Lodge 21 (based on Humeri)

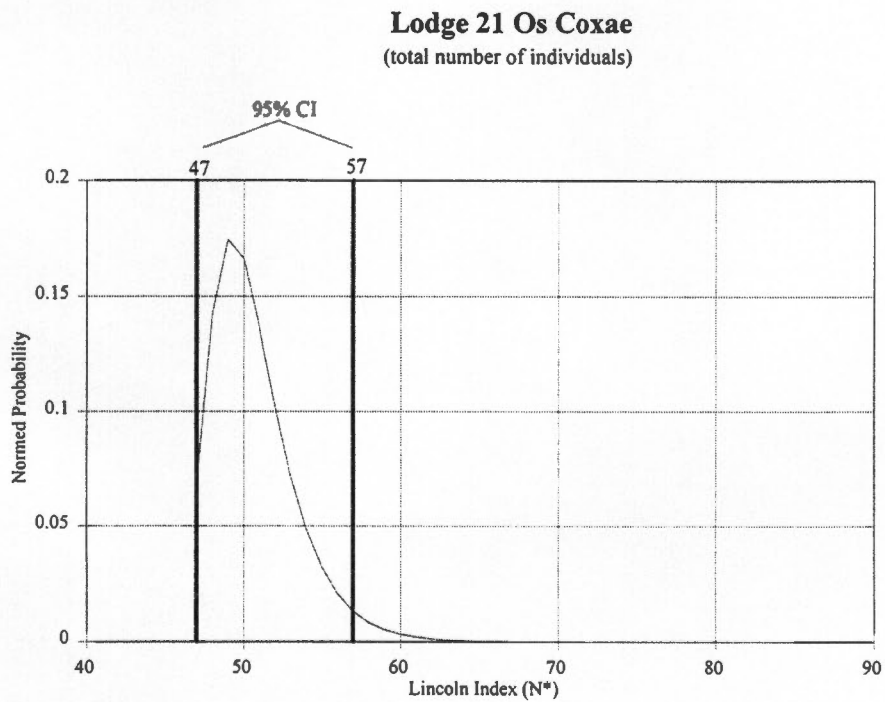


Figure 12: Total Number of Individuals from Lodge 21 (based on Os Coxae)

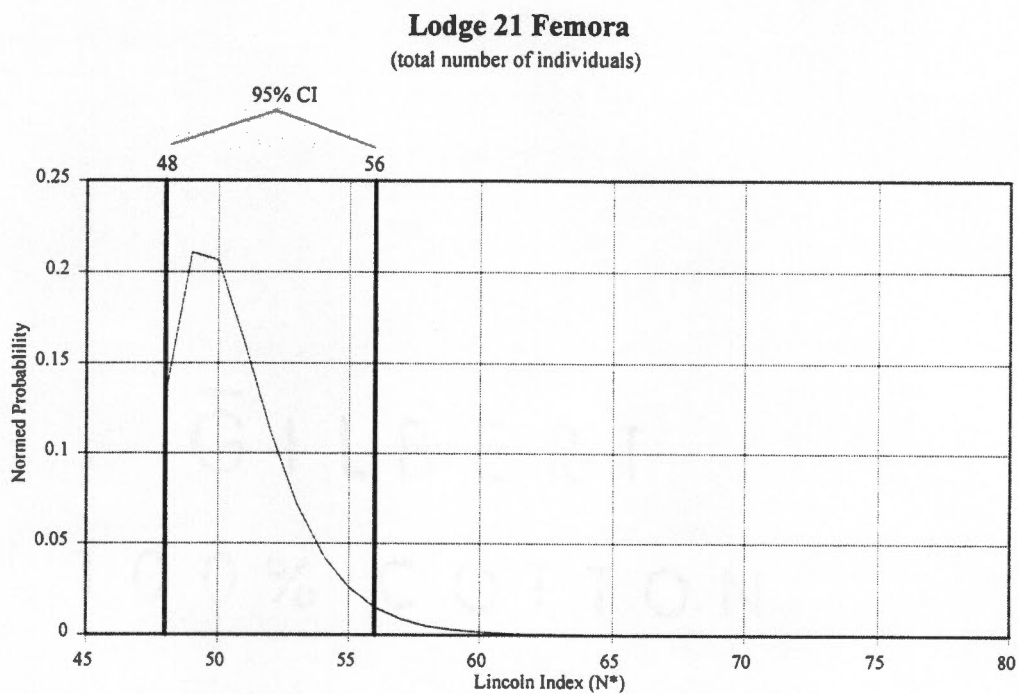


Figure 13: Total Number of Individuals from Lodge 21 (based on Femora)

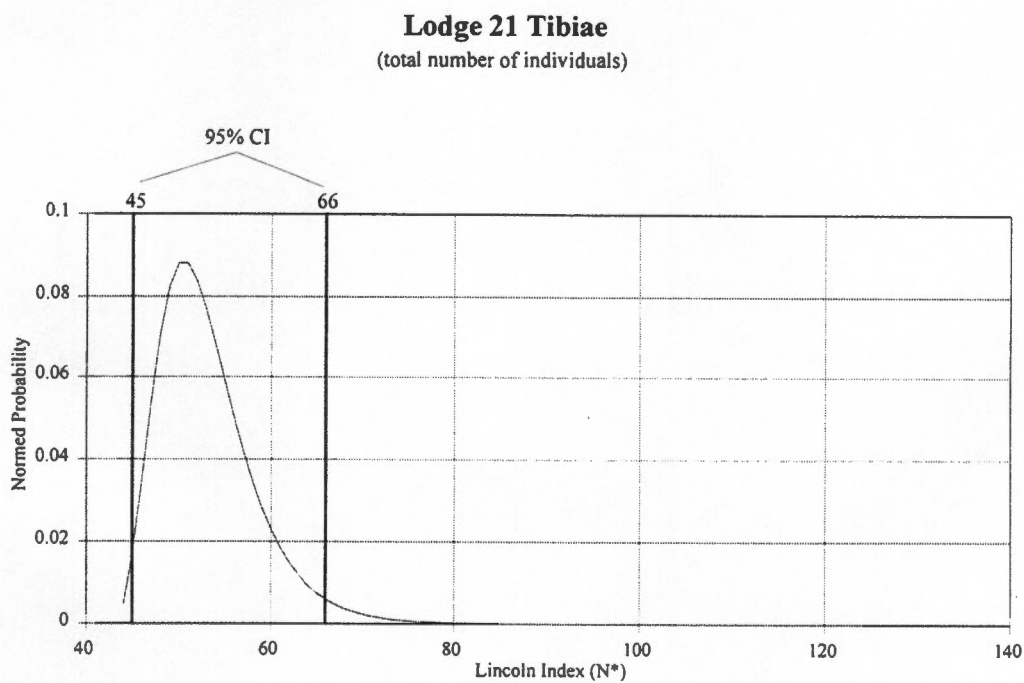


Figure 14: Total Number of Individuals from Lodge 21 (based on Tibiae)

Lodge 21 Combined Estimate (total number of individuals)

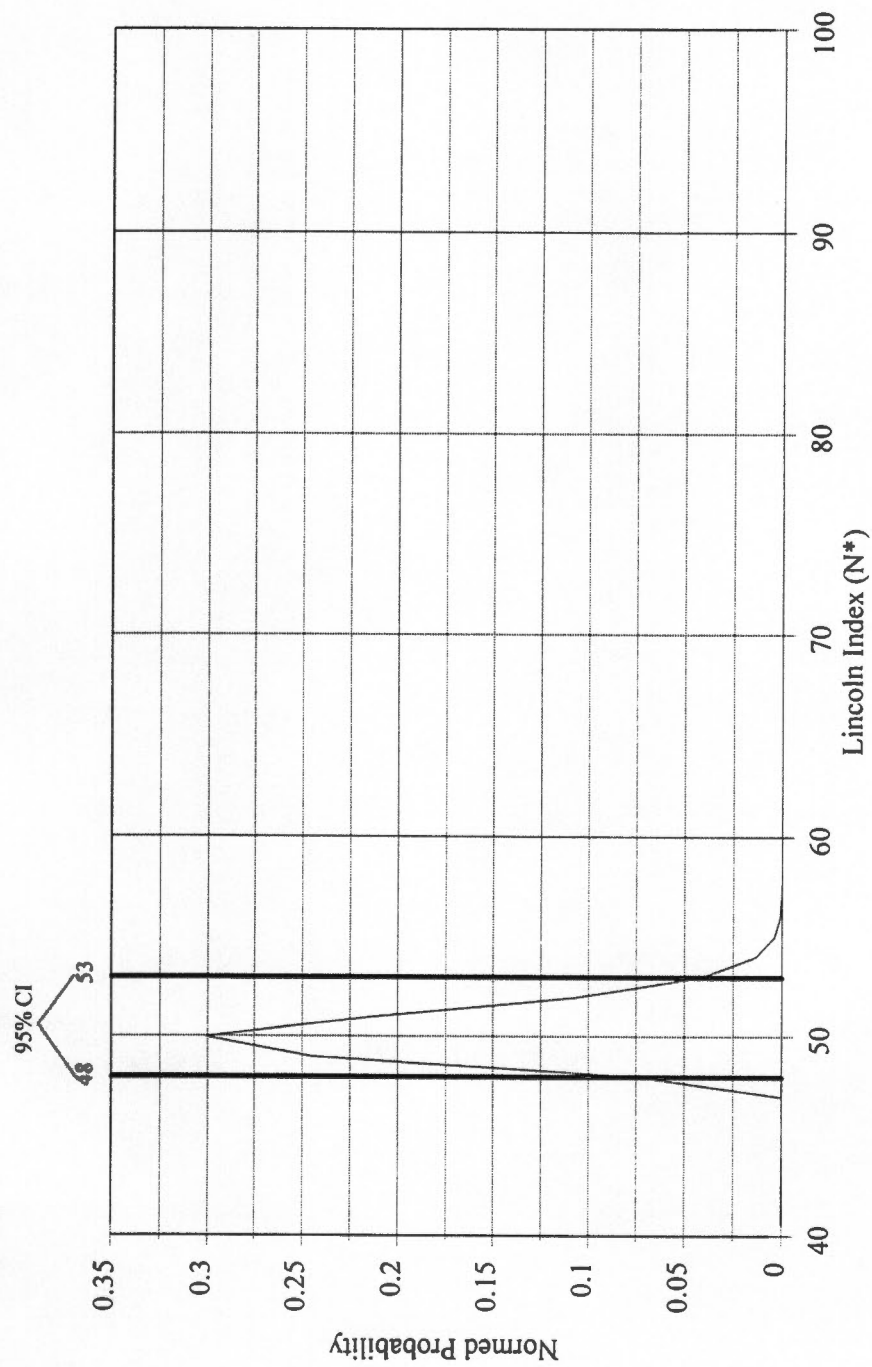


Figure 15: Combined Estimate Derived by Assuming Independence of All Elements

Almost all of the individuals present in Lodge 1 were subadults, while Lodge 23 was primarily composed of adults. Unfortunately, the small sample sizes associated with these two lodges prohibited subdivisions into representative groups. Tables 20 and 21 show the total counts derived for these lodges with the LI and the MNI. Notice that the estimates for the two techniques are very similar or identical. Lodges 1 and 23 provide excellent examples of how good recovery can lead to agreement between the two methods. Also, they provide a good example of the limitations which occur with the LI due to small sample size. It is suggested that the MNI and the LI should both be calculated and reported so that the recovery rate can be determined through the variation in the two estimates.

Table 20: Total Counts from Lodge 1 (numbers in parentheses are 95% CI)

	Femora	Tibiae	Humeri	Os Coxae
Seber's LI (N*)	9.7 (9-22)	7.4 (7-22)	13.7 (12-36)	8 (8-12)
MNI	7	6	10	8

Table 21: Total Counts from Lodge 23 (numbers in parentheses are 95% CI)

	Femora	Tibiae	Humeri	Os Coxae
Seber's LI (N*)	6 (6-14)	7 (7-13)	5 (5-22)	6 (6-14)
MNI	6	7	5	6

Results for all three lodges from the Larson Village analysis are reasonably supportive of Badgley's (1986) view towards the MNI which suggests in situations of good preservation, near complete recovery, and deposition resulting from a single event, that the MNI estimates will be close to the original population. Similarly, in this type of situation the LI results should be extremely accurate and agreement between the two techniques can be used to prove that a high degree of recovery was achieved (see equation 15). It is considered advisable to compute the LI whenever it is feasible since it will be much more accurate than the MNI when recovery is not quite so complete.

Several factors seem to be responsible for the excellent state of preservation and nearly complete recovery of the remains from Larson Village. First, the bones were at least partially protected by the lodge roofs from extensive deterioration. Also, excavation was facilitated by easily recognizable lodge structures with obvious boundaries. Finally, all of the individuals were killed as the result of one distinct event so that deposition was not gradual. This type of ideal situation will be the exception rather than the rule in most cases, but even so it is important to realize that a difference does exist between the MNI and LI estimates.

CHAPTER 5: SUMMARY AND CONCLUSIONS

Summary

Data loss from skeletal assemblages can occur as a result of many distinct processes, i.e. taphonomic forces. Some of these include disarticulation, dispersal, fossilization, mechanical alteration, recovery bias, curational factors, and analysis. Any study which attempts to draw conclusions based on archaeologically recovered material needs to implement the most appropriate quantification technique available. The field of zooarchaeology has many alternatives available for estimating species abundance which can be easily applied to human remains. Since many of the potential biases which are intrinsic to utilitarian faunal remains are not applicable to mortuary situations, the results derived from the human bones will often be more reliable. For human skeletal remains the only option usually considered for the purpose of estimating the original population size has been the MNI. This thesis has compared many different quantification techniques currently employed by faunal analysts and has shown through computer simulation and actual commingled human remains that the LI is the best estimator of the original death assemblage, not the MNI. The strength of this technique is that it can account for taphonomic biases which are an inherent part of archaeological samples with negligible effects to the estimate.

Due to the precedence set by studies using only the MNI as a quantifier of abundance for the past several decades, its use is not anticipated to cease. The goal of this thesis is not to bring the MNI into obsolescence, but rather to suggest the implementation

of a potentially superior method of quantification. The LI provides a more realistic reconstruction of past population counts from commingled situations and supplies researchers with more accurate figures from which to present demographic results. The MNI should still be reported, but alongside the LI instead of alone. Similar results between the MNI and LI only provides added support for the reliability of the estimates and a high recovery rate. Discrepancies between the two methods demonstrate the MNI's correlation with the recovery rate and its inability to estimate the *original* population when data loss has occurred. The LI behavior is not as susceptible to recovery rates and its estimates provide a more accurate reconstruction of the *original* numbers of the dead.

Although estimates derived for the biased LI and Seber's LI will often be nearly identical, this study has shown Seber's LI to be superior in instances when recovery is extremely poor, i.e. less than 30%. It is suggested that interpretations should be made based on Seber's LI in all circumstances since its derivation is only slightly more complicated and it is a less biased estimate.

If fragmentation is extensive or preservation is extremely poor so that accurate pair-matches are impossible to determine, the LI is prone to gross miscalculations due to the multiplicative nature of the procedure. In this type of situation, no method is available which can provide accurate estimates of original populations. At best, an MNI and NISP ratio can be derived in order to demonstrate the degree of fragmentation, but any further interpretations are hazardous.

In situations of recovery greater than 20% and good preservation, the use of the LI provides an accurate assessment of the actual population which contributed to the

recovered osteological assemblage. The total population can be divided into sub-groups (i.e. age cohorts) using modifications to the LI for presenting a more detailed demographic reconstruction. It is also possible to apply confidence intervals to these estimates, a feature not available with some of the other techniques. Overall, the LI provides results which are of much more value for interpretation than any other quantification technique currently employed. The results of this thesis are essential for demonstrating the utility of the LI with commingled human remains.

Future Research Possibilities

White (1992) warns against computer matching programs such as the one outlined by Nichol and Creak (1979), but perhaps something to assist this procedure would be helpful. If the assemblage size is small and manageable, pair-matching should be efficiently performed by the analyst, but with very large collections computer assistance may greatly expedite pair-matching. It would be dangerous and ill-advised to totally remove the human eye which can discern more subtleties than a computer, but some type of automated assistance may prove beneficial.

Further research and experimentation needs to be undertaken using the LI with human remains. This thesis has shown that it appears to be a useful technique for many situations which are encountered, but more examples of its implementation are necessary to provide added support for its use. The only way for a method to gain acceptance is for it to be frequently utilized and the subsequent results made accessible to other researchers.

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GILBERT

100% COTTON

APPENDICES

APPENDIX A

CODES USED FOR INVENTORY SHEET

Unique Identification Number (abbreviated ID#)

The majority of the numbers consist of the lodge number followed by a sequential number (i.e. 21-456). If the lodge number was unknown or not applicable, a different prefix was attached. For example, a random bone which was collected during a beach survey might have been labeled as rb-978, while a bone discovered in excavation unit 5 might have been cataloged as xu5-246.

River Basin Survey Catalog Number (abbreviated CAT#)

This number is the original catalog number used for the Larson site inventory. It consists of the site number and a catalog number (i.e. 39WW2-287). For the recordation of these numbers with this study, the site number was left off and only the catalog number was noted.

Box Number (abbreviated BOX)

This number designates the box in which each element was being curated. The designation is random in that it only signifies the order in which each box was encountered. The utility of this number is that removal and replacement of elements into their correct boxes was greatly facilitated. Numbers range from 0 to 75. Box 0 signifies that the bone has been removed and is currently being used as a teaching specimen of maturational changes.

Age

s =subadult
a =adult
u =unknown

Sex

m =male
f =female
u =unknown

Element (abbreviated ELM)

hu =humerus
ra =radius
ul =ulna
fe =femur
ti =tibia
fi =fibula
il =ilium
is =ischium
pu =pubis

Side (abbreviated SID)

l =left
r =right
u =unknown

Completeness (abbreviated COM)

1 =75-100%
2 =50-75%
3 =1-50%
4 =absent

Proximal Epiphysis (abbreviated PXEP)

(use completeness codes)

Proximal 1/3 Diaphysis (abbreviated PXDP)

(use completeness codes)

Middle 1/3 Diaphysis (abbreviated MDDP)

(use completeness codes)

Distal 1/3 Diaphysis (abbreviated DSDP)

(use completeness codes)

Distal Epiphysis (abbreviated DSEP)

(use completeness codes)

Cutmarks (abbreviated CUT)

0 =absent
1 =present

Animal Gnawing/Chewing (abbreviated AML)

0 =absent

1 =present

Weathering (abbreviated WEA)

0-V (after Behrensmeyer, 1978)

Burned Color (abbreviated BRN)

0 =unburned

1 =smoked (dark brown/black)

2 =calcined (white)

Paired (abbreviated PAIR)

(ID# of corresponding paired element)

Measurements

MEASUREMENT #1 (abbreviated M1)

tibia =*maximum epiphyseal breadth of the proximal end* (BPE)

humerus =*maximum vertical diameter of the head* (MDH)

femur =*maximum diameter of the head* (VHD)

MEASUREMENT #2 (abbreviated M2)

tibia =*maximum epiphyseal breadth of the distal end* (BDE)

humerus =*maximum diameter at midshaft* (MDS)

femur =*minimum shaft circumference* (MSC)

MEASUREMENT #3 (abbreviated M3)

tibia =*maximum diameter at the nutrient foramen* (APN)

humerus =*minimum diameter at midshaft* (MDM)

MEASUREMENT #4 (abbreviated M4)

humerus =*epicondylar breadth* (EBR)

Comments (abbreviated COMM)

This section was used to record pathologies, conjoining of fragments, provenience data, and general observations.

39WW2 INVENTORY

ID#	CAT#	BOX	AGE	SEX	ELM	SID	COM	PXEP	PXDP	MDDP	DSDP	DSEP	CUT	AML	WEA	BRN	PAIR	M1	M2	M3	M4	COMM
1-079	270	56 a	m	fe	f		1	2	1	1	1	1	0	0	0	0		51	91			
1-116	288	64 a	m	fe	f			1	1	1	1	1	0	0	0	0		44	79			postmortem cuts on prox epiphysis
1-164	268	67 s	m	fe	f			1	1	1	2	4	0	0	0	0	200	48	85			woven bone, active periosteal reaction
1-183	289	68 s	u	te	f			4	1	1	2	4	0	1	1	0		52				woven bone, periosteal reaction
1-200	289	68 s	u	te	f			4	2	1	1	4	0	1	1	0	164		86			
1-331	267	69 s	u	te	f			1	1	1	2	4	0	0	0	0		50				
1-332	267	69 s	u	te	f			1	1	1		4	0	0	0	0		50				
1-358	287	69 s	u	te	f								0	0	0	0		57				
1-359	287	69 s	u	te	f								0	0	0	0		57				
1-388	289	72 a	u	te	f			1	1	3	4	4	0	0	1	1		40				
1-477	265	74 s	u	te	f								0	0	0	0		67				
1-478	265	74 s	u	te	f			3	1	1	1	3	0	0	0	0		66				active periosteal reaction and poss. bone remodeling at prox end... similar reaction on ilium
1-514	269	63 s	u	te	f		1						0	0	0	0		63				
1-515	269	63 s	u	te	f		1						0	0	0	0		60				
21-0022	1009	1 a	u	te	f			1	1	4	4	4	0	0	0	0		44	76			diaphysis appears swollen (infection or healed break ?)
21-0057	1010	2 s	u	te	f			4	1	1	1	4	0	0	0	0	58		84			cut at prox end (postmortem ?)
21-0058	1010	2 s	u	te	f			1	1	1	1	4	1	0	0	0	57	44	77			perimortem bread on diaphysis
21-0079	1010	2 a	u	te	f			1	1	1	4	4	0	0	0	0		44	81			joined w/ 359
21-0080	1010	2 a	u	te	f			4	4	1	4	4	0	0	0	0	95	51	87			
21-0094	1010	2 a	m	te	f			2	1	1	1	1	0	0	0	0	94	88				
21-0095	1010	2 a	m	te	f								0	0	0	0	118	49	92			
21-0117	1012	3 a	m	te	f		1						0	1	0	0	117	49	88			
21-0118	1012	3 a	m	te	f		1						0	0	0	0	224	42				
21-0223	1031	5 s	u	te	f			4	1	1	1	4	0	0	0	0	223	45	93			
21-0224	1031	5 s	u	te	f			4					0	0	0	0						
21-0253	1063	6 a	u	te	f		1						0	0	0	0						
21-0261	1063	6 s	u	te	f			1	1	1	1	4	0	0	0	0	1351		70			joined w/ 1350
21-0284	1064	7 s	u	te	f			4	4	4	4	1	0	0	0	0	1135					joined w/ 1154
21-0285	1064	7 s	u	te	f			4	4	4	4	1	0	0	0	0	287?					joined w/ 1091
21-0286	1064	35 s	u	te	f			4	4	4	4	1	0	0	0	0	286?					joined w/ 1372
21-0287	1064	35 s	u	te	f			4	4	4	4	1	0	0	0	0	1373					joined w/ 1373
21-0337	1065	8 s	u	te	f			4	3	4	4	4	0	0	0	0	1372					joined w/ 80
21-0338	1065	8 s	u	te	f			1	4	4	4	4	0	0	0	0						joined w/ 1334
21-0359	1066	8 s	u	te	f			2	1	3	4	4	0	0	0	0		43	81			
21-0371	1065	8 s	u	te	f			4	4	4	4	4	0	0	0	0	1335					
21-0372	1065	8 s	u	te	f			4	1	1	3	4	0	0	0	0	1305		58			
21-0378	1065	1 a?	u	te	f			4	1	1	1	4	0	0	0	0						joined w/ 22
21-0426	1405	9 a	m	te	f		1		4				1	0	0	0	1478	47	92			
21-1015	934	28 a	f	te	f								0	0	0	0	1016	82				
21-1016	934	28 a	f	te	f								0	0	0	0	1015	43	82			
21-1026	934	28 s	f	te	f			1	1	1	1	4	0	0	0	0	1410	42	76			
21-1031	932	29 a	m	te	f			4	1	1	1	1	0	0	0	0		91				
21-1041	955	30 s	f	te	f			1	1	1	1	4	0	0	0	0	1042	38	71			
21-1042	955	30 s	f	te	f			1	1	1	2	4	0	0	0	0	1041	40	72			
21-1056	966	31 s	m?	te	f			1	1	1	1	4	0	0	0	0	1251					
21-1060	954?	31 a	u	te	?			3	4	4	4	4	0	0	0	0						
21-1067	990	32 a	m	te	f			1	1	1	3	4	0	0	0	0		46	91			
21-1087	992	33 a	u	te	f			4	4	4	3	2	0	0	0	0						
21-1091	941	35 s	f	te	f			1	1	1	1	4	0	0	0	0	286?	42	76			poss. periosteal reaction on shaft ... w/ 1100? ... joined w/ 287

39WM2 INVENTORY

ID#	CAT#	BOX	AGE	SEX	ELM	SID	COM	PXEP	PXDP	MDDP	DSDP	DSEP	CUT	AML	WEA	BRN	PAIR	M1	M2	M3	M4	COMM
21-1105	994	36 a	m	fe	1		1						1	0	0	0	1106	50	90			poss. cuts on dist end (postmortem?) ... curious depression on dist/post surf ... 1105-1112
21-1106	994	36 a	m	fe	1			3	1	1	1	1	0	0	0	0	1105		90			1113-1125
21-1113	993	37 s	f	fe	1			1	1	1	1	4	0	0	0	0	1114	40	69			
21-1114	993	37 s	f	fe	1			1	1	1	1	4	0	0	0	0	1113	40	70			
21-1138	974	39 s	u	fe	1			4	1	1	1	4	0	0	0	0			61			joined w/ 285
21-1154	1000	41 s	u	fe	1			1	1	1	1	4	0	0	0	0	1155		58			
21-1155	1000	41 s	u	fe	1			1	1	1	1	4	0	0	0	0	1154		59			
21-1161	1000	41 a	m	fe	1			1	1	1	1	4	0	0	0	0			90			
21-1166	1011	42 a	m	fe	1			1	1	1	1	4	0	0	0	0			86			1164/5
21-1180	961	44 a	f	fe	1								0	0	0	0	1181	42	83			
21-1181	961	44 a	f	fe	1								0	0	0	0	1180	42	82			
21-1191	961	44 a	m	fe	1			1	1	1	1	4	0	0	0	0	1192	48	95			1191-1200
21-1192	961	44 a	m	fe	1			1	1	1	1	4	0	0	0	0	1191	48	92			
21-1204	957	45 a	m	fe	1								0	0	0	0	1205	49	99			1204-1208
21-1205	957	45 a	m	fe	1								0	0	0	0	1204	49	99			
21-1209	957	45 a	m	fe	1								0	0	0	0	1209	47	90			1209-1213?
21-1210	957	45 a	m	fe	1			4	1	1	1	1	0	0	0	0	1210		90			culmarks postmortem??
21-1211	942	46 a	u	fe	1			4	1	1	1	1	0	0	0	0	1226	46	84			1225-1237?
21-1217	962	47 a	m	fe	1								0	0	0	0	1225	46	84			
21-1225	962	47 a	m	fe	1								0	0	0	0	1225	46	83			
21-1236	944	48 a	u	fe	1			4	4	1	1	1	0	0	0	0	1237		87			
21-1237	944	48 a	u	fe	1			4	2	1	1	2	0	0	0	0	1236		88			
21-1251	998	49 s	u	fe	1			4	1	1	1	1	0	0	0	0	1056		85			
21-1260	986	50 s	m	fe	1								0	0	0	0	1261	46	89			
21-1261	986	50 s	m	fe	1								0	0	0	0	1260	48	90			
21-1270	952	51 a	m	fe	1								0	0	0	0	1466	48	98			peristoleal reaction on shaft
21-1275	926	52 s	f	fe	1			1	1	1	1	4	0	0	0	0	1276		73			peristoleal reaction on shaft
21-1276	926	52 s	f	fe	1								0	0	0	0	1275		72			peristoleal reaction on shaft
21-1292	929	53 s	f	fe	1								0	0	0	0	1404	39	71			
21-1301	929	53 a	u	fe	1			1	1	1	1	4	0	0	0	0	372	44	81			
21-1305	995	54 s	u	fe	1								0	0	0	0	1323	47	84			peristoleal reaction on shaft
21-1322	991	55 s	m	fe	1								0	0	0	0	1322	49	83			peristoleal reaction on shaft ... joined w/ 1011
21-1323	991	55 s	m	fe	1								0	0	0	0	1322					peristoleal reaction on shaft ... joined w/ 371
21-1334	997	57 s	u	fe	1			1	1	1	1	4	0	0	0	0	1335		77			peristoleal reaction on shaft ... joined w/ 284
21-1335	997	57 s	u	fe	1			4	1	1	1	4	0	0	0	0	1334		78			peristoleal reaction on shaft ... joined w/ 284
21-1350	946	58 s	u	fe	1			1	1	1	1	4	0	0	0	0	1351		81			peristoleal reaction on shaft
21-1351	946	58 s	u	fe	1			4	1	1	1	4	0	0	0	0	1350		80			slight peristoleal reaction ... joined w/ 357
21-1372	970	59 s	m	fe	1								0	0	0	0	1373	46	82			slight peristoleal reaction ... joined w/ 358
21-1373	970	59 s	m	fe	1			4	1	1	1	2	0	0	0	0	1372	46	81			slight peristoleal reaction
21-1375	970	59 s	u	fe	1								0	0	0	0	1429	42	81			peristoleal reaction on shaft ... joined w/ 1387-1394
21-1379	951	60 s	u	fe	1			1	1	1	1	4	0	0	0	0		38	65			
21-1387	975	61 a	m	fe	1								0	0	0	0	1388	47	90			
21-1388	975	61 a	m	fe	1			1	1	3	4	4	0	0	0	0	1387	49	90			
21-1404	925	62 s	f	fe	1								0	0	0	0	1292	38	68			poss postmortem cut on dist end
21-1410	923	65 s	f?	fe	1								1	1	0	0	1026	44	73			1430? ... peristoleal reaction on shaft
21-1429	968	66 s	f	fe	1			1	1	1	1	4	0	0	0	0	1375	41	78			

39WM2 INVENTORY

ID#	CAT#	BOX	AGE	SEX	ELM	SID	COM	PXEP	PXDP	MDDP	DSDP	DSEP	CUT	AML	WEA	BRN	PAIR	M1	M2	M3	M4	COMM
21-1437	922	70 a	f	fe	f	1	1						0	0	0	0	1438	41	76			
21-1438	922	70 a	f	fe	f	1	1						0	0	0	0	1437	42	75			
21-1461	931	71 a	m	fe	f	1	1						0	0	0	0	1270	49	89			
21-1466	950	73 a	m	fe	f	1	1						0	0	0	0	1270	49	94			
21-1478	1405	9 a	m	fe	f	1	1						0	1	0	0	426	48	91			
21/9-481	1717-	10 a	f	fe	f	1	1						0	0	1	0		43				
23-024	4530	12 a	m	fe	f	1	1						0	0	0	0	25	52	89			
23-025	4529	12 a	m	fe	f	1	1						0	0	0	0	24	51	87			
23-066	4413	13 a	m	fe	f	1	1						0	0	0	0	b3-877	50	88			
23-094	4696	14 a	m	fe	f	1	1						0	0	0	0	95	45	79			
23-095	4695	14 a	m	fe	f	1	1						1	0	0	0	94	45	82			
23-152	4084	11 a	f	fe	f	1	1						1	0	0	0	153	41	83			
23-153	4084	11 a	f	fe	f	1	1						0	0	0	0	152	41	80			
23-192	4779	75 a	m	fe	f	1	1						0	1	0	0		47	91			
23-193	4775	75 a	m	fe	f	1	1						0	1	0	0		47	90			
b101-971	8164	21 s	u	te	f	1	1						1	0	0	0	972	65				
b101-972	8164	21 s	u	te	f	1	1						0	0	0	0	971	65				
b3-877	7433	19 a	m	te	f	1	1						0	1	0	0	23-66	51	89			
bb-906	7455	20 s	f	te	f	1	1						0	0	0	0		44	80			
fb-1004	2556	22 s	u	te	f	1	1						0	0	0	0			45			
fb-1011	1347	22 s	u	te	f	1	1						0	0	0	0	1322					
fb-990	8273	22 s	u	te	f	1	1						0	0	0	0	990-993		41			
fb-995	8274	22 a	u	te	f	1	1						0	0	1	0			87			
fb-996	8275	22 a	u	te	f	1	1						0	0	2	0						
sb-953	8268	21 s	u	te	f	1	1						0	0	0	0	954					
sb-954	8268	21 s	u	te	f	1	1						0	0	0	0	953					
st-519	5238	15 a	f	te	f	1	1						0	0	0	0	522	43	85			
st-522	5238	15 a	f	te	f	1	1						0	0	0	0	519	43	82			
xu3a-609	6406	16 a	f	te	f	1	1						1	0	0	0	610	40	75			
xu3a-610	6406	16 a	f	te	f	1	1						1	0	0	0	609	39	75			
xu3a-674	6487	17 s	u	te	f	1	1						0	0	0	0	675		33			
xu3a-675	6486	17 s	u	te	f	1	1						0	0	0	0	674		33			

39WM2 INVENTORY

ID#	CAT#	BOX	AGE	SEX	ELM	SID	COM	PXEP	PXDP	MDDP	DSDP	DSEP	CUT	AML	WEA	BRN	PAIR	M1	M2	M3	M4	COMM
xu3a-728	6454	17 s	u	u	fe	1		1	1	1	1	4	0	0	0	0	729					no label for lodge number on box... (outside of lodges ??)
xu3a-729	6455	17 s	u	u	fe	1		4	1	1	1	1	0	0	0	0	728		33			no label for lodge number on box... (outside of lodges ??)
xu5-795	7369	18 a	1	1	1			1	1	1	1	4	0	0	0	0	796		75			no label for lodge number on box... (outside of lodges ??)
xu5-796	7369	18 a	1	1	1			4	1	1	1	4	0	0	0	0	795		76			no label for lodge number on box... (outside of lodges ??)
1-078	270	56 a	m	h	1			4	1	1	1	1	0	0	0	0						
1-081	270	56 a	m	h	1			1	1	1	1	1	0	0	0	0						
1-089	270	56 s	u	h	1			4	4	4	4	1	0	0	0	0						
1-119	758	64 u	u	h	1			4	1	1	1	4	0	0	0	0						
1-191	289	68 s	u	h	1			4	1	1	1	4	0	0	0	0						
1-192	289	68 s	u	h	1			4	4	4	2	4	0	0	0	0						
1-196	289	68 s	u	h	1			4	4	1	4	4	0	0	0	0						196 & 197 are from the same element
1-197	289	68 s	u	h	1			4	4	4	1	4	0	0	0	0						196 & 197 are from the same element
1-198	289	68 a	u	h	1			1	1	1	3	4	0	0	0	0						
1-199	758	68 a	u	h	1			1	1	2	4	4	0	0	0	0						
1-334	267	69 s	u	h	1			4	3	2	3	4	0	0	0	0						
1-335	267	69 u	u	h	1			4	3	2	3	4	0	0	0	0						flag appears too big to be part of the same indiv of burial 2
1-362	287	69 s	u	h	1			4	1	1	1	4	0	0	0	0						
1-363	287	69 s	u	h	1			4	4	4	2	4	0	0	0	0						
1-391	289	72 a	u	h	1			3	1	1	1	1	0	0	0	0						392
1-392	289	72 a	u	h	1			3	1	1	1	1	0	0	0	0						391
1-485	265	74 s	u	h	1			4	1	1	1	4	0	0	0	0						
1-518	269	63 s	u	h	1			4	1	1	2	4	0	0	0	0						
1-519	269	63 s	u	h	1			4	1	1	2	4	0	0	0	0						23
21-0024	1009	1 a	u	h	1			4	1	1	1	4	0	0	0	0						77
21-0078	1010	2 a	u	h	1			4	1	1	1	1	0	0	0	0						poss permortem fracture
21-0097	1010	2 a	u	h	1			1	1	1	1	1	0	0	0	0						
21-0121	1012	3 a	m	h	1			1	1	2	4	4	0	0	0	0						
21-0122	1012	3 a	m	h	1			4	4	3	1	4	0	0	0	0						
21-0136	1031	5 s	u	h	1			4	1	1	1	4	0	0	0	0						
21-0227	1031	5 s	u	h	1			4	1	1	1	4	0	0	0	0						
21-0228	1031	5 s	u	h	1			4	1	1	1	4	0	0	0	0						
21-0251	1031	5 s	u	h	1			4	1	1	1	4	0	0	0	0						250
21-0255	1063	6 a	m	h	1			1	1	1	1	4	0	0	0	0						
21-0295	1064	7 a	u	h	1			1	1	4	4	4	0	0	0	0						
21-0296	1064	7 a	u	h	1			4	4	3	1	1	0	0	0	0						
21-0297	1064	7 a	u	h	1			4	1	1	3	4	0	0	0	0						
21-0379	1065	8 a?	u	h	1			2	1	1	1	4	0	0	0	0						
21-0380	1065	8 s	u	h	1			4	1	1	1	4	0	0	0	0						
21-1017	934	28 a	u	h	1								0	0	0	0	1018					
21-1018	934	28 a	u	h	1								0	0	0	0	1017					
21-1021	934	28 s	u	h	1			4	1	1	1	1	0	0	0	0						
21-1029	932	29 a	m	h	1								0	0	0	0	1030					
21-1030	932	29 a	m	h	1			1					0	0	0	0	1029					
21-1032	932	29 s	u	h	1			4	1	1	1	4	0	0	0	0						
21-1033	932	29 a	u	h	1								0	0	0	0						
21-1038	932	29 s	u	h	1			4	1	1	1	4	0	0	0	0						1037
21-1053	955	30 a?	u	h	1			4	4	1	2	4	0	0	0	0						
21-1058	967	31 a	m?	h	1			4	4	1	1	1	0	0	0	0						1057?
21-1068	990	32 a	1?	h	1			4	4	2	1	1	0	0	0	0						

39WW2 INVENTORY

ID#	CAT#	BOX	AGE	SEX	ELM	SID	COM	PXBP	PXDP	MDDP	DSDP	DSEP	CUT	AML	WEA	BRN	PAIR	M1	M2	M3	M4	COMM
21-1085	992	33 a	u	u	f	1		1	1	3	4	4	0	0	0	0						
21-1101	941	35 s	u	h	r?			4	1	4	4	4	0	0	0	0						
21-1116	943	37 s	f	h	f			1	1	1	1	4	0	0	0	0						
21-1143	1001	40 a	u	h	f		1						0	0	0	0	1165					1142
21-1148	1001	40 s	u	h	f			4	1	1	1	4	0	0	0	0						1147
21-1150	999	41 s	u	h	f			4	1	1	1	4	0	0	0	0						
21-1153	1000	41 s	u	h	f			4	1	1	1	4	1	0	0	0						
21-1165	1011	42 a	u	h	f		1						0	0	0	0	1143					1164
21-1179	961	44 a	f	h	f			1	1	1	3	4	0	0	0	1						
21-1202	957	45 a	u	h	f			1	1	1	3	4	0	0	0	0						
21-1203	957	45 a	u	h	f			4	2	1	2	4	0	0	0	0						
21-1215	942	46 a	m?	h	f								0	0	0	0						1214
21-1216	942	46 a	u	h	f		1						0	0	0	0						
21-1235	944	48 a	u	h	f			1	1	1	1	4	0	1	0	0						1234
21-1248	998	49 s	u	h	f			1	1	1	1	4	0	0	0	0						
21-1250	998	49 u	u	h	f			4	2	1	2	4	0	0	0	0						
21-1258	986	50 s	m?	h	f			4	1	1	1	1	0	0	0	0	1259					
21-1259	986	50 s	m?	h	f								0	0	0	0	1258					
21-1269	952	51 a	m	h	f		1						0	0	0	0						peristoleal reaction on shall
21-1273	926	52 s	f	h	f								0	0	0	0	1274					
21-1274	926	52 s	f	h	f		1						0	0	0	0	1273					peristoleal reaction on shall
21-1286	926	52 a	u	h	f			4	4	4	1	1	0	0	0	0						peristoleal reaction on shall
21-1291	929	53 s	u	h	f		1						0	0	0	0						peristoleal reaction on shall
21-1295	929	53 a	u	h	f								0	0	0	0	1296					
21-1296	929	53 a	u	h	f		1						0	0	0	0	1295					
21-1315	993	54 a	u	h	f		1						0	0	0	0						1314
21-1320	991	55 s	m	h	f			4	1	1	1	4	0	0	0	0	1321					peristoleal reaction on shall
21-1321	991	55 s	m	h	f			4	1	1	1	4	0	0	0	0	1320					peristoleal reaction on shall
21-1332	997	57 s	u	h	f			4	1	1	1	4	0	0	0	0						1331
21-1333	997	57 s	u	h	f			4	1	1	2	4	0	0	0	0						
21-1333	997	57 s	u	h	f			1	1	1	1	4	0	0	0	0						
21-1333	946	58 s	u	h	f			1	1	1	4	4	0	0	0	0						
21-1354	946	58 s	u	h	f			4	1	1	1	4	0	0	0	0						
21-1364	970	59 a	u	h	f			4	1	1	1	1	0	0	0	0						
21-1365	970	59 s	u	h	f		1					4	0	0	0	0						1366
21-1367	970	59 a	u	h	f			4	4	1	1	1	0	0	0	0						1368
21-1369	970	59 a	u	h	f		1					1	0	0	0	0						
21-1371	970	59 s	u	h	f			3	1	1	1	4	0	0	0	0						
21-1378	951	60 a	m	h	f		1	4	1	1	1	4	0	0	0	0						1377
21-1386	951	60 a	u	h	f?			4	1	4	4	4	0	0	0	1						
21-1403	925	62 s	f	h	f			4	4	1	1	4	0	0	0	0						
21-1409	923	65 s	f?	h	f			1	1	1	1	4	0	0	0	0						
21-1415	927	65 a	u	h	f							4	0	1	0	0						1414
21-1435	922	70 a	f	h	f		1						0	0	0	0	1436					
21-1436	922	70 a	f	h	f		1						0	0	0	0	1435					
21-1465	950	73 a	m	h	f								0	0	0	0						
21-1477	1405	75 s	u	h	f								0	1	0	0						lodge 21, bur. 1, feature 1
23-035	4534	12 a	m	h	f		1						1	0	0	0						poss. postmortem cut on dist end
23-037	4533	12 a	m	h	f		1						0	0	0	0						catalog notes state "burial 7"
23-052	4782	13 u	u	h	f			4	1	1	1	4	0	0	0	0						catalog notes state "burial 6"
23-068	4778	13 a	m	h	f								0	0	0	0						
23-098	4700	14 a	m	h	f		1						0	0	0	0						catalog states "burial 2"
23-099	4699	14 a	m	h	f		1						0	0	0	0						catalog states "burial 2"
23-155	4084	11 a	f	h	f		1						0	0	0	0						
23-157	4084	11 a	f	h	f		1						0	0	0	0						

39WM2 INVENTORY

ID#	CAT#	BOX	AGE	SEX	ELM	SID	COM	PXEP	PXDP	MDDP	DSIDP	DSEP	CUT	AML	WEA	BRN	PAIR	M1	M2	M3	M4	COMM
23-194	4783	75 a		u	fr	1		4	1	1	1	4	0	1	0	0						From feature 61
b101-969	8164	21 s		u	fr	1		4	1	1	1	1	0	0	0	0						From feature 61
b101-970	8164	21 s		u	fr	1		4	1	1	1	1	0	0	0	0						From feature 61
b3-875	7433	19 a		m	fr	1		3	1	1	1	2	0	1	0	0						catalog states "xu or lodge number not on bag label (possibly lodge 23)"
b5-1490	7455	s		u	fr	1		4	1	1	1	4	0	0	0	0						8 yrs ... box 28
b5-904	7455	20 s		fr	fr	1		4	1	1	1	4	0	0	0	0						catalog states "body on beach east of larson"
fb-988	8276	22 a		u	fr	1		1	1	4	4	4	0	0	0	0						catalog states "random selection picked up here and there" from a beach collection
sb-951	8268	21 s		u	fr	1		4	1	1	1	4	0	0	0	0	952					catalog states "surface (beach)"
sb-952	8268	21 s		u	fr	1		4	4	2	1	4	0	0	0	0	951					catalog states "surface (beach)"
st-517	5238	15 a		fr	fr	1							0	0	0	0						box states that this came from the south trench ... (outside of lodges??)
st-520	5238	15 a		fr	fr	1							0	0	0	0						box states that this came from the south trench ... (outside of lodges??)
xu3a-606	6406	16 a		fr	fr	1							0	0	0	0						no label for lodge number on box...
xu3a-608	6406	16 a		fr	fr	1		1	1	1	1	4	0	1	0	0						(outside of lodges ??)
xu3a-724	6458	17 s		u	fr	1		4	1	1	1	4	0	0	0	0						no label for lodge number on box...
xu3a-726	6459	17 s		u	fr	1							0	0	0	0						(outside of lodges ??)
xu3a-792	7369	18 a		fr	fr	1		4	1	1	1	1	0	0	0	0						no label for lodge number on box...
xu3a-794	7369	18 a		fr	fr	1		4	1	2	4	4	0	0	1	0						(outside of lodges ??)
21-1082	987	33 a		u	fr?	?		4	4	1	4	4	0	0	0	0						no label for lodge number on box...
1-054	270	56 a		m	fr	1							0	0	0	0						(outside of lodges ??)
1-055	270	56 a		m	fr	1							0	0	0	0						bilateral functional wear ?? on the humeral head
1-114	289	64 a		m	fr	1		1	1	1	1	3	0	0	0	1						bilateral functional wear ?? on the humeral head
1-120	758	64 s		fr	fr	1		4	1	1	1	4	0	0	0	0						humeral head
1-155	268	67 s		u	fr	1		4	1	1	1	1	0	0	0	0	156					prob. excavation damage on dist epiphysis
1-156	268	67 s		m	fr	1		4	1	1	1	1	0	0	0	0	155					156 & 157 are from the same element
1-157	268	67 s		m	fr	1		4	4	4	4	4	0	0	0	0						156 & 157 are from the same element
1-177	288	68 a		fr	fr	1							0	0	0	0						42
1-194	758	68 s		u	fr	1		4	1	1	1	4	0	0	0	0						10
1-322	267	69 s		u	fr	1		1	1	1	1	4	0	0	0	0	323					14
1-323	267	69 s		u	fr	1		1	1	1	1	4	0	0	0	0	322					14
1-353	287	69 s		u	fr	1		1	1	1	1	2	0	0	0	0	354					15
1-354	287	69 s		u	fr	1		1	1	1	1	4	0	0	0	0	353					15
1-382	288	72 a		fr	fr	1		1	1	1	1	4	0	0	1	1	383					19
1-383	289	72 a		fr	fr	1		3	1	3	4	4	0	0	1	1	382					14
1-470	268	74 s		u	fr	1							0	0	0	0						18
1-498	269	63 s		u	fr	1		4	2	1	1	4	0	0	0	0	499					15
1-499	269	63 s		u	fr	1		4	1	1	1	4	0	0	0	0	498					12
21-0042	1010	2 s		fr	fr	1							0	0	0	0	1476					42
21-0061	1010	2 a		m	fr	1							0	0	0	0						20
													0	0	0	0						15
													0	0	0	0						18
													0	0	0	0						58

39WM2 INVENTORY

ID#	CAT#	BOX	AGE	SEX	ELM	SID	COM	PXEP	PXDP	MDDP	DSDP	DSEP	CUT	AML	WEA	BRN	PAIR	M1	M2	M3	M4	COMM
21-0064	1010	2 a	m	hu	1	1							1	0	0	0	0	48	21	15	59	
21-0065	1010	2 a	f	hu	1	1							0	0	0	0	1170	41	20	16	55	
21-0132	1061	4 s	u	hu	1			4	1	1			0	0	0	0	222	18	12			
21-0161	1046	5 s	u	hu	1			4	1	1			0	0	0	0	161	13	8			
21-0222	1031	5 s	u	hu	1			4	1	1			0	0	0	0	161	13	8			
21-0232	1031	5 s	u	hu	1			4	1	1			0	0	0	0		16	11			not associated with other elements in this box
21-0298	1064	7 a	m	hu	1			4	4	3	1		0	0	0	0	1126	22	17	61		joined w/ 21/9-484
21-0299	1064	7 a	m	hu	1			4	4	4	3	1	0	0	0	0					60	
21-0300	1064	7 a	u	hu	1			1	3	4	4	4	0	0	0	0		45				joined w/ 1221
21-0338	1065	46 s	u	hu	1			1	4	4	4	4	0	0	0	0						joined w/ 1374
21-0344	1065	59 s	u	hu	1			1	4	4	4	4	0	0	0	0						joined w/ 1076
21-0345	1065	32 a	u	hu	1			4	4	3	1	4	0	0	0	0						
21-0346	1065	8 a	u	hu	1			4	4	3	1	4	0	0	0	0						
21-0375	1065	8 s	u	hu	1			4	4	3	1	4	0	0	0	0	1					
21-0436	1405	9 a	m	hu	1	1					3	1	0	0	0	0	1	374	50	24	16	63
21-1024	934	28 s	f	hu	1	1							0	0	0	0	1223	42	18	15	57	
21-1025	934	28 s	f	hu	1	1							0	0	0	0	1025	42	18	15	57	
21-1036	932	29 a	m	hu	1		1						0	0	0	0	1024	42	19	15	57	
21-1032	955	30 s	f	hu	1			1	1	2	4	4	0	0	0	0	0	46	24	16		midshaft break, postmortem??
21-1035	955	30 s	f	hu	1			4	1	1	1	1	0	0	0	0	1242	19	15			
21-1075	990	32 a	m	hu	1	1		4	1	1	1	1	0	0	0	0	1482	17	14			
21-1076	990	32 s	m	hu	1	1		1	1	3	4	4	0	0	0	0	1195	47	22	16	63	pos infection on prox. end
21-1080	987	33 s	f	hu	1		1						0	0	0	0	0	46	22	16		joined w/ 345
21-1088	939	35 s	u	hu	1		1		4	4	4	4	0	0	0	0	1347	40	22	15		
21-1096	941	35 a	f	hu	1		1						0	0	0	0	0	42	22	16	55	joined w/ 1104
21-1099	941	35 s	f	hu	1		1		4	1	1	1	0	0	0	0	1104	21	15	54		
21-1104	943	37 s	f	hu	1		1		4	1	1	1	0	0	0	0	1099	40	21	15	54	joined w/ 1088
21-1125	943	38 a	m	hu	1		1						0	0	0	0	298	39	18	14	52	
21-1126	972	39 a	m	hu	1		1						0	0	0	0	0	50	24	21	63	
21-1135	974	39 a	m	hu	1		1						0	0	0	0	0	49	21	16		
21-1136	974	39 a	m	hu	1		1						0	0	0	0	0	49	21	16		
21-1137	974	39 a	u	hu	1		1		1	1	1	4	0	0	0	0	1	49	21	16		
21-1140	1002	40 a	u	hu	1		1		2	1	3	4	0	0	0	0	1395	43	23	18		
21-1141	1003	40 s	u	hu	1		1		4	1	1	4	0	0	0	0	0	45				
21-1144	1001	40 a	f	hu	1		1						0	0	0	0	0	20	14			
21-1151	999	41 a	u	hu	1		1						0	0	0	0	1316	44	19	16	56	
21-1160	1000	41 s	u	hu	1		1		1	1	1	4	0	0	0	0	21/9-482	43	23	16		
21-1167	1011	42 a	u	hu	1		1		4	1	3	4	0	0	0	0	1					
21-1170	1005	43 a	f	hu	1		1		3	1	4	4	0	0	0	0	0	41	21	16	55	
21-1184	961	44 a	f	hu	1		1						0	0	0	0	65	39	22	14	60	
21-1195	961	44 a	m	hu	1		1						0	0	0	0	1075	48	22	18	64	
21-1221	942	46 s	m	hu	1		1		4	1	1	1	0	0	0	0	0	50	20	17		joined w/ 338
21-1222	942	46 s	u	hu	1		1		4	1	3	4	0	0	0	0	0	50	20	17		
21-1223	942	46 s	m	hu	1		1		4	1	3	4	0	0	0	0	0	50	20	17		
21-1233	942	46 s	m	hu	1		1		4	1	3	4	0	0	0	0	0	50	20	17		
21-1233	962	47 a	m	hu	1		1		1	1	2	4	0	0	0	0	436	50	25	18	64	
21-1238	944	48 s	m	hu	1		1		4	3	1	1	0	0	0	0	1428	51	24	18		
21-1239	944	48 s	u	hu	1		1		4	4	4	4	0	0	0	0		21	18	61		dist. end, epphyes used but have the appearance of a subadull
21-1242	944	48 s	u	hu	1		1		4	4	4	4	0	0	0	0	1052	48	23	19	66	
21-1289	926	52 a	m	hu	1		1		4	1	1	1	0	0	0	0		44	22	15	60	
21-1297	929	53 a	m	hu	1		1						0	0	0	0	1298	44	22	15	60	1297-1300
21-1298	929	53 a	m	hu	1		1						0	0	0	0	1297	44	24	17	62	
21-1307	995	54 s	u	hu	1		1		1	1	1	4	0	0	0	0	1308	17	13			

39WW2 INVENTORY

ID#	CAT#	BOX	AGE	SEX	ELM	SID	COM	PXEP	PXDP	MDDP	DSDP	DSEP	CUT	AML	WEA	BRN	PAIR	M1	M2	M3	M4	COMM
21-1308	995	54 s	u	f	hu	1		1	1	1	1	4	0	1	0	0	1307	43	16	12		
21-1316	993	54 a	f	hu	1		1						0	0	0	0	1144	43	18	15	56	
21-1328	991	55 s	u	hu	1		1						0	0	0	0	1329	45	27	15		
21-1329	991	55 s	m	hu	1			2	1	1	1	4	0	0	0	0	1328	39	22	15	57	
21-1347	997	57 s	f	hu	1		1						0	0	0	0	1080	42	24	15	57	
21-1363	946	58 a	f	hu	1		1						0	0	0	0	1483	42	24	15	57	
21-1374	970	59 s	f	hu	1			4	1	1	1	1	0	0	0	0	375	42	19	14		
21-1382	951	60 s	u	hu	1			4	1	3	4	4	0	0	0	1					joined w/ 344	
21-1395	979	61 a	u	hu	1			1	1	3	4	4	0	0	0	0	1137	44	21	16		
21-1411	973	70 a	f	hu	1		1						0	0	0	0	1445	40	20	14	57	
21-1426	965	66 a	f	hu	1			1	1	1	4	4	0	0	0	0		41	21	15		
21-1428	963	66 a	m	hu	1		1						0	0	0	0	1233	52	26	20	68	
21-1445	922	70 a	f	hu	1		1						0	0	0	0	1411	41	21	14	55	
21-1473	950	73 a	m	hu	1		1						0	0	0	0	21/9-493	47	23	16	67	
21-1476	1009	2 s	u	hu	1			4	1	1	1	4	0	0	1	0	42		19	13		
21-1482	955	0 s	f	hu	1		1						0	0	0	0	1055	36	18	14		
21-1483	970	0 a	f	hu	1		1						0	0	0	0	1363	42	22	15	56	
21/9-482	1709/1	10 a	f	hu	1			1	1	1	1	4	0	0	1	0	21-1151	42	23	16		
21/9-483	1713	10 u	u	hu	1			4	3	1	1	4	0	0	1	0			16	12		
21/9-484	1710	7 u	m	hu	1			4	1	3	4	4	0	0	1	0					joined w/ 21-298... catalog notes state that 1687-1720 are bones collected from the surface of lodge 21	
21/9-493	1711	10 a	m	hu	1			4	4	3	1	1	0	0	1	0	21-1473				68	
23-007	4539	12 a	m	hu	1		1						0	0	0	0	8	51	25	17	67	
23-008	4538	12 a	m	hu	1		1						0	0	0	0	7	51	23	17	67	
23-076	4702	14 a	f	hu	1		1						0	0	0	0	77	41	19	15	56	
23-077	4701	14 a	f	hu	1		1						0	0	0	0	76	40	20	15	57	
23-145	4084	11 a	f	hu	1		1						0	0	0	0	146	40	20	15	51	
23-146	4084	11 a	f	hu	1		1						0	0	0	0	145	41	20	15	52	
6101-977	8164	21 s	u	hu	1		1		1	1	1	2	0	0	0	0	978					
6101-978	8164	21 s	u	hu	1		1		1	1	1	4	0	0	0	0	977					
63-890	7433	19 a	m	hu	1		1						0	0	0	0		49	23	19	66	
66-911	7455	20 s	f	hu	1			4	1	1	1	1	0	0	0	0					catalog states "xu or lodge number not on bag label (possibly lodge 23)"	
66-1000	6805	22 s	u	hu	1			4	1	1	1	4	0	0	0	0	XU3A-7				originally cataloged as animal bones from xud... w/ 998 & 999	
66-1001	1347	22 s	u	hu	1			4	1	1	1	4	0	0	0	0			11	8	originally cataloged as animal bones from lodge 21	
66-1002	4079	22 s	u	hu	1			4	4	3	1	4	0	0	0	0				8	originally cataloged as animal bones from "lodge 23, f4, burial 1"	
66-994	8273	22 s	u	hu	1			4	3	4	4	4	0	0	0	0					catalog states "random selection picked up here and there" from a beach collection	
66-959	8268	21 s	u	hu	1			1	1	1	1	4	0	0	0	0	960				catalog states "surface (beach)"	
66-960	8268	21 s	u	hu	1			4	4	2	1	4	0	0	0	0	959				catalog states "surface (beach)"	

39WM2 INVENTORY

ID#	CAT#	BOX	AGE	SEX	ELM	SID	COM	PXEP	PXDP	MDDP	DSDP	DSEP	CUT	AML	WEA	BRN	PAIR	M1	M2	M3	M4	COMM
st-538	5238	15 a	f	hu	f	f	1						0	0	0	0	541					box states that this came from the south trench ... (outside of lodges??)
st-541	5238	15 a	f	hu	f	f	1						0	0	0	0	538					box states that this came from the south trench ... (outside of lodges??)
xu3a-629	6406	16 a	f	hu	f	f	1						0	0	0	0	630					no label for lodge number on box... (outside of lodges??)
xu3a-630	6406	16 a	f	hu	f	f	1						0	0	0	0	629					no label for lodge number on box... (outside of lodges??)
xu3a-680	6481	17 s	u	hu	f	f		4	1	1	1	4	0	0	0	0						no label for lodge number on box... (outside of lodges??)
xu3a-732	6431	17 s	u	hu	f	f		4	1	1	1	4	0	0	0	0	RB-100					no label for lodge number on box... (outside of lodges??)
xu5-801	7369	18 a	f	hu	f	f	1						0	0	0	0	802					no label for lodge number on box... (outside of lodges??)
xu5-802	7369	18 a	f	hu	f	f	1						0	0	0	0	801					no label for lodge number on box... (outside of lodges??)
-069	270	56 a	m	il	f	f	1						0	0	0	0	72					
-072	270	56 a	m	il	f	f	1						0	0	0	0	69					
-165	268	67 s	m	il	f	f	3						0	0	0	0	168					
-168	268	67 s	m	il	f	f	1						0	0	0	0	165					
-195	289	68 s	u	il	f	f	2						0	0	0	0	unpaired					
-325	267	69 s	u	il	f	f	1						0	0	0	0	328					
-328	267	69 s	u	il	f	f	1						0	0	0	0	325					
-364	287	69 s	u	il	f	f	1						0	0	0	0	366					
-366	287	69 s	u	il	f	f	1						0	0	0	0	364					
-397	289	72 a	f	il	f	f	1						0	1	0	0	unpaired					petrosal reaction associated with the femur
-479	265	74 s	u	il	f	f	1						0	0	0	0	481					
-481	265	74 s	u	il	f	f	2						0	0	0	0	479					
-508	269	63 s	u	il	f	f	1						0	0	0	0	511					
-511	269	63 s	u	il	f	f	1						0	0	0	0	508					
21-0025	1009	1 s	m?	il	f	f	1						1	0	0	0	unpaired					poss cut on post. side
21-0099	1010	2 a	m	il	f	f	1						0	0	0	0	102					
21-0102	1010	2 a	m	il	f	f	3						0	0	0	0	99					
21-0124	1012	3 a	m	il	f	f	1						0	1	0	0	127					
21-0127	1012	3 a	m	il	f	f	1						0	1	0	0	124					
21-0229	1031	5 s	u	il	f	f	1						0	0	0	0	232					
21-0232	1031	5 s	u	il	f	f	1						0	0	0	0	229					joined with 165?
21-0271	1063	6 a	m	il	f	f	1						0	0	0	0	unpaired					
21-0305	1064	7 s	u	il	f	f	2						0	1	0	0	unpaired					bonny growth on post. surface above sciotic notch
21-0430	1405	9 a	m	il	f	f	1						0	0	0	0	1479					
21-1043	955	30 s	f	il	f	f	1						0	0	0	0	1046					
21-1046	955	30 s	f	il	f	f	1						0	0	0	0	1043					
21-1062	954	31 a	m	il	f	f	1						0	0	0	0	1206					
21-1069	990	32 a	m	il	f	f	1						0	0	0	0	1072					
21-1072	990	32 a	m	il	f	f	1						0	0	0	0	1069					
21-1107	994	36 a	m	il	f	f	1						0	0	0	0	1110					
21-1110	994	36 a	m	il	f	f	2						0	0	0	0	1107					
21-1119	943	37 s	f	il	f	f	1						0	1	0	0	1122					joined with 373
21-1122	943	37 s	f	il	f	f	1						0	1	0	0	1119					
21-1139	974	39 s	u	il	f	f	1						0	1	0	0	unpaired					
21-1156	1000	41 s	u	il	f	f	1						0	0	0	0	1158					
21-1158	1000	41 s	u	il	f	f	1						0	0	0	0	1156					

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ID#	CAT#	BOX	AGE	SEX	ELM	SID	COM	PXEP	PXDP	MDDP	DSDP	DSEP	CUT	AML	WEA	BRN	PAIR	M1	M2	M3	M4	COMM
21-1171	1005	43 a	f	il	1	1	1						0	0	0	0	1174					
21-1174	1005	43 a	f	il	1	1	1						0	0	0	0	1171					
21-1185	961	44 a	f	il	1	1	1						0	0	0	0	1188					
21-1188	961	44 a	f	il	1	1	1						0	0	0	0	1185					
21-1196	961	44 a	m	il	1	1	1						0	1	0	0	1199					
21-1199	961	44 a	m	il	1	1	1						0	0	0	0	1196					
21-1206	957	45 a	m	il	1	1	1						0	0	0	0	1062					
21-1211	957	45 a	m	il	1	1	1						0	1	0	0	1212					joined with 1061
21-1212	957	45 a	m	il	1	1	1						0	0	0	0	1211					
21-1227	962	47 a	m	il	1	1	2						0	0	0	0	1230					
21-1230	962	47 a	m	il	1	1	2						0	0	0	0	1227					
21-1243	944	48 u	u	il	1	1	3						0	1	0	0	ignore					
21-1254	998	49 s	u	il	1	1	1						0	0	0	0	unpaired					
21-1255	998	49 a	u	il	1	1	2						0	0	0	0	unpaired					
21-1262	984	50 s	m	il	1	1	1						0	0	0	0	1265					1262-1267 associated with 1256-1261 ??
21-1265	984	50 s	m	il	1	1	1						0	0	0	0	1262					
21-1277	926	52 s	f	il	1	1	1						0	0	0	0	1405					
21-1280	926	52 s	m	il	1	1	1						0	0	0	0	1283					1280-1285
21-1283	926	52 s	m	il	1	1	1						0	1	0	0	1280					
21-1302	929	53 a	m?	il	1	1	1						0	1	0	0	unpaired					
21-1309	995	54 s	u	il	1	1	1						0	1	0	0	1312					
21-1312	995	54 s	u	il	1	1	1						0	0	0	0	1309					
21-1336	997	57 s	m	il	1	1	1						0	0	0	0	1339					1336-1341
21-1339	997	57 s	m	il	1	1	1						0	0	0	0	1336					
21-1342	997	57 s	m	il	1	1	1						0	0	0	0	unpaired					
21-1355	946	58 s	u	il	1	1	1						0	1	0	0	1357					1355-1358
21-1357	946	58 s	u	il	1	1	1						0	0	0	0	1355					
21-1380	951	60 s	u	il	1	1	1						0	1	0	0	unpaired					
21-1389	975	61 a	m	il	1	1	1						0	0	0	0	1392					
21-1392	975	61 a	m	il	1	1	1						0	0	0	0	1389					
21-1396	924	62 s	m	il	1	1	1						0	0	0	0	1399					1396-1401
21-1399	924	62 s	m	il	1	1	1						0	0	0	0	1396					
21-1405	925	62 s	f	il	1	1	1						0	1	0	0	1277					
21-1416	928	63 s	u	il	1	1	2						0	0	0	0	unpaired					1417
21-1418	928	63 s	m	il	1	1	2						0	0	0	0	unpaired					1418-1420
21-1421	928	65 s	f	il	1	1	2						0	1	0	0	1430					1421-1423
21-1430	968	66 s	f	il	1	1	1						0	1	0	0	1421					1429?
21-1439	922	70 a	f	il	1	1	1						0	0	0	0	1442-4					
21-1442	922	70 a	f	il	1	1	1						0	0	0	0	1439-41					
21-1448	935	71 s	f	il	1	1	1						0	0	0	0	1451					1448-1453
21-1451	935	71 s	f	il	1	1	1						0	0	0	0	1448					
21-1454	935	71 a	f	il	1	1	1						0	0	0	0	1457					1454-1456
21-1457	935	71 a	f	il	1	1	1						0	0	0	0	1454					1454-1459
21-1462	931	71 a	m	il	1	1	1						0	0	0	0	unpaired					
21-1467	950	73 a	m	il	1	1	1						0	0	0	0	1470					
21-1470	950	73 a	m	il	1	1	1						0	1	0	0	1467					
21-1479	1405	9 a	m	il	1	1	1						0	1	0	0	430					lodge 21, bur. 1, feature 1
21/9-498	1698	10 a	u	il	1	1	3						0	0	1	0	ignore					catalog notes state that 1687-1720 are bones collected from the surface of lodge 21
21/9-499	1703	10 a	u	il	1	1	3						0	0	1	0	unpaired					catalog notes state that 1687-1720 are bones collected from the surface of lodge 21

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ID#	CAT#	BOX	AGE	SEX	ELM	SID	COM	PXEP	PXDP	MDDP	DSDP	DSEP	CUT	AML	WEA	BRN	PAIR	M1	M2	M3	M4	COMM
21-9-501	1699	10 s	u	il	r	r	3						0	0	1	0	unpaired					catalog notes state that 1687-1720 are bones collected from the surface of lodge 21
23-028	4521	12 a	m	il	r	r	1						0	0	0	0	31					
23-031	4520	12 a	m	il	r	r	1						0	0	0	0	28					
23-053	4408	13 a	m	il	r	r	1						0	1	0	0	unpaired					catalog notes state "burial 3"
23-059	4409	13 a	m	il	r	r	1						0	1	0	0	62					catalog notes state "burial 3"
23-062	4410	13 a	m	il	r	r	1						0	1	0	0	59					catalog notes state "burial 3"
23-100	4657	14 a	m	il	r	r	1						0	1	0	0	103					
23-103	4656	14 a	m	il	r	r	1						0	0	0	0	100					
23-158	3984	11 a	f	il	r	r	1						0	0	0	0	161					
23-161	3983	11 a	f	il	r	r	1						0	0	0	0	158					
6101-979	8164	21 s	u	il	r	r	1						0	0	0	0						from feature 61
6101-982	8164	21 s	u	il	r	r	1						0	0	0	0						catalog states "body on beach east of larson"
66-930	7455	20 s	f	il	r	r	1						0	0	0	0						catalog states "random selection picked up here and there" from a beach collection
66-989	8272	22 a	u	il	r	r	3						0	0	1	0						catalog states "random selection picked up here and there" from a beach collection
66-991	8273	22 s	u	il	r	r	1						0	0	0	0						catalog states "random selection picked up here and there" from a beach collection
66-993	8273	22 s	u	il	r	r	1						0	0	0	0						catalog states "random selection picked up here and there" from a beach collection
66-961	8268	21 s	u	il	r	r	1						0	0	0	0						catalog states "surface (beach)"
66-964	8268	21 s	u	il	r	r	1						0	0	0	0						catalog states "surface (beach)"
66-532	5238	15 a	f	il	r	r	1						0	0	0	0						box states that this came from the south trench... (outside of lodges??)
66-535	5238	15 a	f	il	r	r	1						0	0	0	0						box states that this came from the south trench... (outside of lodges??)
66-638	6406	16 a	f	il	r	r	1						0	0	0	0						no label for lodge number on box... (outside of lodges??)
66-641	6406	16 a	f	il	r	r	1						0	0	0	0						no label for lodge number on box... (outside of lodges??)
66-733	6419	17 s	u	il	r	r	1						0	0	0	0						no label for lodge number on box... (outside of lodges??)
66-736	6420	17 s	u	il	r	r	1						0	1	0	0						no label for lodge number on box... (outside of lodges??)
66-070	270	56 a	m	il	r	r	1						0	0	0	0						
66-073	270	56 a	m	il	r	r	1						0	0	0	0						
66-166	268	67 s	m	il	r	r	2						0	0	0	0						
66-169	268	67 s	m	il	r	r	1						0	0	0	0						
66-326	267	69 s	m	il	r	r	1						0	0	0	0						
66-329	267	69 s	u	il	r	r	1						0	0	0	0						
66-398	289	72 a	f	il	r	r	2						0	1	0	0						
66-480	265	74 s	u	il	r	r	1						0	0	0	0						
66-482	265	74 s	u	il	r	r	1						0	0	0	0						
66-509	269	63 s	u	il	r	r	1						0	0	0	0						
66-512	269	63 s	u	il	r	r	1						0	0	0	0						
66-0100	1010	2 a	m	il	r	r	2						0	0	0	0						
66-0103	1010	2 a	m	il	r	r	2						0	0	0	0						
66-0125	1012	3 a	m	il	r	r	1						0	1	0	0						
66-0128	1012	3 a	m	il	r	r	2						0	0	0	0						

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ID#	CAT#	BOX	AGE	SEX	ELM	SID	COM	PXEP	PXDP	MDDP	DSDP	DSEP	CUT	AML	WEA	BRN	PAIR	M1	M2	M3	M4	COMM
21-0167	1046	4 s	u	is	f	1	1						0	0	0	0	168					
21-0168	1046	4 s	u	is	f	1	1						0	0	0	0	167					cut appears postmortem
21-0230	1031	5 s	u	is	f	1	1						0	0	0	0						
21-0233	1031	5 s	u	is	f	1	1						0	0	0	0						
21-0272	1063	6 a	u	is	f	1	1						0	0	0	0						
21-0361	1066	8 s	u	is	f	2	2						0	0	0	0	unpaired					
21-0431	1405	9 a	u	is	f	1	1						0	0	0	0						
21-1044	955	30 s	f	is	f	1	1						0	0	0	0						
21-1047	955	30 s	f	is	f	1	1						0	0	0	0						
21-1063	954	31 a	u	is	f	1	1						0	0	0	0						
21-1070	990	32 a	u	is	f	1	1						0	0	0	0						
21-1073	990	32 a	u	is	f	1	1						0	0	0	0						
21-1108	994	36 a	u	is	f	1	1						0	0	0	0						
21-1111	994	36 a	u	is	f	1	1						0	0	0	0						
21-1120	943	37 s	f	is	f	3	3						0	1	0	0						
21-1123	943	37 s	f	is	f	3	3						0	1	0	0						
21-1157	1000	41 s	u	is	f	1	1						0	0	0	0						
21-1159	1000	41 s	u	is	f	1	1						0	0	0	0						
21-1172	1005	43 a	f	is	f	1	1						0	0	0	0						
21-1175	1005	43 a	f	is	f	1	1						0	0	0	0						
21-1186	961	44 a	f	is	f	1	1						0	0	0	0						
21-1189	961	44 a	f	is	f	1	1						0	0	0	0						
21-1197	961	44 a	u	is	f	1	1						0	0	0	0						
21-1200	961	44 a	u	is	f	2	2						0	0	0	0						
21-1207	957	45 a	u	is	f	1	1						0	0	0	0						
21-1213	957	45 a	u	is	f	3	3						0	0	0	0						
21-1228	962	47 a	u	is	f	1	1						0	0	0	0						
21-1231	962	47 a	u	is	f	1	1						0	0	0	0						
21-1263	984	50 s	u	is	f	1	1						0	0	0	0						
21-1266	984	50 s	u	is	f	1	1						0	0	0	0						
21-1278	926	52 s	u	is	f	1	1						0	0	0	0						
21-1281	926	52 s	u	is	f	1	1						0	0	0	0						
21-1284	926	52 s	u	is	f	1	1						0	0	0	0						
21-1303	929	53 a	u	is	f	2	2						0	1	0	0						
21-1310	995	54 s	u	is	f	1	1						0	0	0	0						
21-1313	995	54 s	u	is	f	2	2						0	0	0	0						
21-1317	997	57 s	u	is	f	1	1						0	0	0	0						
21-1340	997	57 s	u	is	f	1	1						0	0	0	0						
21-1343	997	57 s	u	is	f	1	1						0	0	0	0						
21-1356	946	58 s	u	is	f	1	1						0	0	0	0						
21-1358	946	58 s	u	is	f	1	1						0	0	0	0						
21-1359	946	58 s	u	is	f	1	1						0	0	0	0						
21-1381	951	60 s	u	is	f	1	1						0	1	0	0	unpaired					joined with 1246
21-1390	975	61 a	u	is	f	1	1						0	0	0	0						
21-1393	975	61 a	u	is	f	1	1						0	0	0	0						
21-1397	974	62 s	u	is	f	1	1						0	0	0	0						
21-1400	974	62 s	u	is	f	1	1						0	0	0	0						
21-1406	925	62 s	f	is	f	1	1						0	0	0	0						
21-1417	928	65 s	u	is	f	2	2						0	1	0	0						1416
21-1419	928	65 s	u	is	f	1	1						0	0	0	0						
21-1422	928	65 s	f	is	f	2	2						0	0	0	0						
21-1431	968	66 s	f	is	f	2	2						0	0	0	0						1430-1432
21-1440	922	70 a	f	is	f	1	1						0	0	0	0						
21-1443	922	70 a	f	is	f	1	1						0	0	0	0						

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ID#	CAT#	BOX	AGE	SEX	ELM	SID	COM	PXEP	PXDP	MDDP	DSDP	DSEP	CUT	AML	WEA	BRN	PAIR	M1	M2	M3	M4	COMM
21-1449	935	71	s	f	is	f	1						0	0	0	0						
21-1452	935	71	s	f	is	f	1						0	0	0	0						
21-1453	935	71	a	f	is	f	1						0	0	0	0						
21-1458	935	71	a	f	is	f	1						0	0	0	0						
21-1463	931	71	a	m	is	f	2						0	1	0	0						
21-1468	950	73	a	m	is	f	1						0	0	0	0						
21-1471	950	73	a	m	is	f	1						0	0	0	0						
21-1480	1405	9	a	m	is	f	1						0	1	0	0						
21/9-497	1696	10	a	u	is	f	3						0	0	1	0	unpaired					
21/9-500	1697	10	a	u	is	f	3						0	0	1	0	ignore					
23-029	4321	12	a	m	is	f	1						0	0	0	0						
23-032	4320	12	a	m	is	f	1						0	0	0	0						
23-054	4408	13	a	m	is	f	1						0	1	0	0						catalog notes state "burial 3"
23-060	4409	13	a	m	is	f	1						0	0	0	0						catalog notes state "burial 3"
23-063	4410	13	a	m	is	f	1						0	0	0	0						
23-101	4657	14	a	m	is	f	1						0	0	0	0						
23-104	4656	14	a	m	is	f	1						0	0	0	0						
23-159	3984	11	a	f	is	f	1						0	0	0	0						
23-162	3983	11	a	f	is	f	1						0	0	0	0						
6101-980	8164	21	s	u	is	f	1						0	0	0	0						from feature 61
6101-983	8164	21	s	u	is	f	1						0	0	0	0						from feature 61
66-931	7455	20	s	f	is	f	1						0	0	0	0						catalog states "body on beach east of Larson"
7B-992	8273	22	s	u	is	f	1						0	0	0	0						catalog states "random selection picked up here and there" from a beach collection
SB-962	8368	21	s	u	is	f	2						0	0	0	0						catalog states "surface (beach)"
SB-965	8268	21	s	u	is	f	1						0	0	0	0						catalog states "surface (beach)"
SB-533	5238	15	a	f	is	f	1						0	0	0	0						box states that this came from the south trench ... (outside of lodges??)
SB-536	5238	15	a	f	is	f	1						0	0	0	0						box states that this came from the south trench ... (outside of lodges??)
XU3A-639	6406	16	a	f	is	f	1						0	0	0	0						no label for lodge number on box...
XU3A-642	6406	16	a	f	is	f	1						0	0	0	0						no label for lodge number on box...
XU3A-734	6422	17	s	u	is	f	1						0	0	0	0						no label for lodge number on box...
XU3A-737	6421	17	s	u	is	f	1						0	0	0	0						no label for lodge number on box...
1-071	270	56	a	m	pu	f	2						0	0	0	0						no label for lodge number on box...
1-074	270	56	a	m	pu	f	2						0	0	0	0						no label for lodge number on box...
1-167	268	67	s	m	pu	f	3						0	0	0	0						no label for lodge number on box...
1-170	268	67	s	m	pu	f	3						0	0	0	0						no label for lodge number on box...
1-327	267	69	s	u	pu	f	1						0	0	0	0						no label for lodge number on box...
1-330	267	69	s	u	pu	f	1						0	0	0	0						no label for lodge number on box...
1-365	287	69	s	u	pu	f	1						0	0	0	0						no label for lodge number on box...
1-399	289	72	a	f	pu	f	3						0	0	0	0						no label for lodge number on box...
1-483	265	74	s	u	pu	f	3						0	0	0	0						no label for lodge number on box...
1-510	269	63	s	u	pu	f	1						0	0	0	0						no label for lodge number on box...

39WM2 INVENTORY

ID#	CAT#	BOX	AGE	SEX	ELM	SID	COM	PXEP	PXDP	MDDP	DSDP	DSEP	CUT	AML	WEA	BRN	PAIR	M1	M2	M3	M4	COMM
1-513	269	63 s	u	pu	f	r	1						0	0	0	0						
21-0075	1010	2 a	u	pu	f	r	2						0	0	0	0	ignore					
21-0101	1010	2 a	m	pu	f	r	3						0	0	0	0						
21-0104	1010	2 a	m	pu	f	r	1						0	0	0	0						
21-0126	1012	3 a	m	pu	f	r	1						0	1	0	0						
21-0129	1012	3 a	m	pu	f	r	1						0	1	0	0						
21-0164	1046	4 s	u	pu	f	r	1						0	0	0	0						joined with 167
21-0165	1046	4 s	u	pu	f	r	1						0	0	0	0						joined with 232?
21-0166	1046	4 s	u	pu	f	r	1						0	0	0	0						joined with 168
21-0231	1031	5 s	u	pu	f	r	1						0	0	0	0						
21-0273	1063	6 a	u	pu	f	r	1						0	0	0	0						
21-0306	1064	7 a	m?	pu	f	r	2						0	0	0	0	ignore					
21-0373	1065	8 s	f	pu	f	r	1						0	1	0	0						joined with 1119
21-0374	1065	8 s	u	pu	f	r	2						0	0	0	0	ignore					
21-0432	1405	9 a	m	pu	f	r	1						0	0	0	0						
21-0435	955	30 s	f	pu	f	r	1						0	0	0	0						
21-1048	955	30 s	f	pu	f	r	1						0	0	0	0						
21-1061	954?	31 a	m	pu	f	r	2						0	0	0	0						joined with 1212
21-1064	954	31 a	m	pu	f	r	1						0	0	0	0						
21-1071	990	32 a	m	pu	f	r	1						0	0	0	0						
21-1074	990	32 a	m	pu	f	r	2						0	0	0	0						
21-1109	994	36 a	m	pu	f	r	3						0	0	0	0						
21-1112	994	36 a	m	pu	f	r	3						0	0	0	0						
21-1121	943	37 s	f	pu	f	r	3						0	0	0	0						
21-1124	943	37 s	f	pu	f	r	1						0	1	0	0						
21-1149	1001	40 s	u	pu	f	r	3						0	0	0	0	ignore					
21-1173	1005	43 a	f	pu	f	r	1						0	0	0	0						
21-1176	1005	43 a	f	pu	f	r	1						0	0	0	0						
21-1187	961	44 a	f	pu	f	r	1						0	0	0	0						
21-1190	961	44 a	f	pu	f	r	1						0	0	0	0						
21-1198	961	44 a	m	pu	f	r	1						0	0	0	0						
21-1201	961	44 a	m	pu	f	r	1						0	0	0	0						
21-1208	957	45 a	m	pu	f	r	1						0	0	0	0						
21-1229	962	47 a	m	pu	f	r	1						0	0	0	0						
21-1232	962	47 a	m	pu	f	r	1						0	0	0	0						
21-1244	944	48 a	f?	pu	f	r	2						0	0	0	0	ignore					
21-1245	944	48 a	f?	pu	f	r	2						0	0	0	0	impaired					
21-1246	948	48 s	u	pu	f	r	1						0	0	0	0						joined with 1359
21-1253	998	49 s	u	pu	f	r	2						0	0	0	0	ignore					
21-1264	984	50 s	m	pu	f	r	1						0	0	0	0						
21-1267	984	50 s	m	pu	f	r	1						0	0	0	0						
21-1279	926	52 s	f	pu	f	r	1						0	0	0	0						
21-1282	926	52 s	m	pu	f	r	1						0	0	0	0						
21-1285	926	52 s	m	pu	f	r	1						0	0	0	0						
21-1311	995	54 s	u	pu	f	r	1						0	0	0	0						
21-1338	997	57 s	m	pu	f	r	1						0	0	0	0						
21-1341	997	57 s	m	pu	f	r	1						0	0	0	0						
21-1344	997	57 s	m	pu	f	r	1						0	0	0	0						
21-1391	975	61 a	m	pu	f	r	1						0	0	0	0						
21-1394	975	61 a	m	pu	f	r	1						0	0	0	0						
21-1398	974	62 s	m	pu	f	r	1						0	0	0	0						
21-1401	974	62 s	m	pu	f	r	1						0	0	0	0						
21-1407	975	62 s	f	pu	f	r	1						0	0	0	0						
21-1420	928	65 s	m	pu	f	r	2						0	0	0	0						

39WW2 INVENTORY

ID#	CAT#	BOX	AGE	SEX	ELEM	SID	COM	PXEP	PXDP	MDDP	DSDP	DSEP	CUT	AML	WEA	BRN	PAIR	M1	M2	M3	M4	COMM
21-1423	928	65 s	f	pu	1		1						0	0	0	0						
21-1432	968	66 s	f	pu	1		1						0	0	0	0						
21-1441	922	70 a	f	pu	1		1						0	0	0	0						
21-1444	922	70 a	f	pu	1		1						0	0	0	0						
21-1450	935	71 s	f	pu	1		1						0	0	0	0						
21-1453	935	71 s	f	pu	1		1						0	0	0	0						
21-1456	935	71 a	f	pu	1		2						0	0	0	0						
21-1459	935	71 a	f	pu	1		2						0	0	0	0						
21-1469	950	73 a	m	pu	1		1						0	0	0	0						
21-1472	950	73 a	m	pu	1		1						0	0	0	0						
21-1481	1405	9 a	m	pu	1		1						0	0	0	0						lodge 21, bur. 1, feature 1
23-030	4521	12 a	m	pu	1		1						0	0	0	0						
23-033	4520	12 a	m	pu	1		1						0	0	0	0						
23-055	4408	13 a	m	pu	1		3						0	0	0	0						catalog notes state "burial 3"
23-061	4409	13 a	m	pu	1		1						0	0	0	0						catalog notes state "burial 3"
23-064	4410	13 a	m	pu	1		1						0	0	0	0						catalog notes state "burial 3"
23-102	4657	14 a	m	pu	1		1						0	0	0	0						
23-105	4656	14 a	m	pu	1		1						0	0	0	0						
23-125	4050	11 u	u	pu	1		1						0	0	0	0	unpaired					catalog states that # 4050 is phalanges from burial 1
23-160	3984	11 a	f	pu	1		1						0	0	0	0						
23-163	3983	11 a	f	pu	1		1						0	0	0	0						from feature 61
b101-981	8164	21 s	u	pu	1		1						0	0	0	0						from feature 61
b101-984	8164	21 s	u	pu	1		1						0	0	0	0						catalog states "body on beach east of lagoon"
bb-932	7455	20 s	f	pu	1		2						0	0	0	0						originally cataloged as animal bones from lodge 21
fb-1012	1347	22 s	u	pu	1		2						0	0	0	0	ignore					catalog states "surface (beach)"
sb-963	8268	21 s	u	pu	1		1						0	0	0	0						catalog states "surface (beach)"
sb-966	8268	21 s	u	pu	1		1						0	0	0	0						catalog states "surface (beach)"
st-534	5238	15 a	f	pu	1		1						0	0	0	0						box states that this came from the south trench ... (outside of lodges??)
st-537	5238	15 a	f	pu	1		1						0	0	0	0						box states that this came from the south trench ... (outside of lodges??)
xu3a-640	6406	16 a	f	pu	1		1						0	0	0	0						no label for lodge number on box...
xu3a-643	6406	16 a	f	pu	1		1						0	0	0	0						no label for lodge number on box...
xu3a-735	6423	17 s	u	pu	1		1						0	0	0	0						no label for lodge number on box...
xu3a-738	6424	17 s	u	pu	1		1						0	0	0	0						no label for lodge number on box...
1-056	270	56 a	m	ra	1		1						0	0	0	0						cutmarks on dist shaft
1-058	270	56 a	m	ra	1		1						0	0	0	0						
1-118	290	64 u	u	ra	1		1						0	0	0	0						
1-161	268	67 s	m	ra	1		1						0	0	0	0						
1-179	289	68 a	u	ra	1		1						0	0	0	0						
1-180	758	68 s	u	ra	1		1						0	0	0	0						180 & 181 are from the same element
1-181	289	68 s	u	ra	1		1						0	0	0	0						180 & 181 are from the same element
1-188	289	68 s	u	ra	1		1						0	0	0	0						
1-193	289	68 s	u	ra	1		1						0	0	0	0						
1-357	287	69 s	u	ra	1		1						0	0	0	0						
1-390	289	72 a	u	ra	1		1						0	0	0	0						
1-394	288	72 a	u	ra	1		1						0	0	0	0						389

39WM2 INVENTORY

ID#	CAT#	BOX	AGE	SEX	ELM	SID	COM	PXEP	PXDP	MDDP	DSDP	DSEP	CUT	AML	WEA	BRN	PAIR	M1	M2	M3	M4	COMM
1-395	290	72 a	u	ra	1			3	1	3	4	4	1	0	0	0						poss cutmark on head (postmortem?)
1-396	290	72 a	u	ra	1			4	2	1	1	4	0	0	0	0						catalog notes state "burial 3"
1-471	268	74 s	u	ra	1			4	1	1	1	4	0	0	0	0						
1-472	289	74 s	u	ra	1			4	2	1	1	4	0	0	0	0						
1-500	269	63 s	u	ra	1			4	1	1	1	4	0	0	0	0						
21-0046	1010	2 s	u	ra	1			4	1	1	1	4	0	0	0	0						
21-0048	1010	2 s	u	ra	1			4	1	2	4	4	0	0	0	0						
21-0066	1010	2 a	u	ra	1		1	1	1	1	1	4	0	0	0	0						69
21-0068	1010	2 a	u	ra	1			1	1	1	1	4	0	0	0	0						70
21-0071	1010	2 a	u	ra	1								0	0	0	0						73
21-0072	1010	2 a	u	ra	1								0	0	0	0						
21-0133	1061	4 s	u	ra	1			4	1	1	1	4	1	0	0	0						248
21-0249	1031	5 s	u	ra	1			4	1	1	1	4	0	0	0	0						
21-0301	1064	7 s	u	ra	1			4	1	1	1	4	0	0	0	0						347
21-0348	1065	8 a	u	ra	1			4	4	1	1	1	0	0	0	0						
21-0362	1066	8 s	u	ra	1			4	4	4	4	1	0	0	0	0						1022-1024
21-0422	934	28 s	u	ra	1								0	0	0	0						1035
21-1034	932	29 a	u	ra	1			4	1	1	1	4	0	0	0	0						
21-1039	932	29 s	u	ra	1			4	1	1	1	4	0	0	0	0						
21-1049	955	30 s	u	ra	1			1	1	1	1	4	0	0	0	0						
21-1054	955	30 a?	u	ra	1			1	1	3	4	4	0	0	0	0						1066?
21-1065	954	31 a	u	ra	1								0	0	0	0						1079?
21-1078	987	33 a	u	ra	1								0	0	0	0						
21-1081	987	33 a	u	ra	1			4	4	2	1	4	0	0	0	0						
21-1083	987	33 s	u	ra	1			1	2	4	4	4	0	0	0	0						
21-1084	992	33 s	u	ra	1			1	4	4	4	4	0	0	0	0						1093
21-1090	939	34 s	u	ra	1			4	4	4	4	1	0	0	0	0						1095
21-1092	941	35 a	u	ra	1								0	0	0	0						1098
21-1094	941	35 a	u	ra	1			1	1	3	4	4	0	0	0	0						1103
21-1097	941	35 s	u	ra	1			1	1	1	1	4	0	0	0	0						
21-1102	941	35 s	u	ra	1			1	1	1	1	4	0	0	0	0						
21-1117	943	37 s	u	ra	1			1	1	1	1	4	1	0	0	0						1129
21-1128	972	38 s	u	ra	1			4	1	1	1	4	0	0	0	0						1131
21-1130	974	39 a	u	ra	1			1	1	4	4	4	0	0	0	0						1134
21-1133	974	39 a	u	ra	1			1	1	1	3	4	0	0	0	0						1146
21-1145	1001	40 a	u	ra	1			1	1	2	4	4	0	0	0	0						
21-1162	1000	41 a	u	ra	1			1	1	1	2	4	0	0	0	0						1168-1170
21-1168	1005	43 a	u	ra	1								0	0	0	0						
21-1182	961	44 a	u	ra	1								0	0	0	0						
21-1193	961	44 a	u	ra	1								0	0	0	0						
21-1218	942	46 a	u	ra	1								0	0	0	0						
21-1219	942	46 s	u	ra	1								0	0	0	0						1220
21-1240	944	48 s	u	ra	1			1	1	1	1	4	0	0	0	0						1241
21-1287	976	52 a	u	ra	1			1	1	1	2	4	0	0	0	0						1287-1289??
21-1299	929	53 a	u	ra	1								0	0	0	0						
21-1306	995	54 s	u	ra	1			4	1	1	1	4	0	0	0	0						
21-1324	991	55 s	u	ra	1								0	0	0	0						1325
21-1325	991	55 s	u	ra	1			4	1	1	1	4	0	0	0	0						1324
21-1325	991	55 s	u	ra	1			4	1	1	1	4	0	0	0	0						
21-1345	997	57 s	u	ra	1			1	1	1	1	4	0	0	0	0						1345-1347?
21-1360	946	58 a	u	ra	1			1	1	1	1	4	0	0	0	0						
21-1361	946	58 a	u	ra	1			1	1	3	4	4	0	0	0	0						
21-1383	951	60 s	u	ra	1			1	1	1	1	4	0	0	0	0						
21-1384	951	60 s	u	ra	1								0	0	0	0						
21-1412	923	65 a	u	ra	1								0	0	0	0						

39WM2 INVENTORY

ID#	CAT#	BOX	AGE	SEX	ELM	SID	COM	PXEP	PXDP	MDDP	DSDP	DSEP	CUT	AML	WEA	BRN	PAIR	M1	M2	M3	M4	COMM
21-1424	963	66	a	m	ra	f	1	1	1	1	1	1	0	0	0	0	0					1425
21-1427	965	66	a	u	ra	f	1	1	1	1	1	1	0	0	0	0	0					
21-1446	922	70	a	f	ra	f	1	1	1	1	1	1	0	0	0	0	0					1484? ... 4 yrs.
21-1474	950	73	a	m	ra	f	1	1	1	1	1	1	0	0	0	0	0					17 yrs ... box 30?
21-1487	1031	s	u	ra	f	1	1	1	1	1	1	1	0	0	0	0	0					box 59
21-1488	955	s	u	ra	f	1	1	1	1	1	1	1	0	0	0	0	0					catalog notes state that 1687-1720 are bones collected from the surface of lodge 21
21-1489	970	a	u	ra	f	1	1	1	1	1	1	1	0	0	0	0	0					catalog notes state that 1687-1720 are bones collected from the surface of lodge 21 ... assoc. w/ 486
21-9-485	1714	10	a	u	ra	f	1	1	1	1	1	1	0	0	0	0	0					
21-9-487	1715	10	a	u	ra	f	1	1	1	1	1	1	0	0	0	0	0					
23-010	4540	12	a	m	ra	f	1	1	1	1	1	1	0	0	0	0	0					catalog states "burial 2"
23-012	4541	12	a	m	ra	f	1	1	1	1	1	1	0	0	0	0	0					catalog states "burial 2"
23-018	4704	14	a	m	ra	f	1	1	1	1	1	1	0	0	0	0	0					from feature 61
23-079	4705	14	a	m	ra	f	1	1	1	1	1	1	0	0	0	0	0					catalog states "body on beach east of laron"
23-147	4084	11	a	f	ra	f	1	1	1	1	1	1	0	0	0	0	0					catalog states "body on beach east of laron"
23-149	4084	11	a	f	ra	f	1	1	1	1	1	1	0	0	0	0	0					catalog states "body on beach east of laron"
b101-973	8164	21	s	u	ra	f	1	1	1	1	1	1	0	0	0	0	0					catalog states "body on beach east of laron"
b101-974	8164	21	s	u	ra	f	1	1	1	1	1	1	0	0	0	0	0					catalog states "body on beach east of laron"
b3-886	7433	19	a	m	ra	f	1	1	1	1	1	1	0	0	0	0	0					catalog states "body on beach east of laron"
b3-888	7433	19	a	m	ra	f	1	1	1	1	1	1	0	0	0	0	0					catalog states "body on beach east of laron"
b6-907	7435	20	s	f	ra	f	1	1	1	1	1	1	0	0	0	0	0					catalog states "body on beach east of laron"
b6-909	7435	20	s	f	ra	f	1	1	1	1	1	1	0	0	0	0	0					catalog states "body on beach east of laron"
tb-1009	1347	22	a	u	ra	f	1	1	1	1	1	1	0	0	0	0	0					catalog states "body on beach east of laron"
tb-985	8276	22	s	u	ra	f	1	1	1	1	1	1	0	0	0	0	0					catalog states "body on beach east of laron"
tb-987	8276	22	a	u	ra	f	1	1	1	1	1	1	0	0	0	0	0					catalog states "body on beach east of laron"
tb-998	6805	22	s	u	ra	f	1	1	1	1	1	1	0	0	0	0	0					catalog states "body on beach east of laron"
sb-955	8268	21	s	u	ra	f	1	1	1	1	1	1	0	0	0	0	0					catalog states "body on beach east of laron"
sb-956	8268	21	s	u	ra	f	1	1	1	1	1	1	0	0	0	0	0					catalog states "body on beach east of laron"
sf-539	5238	15	a	f	ra	f	1	1	1	1	1	1	0	0	0	0	0					catalog states "body on beach east of laron"
sf-542	5238	15	a	f	ra	f	1	1	1	1	1	1	0	0	0	0	0					catalog states "body on beach east of laron"
xu3a-625	6406	16	a	f	ra	f	1	1	1	1	1	1	0	0	0	0	0					catalog states "body on beach east of laron"
xu3a-627	6406	16	a	f	ra	f	1	1	1	1	1	1	0	0	0	0	0					catalog states "body on beach east of laron"
xu3a-676	6484	17	s	u	ra	f	1	1	1	1	1	1	0	0	0	0	0					catalog states "body on beach east of laron"
xu3a-677	6485	17	s	u	ra	f	1	1	1	1	1	1	0	0	0	0	0					catalog states "body on beach east of laron"

39WM2 INVENTORY

ID#	CAT#	BOX	AGE	SEX	ELM	SID	COM	PXEP	PXDP	MDDP	DSDP	DSEP	CUT	AML	WEA	BRN	PAIR	M1	M2	M3	M4	COMM
Xu3a-730	6453	17	s	u	ra	r		4	1	1	1	4	0	0	0	0						no label for lodge number on box... (outside of lodges ??)
Xu5-799	7369	18	a	r	ra	r		1	1	1	1	4	0	0	0	0						no label for lodge number on box... (outside of lodges ??)
1-080	270	56	a	m	ti	r		1	1	1	1	3	0	0	0	0	117	79		42		joined w/ 361
1-088	270	69	s	u	ti	r		4	4	4	4	1	0	0	0	0	80	78	51	40		
1-117	290	64	a	m	ti	r							0	0	0	0	333			20		
1-190	289	69	s	u	ti	r		4	1	1	1	4	0	0	0	0				37		
1-201	289	68	s	m	ti	r		4	1	1	1	4	0	0	0	0						
1-202	289	68	a	u	ti	r		4	4	4	4	4	0	0	0	0	190			20		
1-333	267	69	s	u	ti	r		1	1	1	1	4	0	0	0	0	361			22		
1-360	287	69	s	u	ti	r		1	1	1	1	4	0	0	0	0	360			22		joined w/ 88
1-361	287	69	s	u	ti	r		1	1	1	1	4	0	0	0	0				25		
1-484	265	74	s	u	ti	r		2	1	1	1	4	0	0	0	0	517			25		
1-516	269	63	s	u	ti	r		1	1	1	1	4	0	0	0	0	516			25		
1-517	269	63	s	u	ti	r		1	1	1	1	4	0	0	0	0	96	80	50	33		24
21-0023	1009	1	a	u	ti	r							0	0	0	0				31		78
21-0077	1010	2	a	u	ti	r		4	1	1	1	1	1	0	0	0	23	79	51	34		
21-0096	1010	2	a	u	ti	r							0	0	0	0	120	82		40		poss perimortem fracture
21-0119	1012	3	a	m	ti	r		1	1	2	4	4	0	0	0	0	119	82	55	40		
21-0120	1012	3	a	m	ti	r							0	0	0	0						
21-0135	1061	4	s	u	ti	r		4	4	4	1	4	0	0	0	0	226			15		
21-0225	1031	5	s	u	ti	r		4	1	1	1	4	0	0	0	0	225			16		
21-0226	1031	5	s	u	ti	r		4	1	1	1	4	0	0	0	0				15		
21-0250	1031	5	s	u	ti	r		4	1	1	1	4	0	0	0	0				15		
21-0254	1063	6	a	m	ti	r							0	0	0	0				40		251
21-0294	1064	7	a	m	ti	r		1	1	3	4	4	1	0	0	0	1059	80		40		joined w/ 1331
21-0377	1065	57	s	u	ti	r		2	4	4	4	4	0	0	0	0				33		younger than other associated elements
21-0427	1405	9	a	m	ti	r							0	0	0	0						peristotal reaction on shaft ...
21-1013	934	28	a	r	ti	r							0	0	0	0	1014	71	47	37		peristotal reaction on shaft ...
21-1014	934	28	a	r	ti	r							0	0	0	0	1013	70	46	36		peristotal reaction on shaft ...
21-1019	934	28	s	r	ti	r							0	0	0	0		70	45	28		
21-1020	934	28	s	r	ti	r		1	1	1	1	4	0	0	0	0				30		
21-1027	932	29	a	m	ti	r							0	0	0	0	1028	84	54	41		1027-1031
21-1028	932	29	a	m	ti	r							0	0	0	0	1027	83	55	41		
21-1037	932	29	s	u	ti	r		1	1	1	1	4	0	0	0	0				26		1038
21-1057	967	31	a	m	ti	r							0	0	0	0	1214	83	53	36		1058?
21-1059	954	31	a	m	ti	r		1	1	2	4	4	0	0	0	0	294	82		41		
21-1086	992	33	a	u	ti	r		1	3	4	4	4	0	0	0	0						peristotal reaction on shaft ... w/ 1091?
21-1100	941	35	s	u	ti	r		4	2	1	1	1	1	0	0	0	1			30		
21-1115	943	37	s	r	ti	r		4	1	1	1	4	0	0	0	0				29		
21-1121	972	38	s	u	ti	r						4	0	0	0	0				29		peristotal reaction on shaft
21-1142	1001	40	a	m	ti	r		4	1	1	1	4	0	0	0	0	1164	76	49	37		1143
21-1147	1001	40	s	u	ti	r		4	1	1	1	4	0	0	0	0	1152			25		1148
21-1152	1000	41	s	u	ti	r		1	1	1	1	4	0	0	0	0	1147			24		1152-1159
21-1164	1011	42	a	m	ti	r							0	0	0	0	1142	76	51	37		1165
21-1177	961	44	a	r	ti	r		1	3	3	3	4	0	0	0	0	1178					1177-1190
21-1178	961	44	a	r	ti	r							0	0	0	0	1177			47		
21-1214	962	46	a	m	ti	r							0	0	0	0	1057	83	53	37		1215
21-1224	962	47	a	m	ti	r		4	4	4	1	1	0	0	0	0				52		
21-1234	944	48	a	r	ti	r		1	1	1	1	4	0	0	0	0				31		1235

39WM2 INVENTORY

ID#	CAT#	BOX	AGE	SEX	ELM	SID	COM	PXEP	PXDP	MDDP	DSDP	DSEP	CUT	AML	WEA	BRN	PAIR	M1	M2	M3	M4	COMM
21-1247	998	49 s	m	u	f			1	1	1	2	4	0	0	0	0		84	37			
21-1249	998	49 s	m	u	f								0	0	0	0		78	51	39		
21-1256	986	50 s	m	u	f								0	0	0	0		81	52	39		
21-1257	986	50 s	m	u	f								0	0	0	0		81	51	38		
21-1268	922	51 a	m	u	f								0	0	0	0		81	55	39		
21-1271	926	52 s	f	u	f								0	0	0	0		68	43	28		
21-1272	926	52 s	f	u	f								0	0	0	0		68	44	27		
21-1290	929	53 s	u	u	f								0	0	0	0		1402	66	46	28	
21-1293	929	53 a	m	u	f								0	0	0	0		1294	76	48	38	
21-1294	929	53 a	m	u	f			3	1	1	1	1	0	0	0	0		1293	49	37		
21-1304	995	54 s	u	u	f								0	0	0	0				23		
21-1314	993	54 a	m	u	f								0	0	0	0			50	37		
21-1318	991	55 a	m	u	f								0	0	0	0		1319	82	32		
21-1319	991	55 s	m	u	f								0	0	0	0		1318	82	35		
21-1330	997	57 s	u	u	f			4	1	1	2	4	0	0	0	0				54	36	
21-1331	997	57 s	u	u	f			4	1	1	1	1	0	0	0	0		1370				
21-1348	946	58 s	u	u	f			1	1	1	1	4	0	0	0	0		1349	74	33		
21-1349	946	58 s	u	u	f			4	1	1	1	4	0	0	0	0		1348		35		
21-1352	946	58 s	u	u	f			4	1	1	1	4	0	0	0	0			70	45	37	
21-1366	970	59 a	f	u	f								0	0	0	0			48	31		
21-1368	970	59 a	f	u	f			1	2	1	1	1	0	0	0	0		1331	77	54	35	
21-1370	970	59 s	u	u	f								0	0	0	0		1460	86	35	38	
21-1377	951	60 a	m	u	f								0	0	0	0		1290	66	27		
21-1402	925	62 s	f	u	f			1	1	1	1	2	0	0	0	0			66	32		
21-1408	923	65 s	f	u	f								0	0	0	0			76	51	37	
21-1414	927	65 a	m	u	f								0	0	0	0		1434	69	45	28	
21-1433	922	70 a	f	u	f								0	0	0	0			69	47	28	
21-1434	922	70 a	f	u	f								0	0	0	0		1433	69	47	28	
21-1460	931	71 a	m	u	f								0	0	0	0		1377	84	34	39	
21-1464	950	73 a	m	u	f								0	0	0	0		1268	84	56	41	
23-034	4532	12 a	m	u	f								0	0	0	0		36	85	60	37	
23-036	4531	12 a	m	u	f								0	0	0	0		34	85	60	38	
23-056	4776	13 a	m	u	f								0	0	0	0			53	42		
23-057	4781	13 a	m	u	f								0	0	0	0		191	79	41		
23-058	4777	13 a	m	u	f			1	1	1	2	4	0	0	0	0				41		
23-067	4414	13 a	m	u	f			4	2	1	2	4	0	0	0	0		B3-874	81	53	39	
23-096	4698	14 a	u	u	f								1	0	0	0		97	47	34		
23-097	4697	14 a	u	u	f								0	0	0	0						
23-154	4084	11 a	f	u	f								0	0	0	0		156	69	45	29	
23-156	4084	11 a	f	u	f								0	0	0	0		154	70	45	31	
23-191	4780	13 a	m	u	f								0	0	0	0		57	54	39		
B101-967	8164	21 s	u	u	f								0	0	0	0		968				
B101-968	8164	21 s	u	u	f								0	0	0	0		967				
B3-874	7433	13 a	m	u	f								0	0	0	0		23-67	82	52	38	
B6-903	7455	20 s	f	u	f			4	1	1	1	4	0	0	0	0		905				

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ID#	CAT#	BOX	AGE	SEX	ELM	SID	COM	PXEP	PXDP	MDDP	DSDP	DSEP	CUT	AML	WEA	BRN	PAIR	M1	M2	M3	M4	COMM
bb-905	7455	20	s	f	ti	f		4	1	1	1	4	0	0	1	0	903					catalog states "body on beach east of tarsion"
fb-1005	1347	55	s	u	ti	f		4	4	4	4	1	0	0	0	0						joined w/ 1319 ... originally cataloged as animal bones from lodge 21
fb-1006	3258	14	a	u	ti	f		4	4	4	3	1	0	0	0	0						joined w/ 23-97 ... originally cataloged as animal bones from lodge 9 or 23??
fb-1007	2133	22	a	u	ti	f		4	4	4	3	1	0	0	0	0			49			originally cataloged as animal bones from lodge 21 or 9??
sb-949	8268	21	s	u	ti	f							0	0	0	0	950					catalog states "surface (beach)"
sb-950	8268	21	s	u	ti	f		1	1	1	1	4	0	0	0	0	949					catalog states "surface (beach)"
st-518	5238	15	a	f	ti	f							0	0	0	0	521	72	49	32		box states that this came from the south trench ... (outside of lodges??)
st-521	5238	15	a	f	ti	f							0	0	0	0	518	72	49	31		box states that this came from the south trench ... (outside of lodges??)
xu3a-605	6406	16	a	f	ti	f							0	0	0	0	607	65	44	28		no label for lodge number on box ... (outside of lodges??)
xu3a-607	6406	16	a	f	ti	f		1	1	1	1	4	0	1	0	0	605	67		29		no label for lodge number on box ... (outside of lodges??)
xu3a-723	6457	17	s	u	ti	f		4	1	1	1	1	0	0	0	0	725					no label for lodge number on box ... (outside of lodges??)
xu3a-725	6456	17	s	u	ti	f							0	0	0	0	723					no label for lodge number on box ... (outside of lodges??)
xu5-791	7369	18	a	f	ti	f							0	0	0	0	793?					no label for lodge number on box ... (outside of lodges??) ... peristosteal reaction on shaft
xu5-793	7369	18	a	f	ti	f		4	1	1	2	4	0	0	1	0	791?					no label for lodge number on box ... (outside of lodges??) ... peristosteal reaction on shaft
1-057	270	56	a	m	ul	f							0	0	0	0						cutmarks on dist shaft
1-059	270	56	a	m	ul	f		1	1	1	1	2	0	0	0	0						diaphyseal thickening and possible peristosteal infection (osteomyelitis)
1-121	758	64	s	u	ul	f		4	1	1	1	4	0	0	0	0						
1-160	268	67	s	m	ul	f		1	1	1	1	4	0	0	0	0						
1-172	268	67	s	u	ul	f		2	1	1	1	4	0	0	0	0						
1-178	290	68	a	u	ul	f		1	1	3	4	4	0	0	0	0						
1-182	289	68	s	u	ul	f		4	1	1	1	4	0	0	0	0						
1-189	289	68	s	u	ul	f		4	1	1	1	4	0	0	0	0						
1-355	287	69	s	u	ul	f		4	1	1	1	4	0	0	0	0						
1-356	287	69	s	u	ul	f		4	1	4	4	4	0	0	0	0						
1-389	289	72	a	u	ul	f							0	0	0	0						390
1-393	288	72	a	u	ul	f							0	0	0	0						
1-501	269	63	s	u	ul	f		4	1	1	2	4	0	0	0	0						
21-0047	1010	2	s	u	ul	f							0	0	0	0						
21-0049	1010	2	s	u	ul	f		1	1	1	1	4	0	0	0	0						
21-0067	1010	2	a	f	ul	f							0	0	0	0						68
21-0069	1010	2	a	f	ul	f		1	1	1	1	4	0	0	0	0	70					71
21-0070	1010	2	a	u	ul	f							0	0	0	0	69					72
21-0073	1010	2	a	u	ul	f							0	0	0	0						poss perimortem damage on dist end
21-0074	1010	2	a	u	ul	f		1	1	1	1	4	1	0	0	0						
21-0134	1061	4	s	u	ul	f		4	1	1	1	4	0	0	0	0	1					249 ... paired elements are likely on the growth board
21-0248	1031	5	s	u	ul	f		4	1	1	1	4	0	0	0	0						
21-0347	1065	8	a	u	ul	f		4	4	2	1	1	0	1	0	1						348

39WM2 INVENTORY

ID#	CAT#	BOX	AGE	SEX	ELM	SID	COM	PXEP	PXDP	MDDP	DSDP	DSEP	CUT	AML	WEA	BRN	PAIR	M1	M2	M3	M4	COMM
21-0349	1065	8 a	u	u	u	1		2	1	1	4	4	0	0	0	1						
21-0350	1065	8 s	u	u	u	1		4	4	1	1	4	0	0	0	0						
21-0376	1065	8 a	u	u	u	1		4	1		4	4	0	0	0	0						
21-0428	1405	9 a	u	u	u	1							0	0	0	0						
21-1023	934	28 s	u	u	u	1							0	0	0	0						
21-1035	932	29 a	u	u	u	1							0	0	0	0						
21-1040	932	29 a	u	u	u	1		4	1	1	4	4	0	0	0	0						1034
21-1050	955	30 s	f	u	f	1		1	1	1	1	4	0	0	0	0						
21-1051	955	30 s	f	u	f	1		1	1	1	1	4	0	0	0	0						
21-1066	954	31 a	u	u	u	1		4	1	1	1	1	0	0	0	0						1065?
21-1077	990	32 s	u	u	u	1		1	2	4	4	4	0	0	0	1						
21-1079	987	33 a	u	u	u	1		3	1	1	1	1	0	0	0	0						1078?
21-1089	939	34 s	u	u	u	1		4	4	4	4	1	0	0	0	0						
21-1093	941	35 a	u	u	u	1		1	1	3	4	4	0	0	0	0						1092
21-1095	941	35 a	u	u	u	1		1	1	1	1	4	0	0	0	0						1094
21-1098	941	35 s	u	u	u	1		1	1	1	1	4	0	0	0	0						1097
21-1103	941	35 s	u	u	u	1		1	1	1	1	4	0	0	0	0						1102
21-1118	943	37 s	f	u	f	1		1	1	1	1	4	0	0	0	0						
21-1129	972	38 s	u	u	u	1		1	1	1	1	4	0	0	0	0						1128
21-1131	974	39 a	u	u	u	1		1	1	1	3	4	4	0	0	0						1130
21-1132	974	39 a	u	u	u	1		3	4	4	4	4	0	0	0	0						
21-1134	974	39 a	u	u	u	1		2	1	1	2	4	0	0	0	0						1133
21-1146	1001	40 a	u	u	u	1		1	1	2	4	4	0	0	0	0						1145
21-1163	1000	41 a	u	u	u	1		1	1	1	2	4	0	0	0	0						
21-1169	1005	43 a	f?	u	f	1							0	0	0	0						
21-1183	961	44 a	f	u	f	1							0	0	0	0						
21-1194	961	44 a	u	u	u	1		1	1	1	1	4	0	0	0	0						1219
21-1220	942	46 s	u	u	u	1		1	1	1	1	4	0	0	0	0						
21-1241	944	48 s	u	u	u	1		1	1	1	1	4	0	0	0	0						1240
21-1252	998	49 s	u	u	u	1		4	1	1	1	4	0	0	0	0						
21-1288	926	52 a	u	u	u	1		1	1	1	2	4	0	0	0	0						
21-1300	929	53 a	u	u	u	1		1	1	3	4	4	0	0	0	0						
21-1317	993	54 a	u	u	u	1		1	1	2	4	4	0	0	0	0						
21-1326	991	55 s	u	u	u	1		1	1	2	4	4	0	0	0	0						1327
21-1327	991	55 s	u	u	u	1		4	4	2	1	4	0	0	0	0						1326
21-1346	997	57 s	u	u	u	1							0	0	0	0						
21-1362	946	58 s	u	u	u	1		4	1	1	1	4	0	0	0	0						
21-1376	970	59 a	u	u	u	1							0	0	0	0						
21-1385	951	60 a	u	u	u	1		1	1	1	2	4	0	0	0	0						
21-1413	923	65 a	f?	u	f	1							0	0	0	0						
21-1425	963	66 a	u	u	u	1							0	0	0	0						1424
21-1447	922	70 a	f	u	f	1							0	0	0	0						
21-1475	950	73 a	u	u	u	1		1	1	1	1	4	0	0	0	0						
21-1484	1031	s	u	u	u	1		4	1	1	1	4	0	0	0	0						1487 ... 4 yrs.
21-1485	951	s	u	u	u	1		1	1	1	1	4	0	0	0	0						19 yrs. ... box 60
21-1486	942	a	f?	u	f	1							0	0	0	0						catalog notes state that 1687-1720 are bones collected from the surface of lodge 21 ... assoc w/ 487
21-1486	1716	10 a	u	u	u	1		1	1	1	4	4	0	0	0	0						
23-009	4542	12 a	u	u	u	1		1	1	1	2	4	0	0	0	0						catalog states "burial 2"
23-011	4543	12 a	u	u	u	1							0	0	0	0						
23-080	4703	14 a	u	u	u	1							0	0	0	0						
23-148	4084	11 a	f	u	f	1							0	0	0	0						catalog states "burial 2"
23-150	4084	11 a	f	u	f	1							0	0	0	0						

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ID#	CAT#	BOX	AGE	SEX	ELM	SID	COM	PXEP	PXDP	MDDP	DSDP	DSEP	CUT	AML	WEA	BRN	PAIR	M1	M2	M3	M4	COMM
b101-975	8164	21	s	u	ul	f		4	1	1	1	4	0	0	0	0						from feature 61
b101-976	8164	21	s	u	ul	f		4	1	1	1	4	0	0	0	0						from feature 61
b3-887	7433	19	a	m	ul	f	1						0	0	0	0	889					catalog states "xu or lodge number not on bag label (possibly lodge 23)"
b3-889	7433	19	a	m	ul	f	1						0	0	0	0	887					catalog states "xu or lodge number not on bag label (possibly lodge 23)"
b3-898	7433	19	a	m?	ul	f		1	1	1	1	4	1	0	0	0						catalog states "xu or lodge number not on bag label (possibly lodge 23)" ... perimortem fracture w/ poss. cutmark ???
b6-908	7455	20	s	f	ul	f		1	1	1	1	4	0	0	0	0						catalog states "body on beach east of larson"
b6-910	7455	20	s	f	ul	f		1	1	1	1	4	0	0	0	0						catalog states "body on beach east of larson"
b6-1003	3297	22	s	u	ul	f		4	4	4	1	4	0	0	0	0						originally cataloged as animal bones from lodge 9 or 23 ??
b6-1008	836	22	a	u	ul	f		1	1	1	3	4	0	0	1	0						originally cataloged as animal bones from lodge 1 ??
b6-1010	836	22	s	u	ul	f		4	1	1	1	4	0	0	0	0						originally cataloged as animal bones from lodge 1 ??
b6-986	8276	22	s	u	ul	f		4	1	1	1	4	0	0	0	0						catalog states "random selection picked up here and there" from a beach collection ... w/ 985
b6-997	623	22	a	u	ul	f		2	1	1	1	1	0	0	0	0						catalog states "random selection picked up here and there" from a beach collection
b6-999	6805	22	s	u	ul	f		4	1	1	1	4	0	0	0	0						originally cataloged as animal bones from xu5 ... w/ 998
sb-957	8268	21	s	u	ul	f		4	1	1	4	4	0	0	0	0	958					catalog states "surface (beach)"
sb-958	8268	21	s	u	ul	f		4	1	1	1	4	0	0	0	0	957					catalog states "surface (beach)"
st-540	5238	15	a	f	ul	f	1				1	4	0	0	0	0						box states that this came from the south trench ... (outside of lodges??)
st-543	5238	15	a	f	ul	f	1						0	0	0	0						box states that this came from the south trench ... (outside of lodges??)
xu3a-626	6406	16	a	f	ul	f	1						0	0	0	0						no label for lodge number on box ... (outside of lodges ??)
xu3a-628	6406	16	a	f	ul	f	1						0	0	0	0						no label for lodge number on box ... (outside of lodges ??)
xu3a-678	6482	17	s	u	ul	f		4	1	1	1	4	0	0	0	0						no label for lodge number on box ... (outside of lodges ??)
xu3a-679	6483	17	s	u	ul	f		4	1	1	1	4	0	0	0	0						no label for lodge number on box ... (outside of lodges ??)
xu3a-731	6452	17	s	u	ul	f		4	1	1	1	4	0	0	0	0						no label for lodge number on box ... (outside of lodges ??)
xu5-798	7369	18	a	f	ul	f	1						0	0	0	0						no label for lodge number on box ... (outside of lodges ??)
xu5-800	7369	18	a	f	ul	f		1	1	1	1	4	0	0	0	0						no label for lodge number on box ... (outside of lodges ??)
xu5-808	7369	18	a	f	il	f	2						0	0	0	0						
xu5-809	7369	18	a	f	is	f	2						0	0	0	0						
xu5-810	7369	18	a	f	il	f	3						0	0	0	0						
xu5-811	7369	18	a	f	is	f	3						0	0	0	0						

APPENDIX B

CODES USED FOR SPECIFIC AGE DESIGNATION SHEET

Unique Identification Number (abbreviated ID#)

This number is identical to the one described for the inventory codes and was used for cross-referencing data on the elements.

River Basin Survey Catalog Number (abbreviated CAT#)

This number is identical to the one described for the inventory codes and was used for cross-referencing data on the elements.

Pubic Symphysis (abbreviated PUB)

Stages 1-10 (based on Todd, 1921)

Auricular Surface (abbreviated AUR)

Phase 1-8 (based on Lovejoy et al., 1985)

Diaphyseal Length of Immature Remains (abbreviated DIAPH LGTH)

Length recorded in millimeters

Codes for Epiphysis #1, #2, #3

0 =Open

1 =partial union (line visible)

2 =complete union

Epiphysis #1 (abbreviated EPIPH1)

Humerus -head

Radius -proximal end

Ulna -proximal end

Os Coxae -primary elements

Femur -head

Tibia -proximal end

Fibula -proximal end

Epiphysis #2 (abbreviated EPIPH2)

Humerus -distal end

Radius -distal end

Ulna -distal end

Os Coxae -iliac crest

Femur -greater trochanter

Tibia -distal end
Fibula -distal end

Epiphysis #3 (abbreviated EPIPH3)

Humerus -medial epicondyle
Os Coxae -ischial tuberosity
Femur -distal end

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ID#	CAT#	PUB	AUR	DIAP LGTH	EIPH1	EIPH2	EIPH3
1-069	270		4				
1-072	270		4				
1-088	270					0	
1-089	270					0	
1-120	758			201	0	0	
1-121	758				0		
1-127	289				0		
1-155	268				0	2	2
1-156	268				0	2	2
1-158	268				2	1	
1-160	268				1	0	
1-161	268				2	0	
1-164	268				1	1	
1-165	268				2	0	1
1-168	268				2	1	1
1-172	268					0	
1-180	758				2	0	
1-182	289					0	
1-183	289				0	0	0
1-188	289			127	0	0	
1-189	289			139	0	0	
1-190	289			190	0	0	
1-191	289			183	0	0	
1-192	289					0	
1-193	289				0		
1-194	758				0	0	0
1-195	289				0		
1-197	289					0	
1-200	289						0
1-317	267				0		
1-318	267				0	0	
1-320	267				0	0	
1-322	267			169	0	0	0
1-323	267			167	0	0	0
1-325	267				0	0	0
1-328	267				0	0	0
1-331	267			227	0	0	0
1-332	267			228	0	0	0
1-333	267			191	0	0	0
1-350	287				0		
1-351	287				0	0	
1-353	287			215	0	0	0
1-354	287			211	0	0	0
1-355	287			184	0	0	
1-356	287				0		
1-357	287				0		
1-358	287			293	0	0	0
1-359	287			292	0	0	0
1-360	287			242	0	0	
1-361	287			242	0	0	
1-362	287			239	0	0	
1-363	287					0	
1-364	287				0	0	
1-366	287				0	0	
1-397	289		4				
1-464	265				0		
1-465	265				0	0	
1-467	265				0	0	
1-470	268				0	1	0
1-471	268			190	0	0	
1-472	289					0	
1-477	265				0		0
1-478	265				0	0	0
1-479	265				1	0	0
1-481	265				1	0	0

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ID#	CAT#	PUB	AUR	DIAP LGTH	EIPH1	EIPH2	EIPH3
1-484	265				0		
1-485	265			288	0	0	
1-494	269				0		
1-495	269				0		
1-498	269					0	0
1-499	269			232	0	0	0
1-500	269				0		
1-501	269				0		
1-508	269				0	0	0
1-511	269				0	0	0
1-514	269			319	0	0	0
1-515	269			323	0	0	0
1-516	269			260	0	0	
1-517	269			261	0	0	
1-518	269				0		
1-519	269				0		
21-0004	1009				0	0	
21-0025	1009		1			0	
21-0040	1010				0		
21-0041	1010				0		
21-0042	1010			289	0	1	0
21-0043	1010				0		
21-0045	1010				0		
21-0046	1010			216	0	0	
21-0047	1010				1	0	
21-0048	1010				0		
21-0049	1010				1		
21-0057	1010						0
21-0058	1010				0	0	0
21-0099	1010		3				
21-0102	1010	6					
21-0124	1012	8	5				
21-0127	1012	9	5				
21-0132	1061			235	0	0	0
21-0133	1061			176	0	0	
21-0134	1061				0		
21-0135	1061					0	
21-0136	1061					0	
21-0161	1046			152	0	0	0
21-0164	1046				0		
21-0165	1046				0		
21-0166	1046				0		
21-0167	1046				0		0
21-0168	1046				0		0
21-0216	1031				0	0	
21-0218	1031				0	0	
21-0220	1031				0		
21-0221	1031				0		
21-0222	1031			155	0	0	0
21-0223	1031				0	0	
21-0224	1031			206	0	0	0
21-0226	1031			166	0	0	
21-0228	1031			164	0	0	
21-0229	1031				0	0	
21-0230	1031						0
21-0232	1031				0	0	
21-0233	1031						0
21-0248	1031				0		
21-0249	1031			119	0	0	
21-0250	1031			145	0	0	
21-0251	1031			141	0	0	
21-0252	1031			253	0	0	0
21-0261	1063			367	0	0	0
21-0271	1063	6	4				
21-0284	1064						0
21-0285	1064						0

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ID#	CAT#	PUB	AUR	DIAP LGTH	EPIPH1	EPIPH2	EPIPH3
21-0286	1064						0
21-0287	1064						0
21-0301	1064			103	0	0	
21-0305	1064					0	
21-0306	1064	8					
21-0334	1065				0		
21-0344	1065				0		
21-0350	1065					0	
21-0357	1065					0	
21-0358	1065				0		
21-0361	1066				0		0
21-0362	1066					0	
21-0371	1065						0
21-0372	1065					0	
21-0375	1065					2	0
21-0377	1065				0		
21-0380	1065				0	0	
21-0427	1405				1	2	
21-0430	1405	6	3				
21-0498	1698		6				
21-0501	1699					0	
21-1019	934				1	1	
21-1020	934				1		
21-1021	934			297	0	0	
21-1022	934				2	0	
21-1023	934				2	0	
21-1024	934				1	2	1
21-1025	934				1	2	2
21-1026	934				1	1	0
21-1032	932				0		
21-1037	932				0	0	
21-1038	932			238	0	0	
21-1039	932			188	0	0	
21-1040	932				0	0	
21-1041	955				1	1	0
21-1042	955				1	1	0
21-1043	955				2	0	0
21-1046	955				2	0	0
21-1049	955			203	1	2	
21-1050	955			226	2	0	
21-1051	955				2		
21-1052	955				0	1	0
21-1056	966				2	2	0?
21-1062	954	6	4				
21-1069	990	6	3				
21-1072	990		4				
21-1076	990				0/1		
21-1077	990				2		
21-1080	987				1	2	2
21-1083	987					0	
21-1084	992				1		
21-1088	939				0		
21-1089	939					0	
21-1090	939					0	
21-1091	941				1	2	0
21-1097	941				2	0	
21-1098	941				2	0	
21-1099	941				0	2	2
21-1100	941					0	
21-1101	941				0		
21-1102	941				2	0	
21-1103	941				2	0	
21-1104	941				0	2	2
21-1107	941	5	3				
21-1110	941	5	3				
21-1113	943				1		0

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ID#	CAT#	PUB	AUR	DIAP LGTH	EIPH1	EIPH2	EIPH3
21-1114	943				1	1	
21-1115	943				0		
21-1116	943				0		
21-1117	943				2		
21-1118	943				2		
21-1119	943		<1		2	0	2
21-1122	943	<1			2	0	2
21-1125	943				0	2	1
21-1127	972			275	0	0	
21-1128	972					0	
21-1129	972				1	0	
21-1138	974			298	0	0	0
21-1139	974				0	0	
21-1141	1003				0	0	0
21-1147	1001			235	0	0	
21-1148	1001			233	0	0	
21-1149	1001				0		
21-1150	999			270	0	0	
21-1152	1000				0	0	
21-1153	1000				0		
21-1154	1000				0	0	0
21-1155	1000				0	0	0
21-1156	1000				0	0	0
21-1158	1000				0	0	0
21-1160	1000				0		
21-1171	1005	6	3				
21-1174	1005	5	3				
21-1185	961	8	6				
21-1188	961	8	7				
21-1196	961	9	7				
21-1199	961	9	7				
21-1206	957	7	4				
21-1219	942				2	1	
21-1220	942				2	0	
21-1221	942				0	2	
21-1222	942				0		
21-1227	962	8	not				
21-1230	962	9	not				
21-1240	944				2	0	
21-1241	944				2	0	
21-1242	944			244	0	0	0
21-1244	944	7					
21-1245	944	7					
21-1246	944				0		
21-1247	998				0		
21-1248	998				0	0	
21-1251	998				0	0	0
21-1252	998					0	
21-1254	998					0	
21-1255	998		5				
21-1256	986				1	1	
21-1257	986				1	1	
21-1258	986				0	1	
21-1259	986				0	1	
21-1260	986				1	1	0
21-1261	986				1	1	0
21-1262	984				2	1	1
21-1265	984				2	1	1
21-1271	926				1	1	
21-1272	926				1	1	
21-1273	926				1	1	
21-1274	926				1	1	
21-1275	926				0	0	0
21-1276	926				0	0	0
21-1277	926				2	0	0
21-1280	926				0	0	0

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ID#	CAT#	PUB	AUR	DIAP LGTH	EIPPH1	EIPPH2	EIPPH3
21-1283	926				0	0	0
21-1290	929			301	0	0	
21-1291	929				0	0	
21-1292	929			373	0	0	0
21-1302	929		4				
21-1304	995				0	0	
21-1305	995				0	0	0
21-1306	995			146	0	0	
21-1307	995			196	0	0	0
21-1308	995				0		
21-1309	995				0	0	0
21-1312	995				0	0	0
21-1318	991				1	0	
21-1319	991				0/1	0	
21-1320	991			342	0	0	
21-1321	991				0	0	
21-1322	991				0	0	0
21-1323	991				0	0	0
21-1324	991			229	0	0	
21-1325	991				0	0	
21-1326	991				1		
21-1327	991					0	
21-1328	991				0	2	0
21-1329	991				0		
21-1330	997				0		
21-1331	997			337	0	0	
21-1332	997			330	0	0	
21-1333	997				0		
21-1334	997			380	0	1	0
21-1335	997				0	1	
21-1336	997				1	0	0
21-1339	997				1	0	0
21-1342	997				1	0	0
21-1345	997				2		
21-1346	997				2	0	
21-1347	997				1	2	2
21-1348	946				0		
21-1349	946			327	0	0	
21-1350	946			386	0	0	0
21-1351	946				0	0	0
21-1353	946				0		
21-1354	946			276	0	0	
21-1355	946				1	0	0
21-1357	946				1	0	0
21-1359	946				0/1		0
21-1362	946					0	
21-1365	970					0	
21-1370	970			338	0	0	
21-1371	970			330	0	0	
21-1372	970			397	0	0	0
21-1373	970			398	0	0	0
21-1374	970			284	0	2	0
21-1375	970				1		
21-1379	951				0	0	
21-1380	951				0	0	0
21-1382	951				0		
21-1383	951			217	1	0	
21-1389	975	6	4				
21-1392	975	6	4				
21-1396	924				1	0	0
21-1399	924				1	0	0
21-1402	925			305	0	0	
21-1403	925					0	
21-1404	925			370	0	1	0
21-1405	925				2	0	0
21-1408	923				1	1	

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ID#	CAT#	PUB	AUR	DIAP LGTH	EPIPH1	EPIPH2	EPIPH3
21-1409	923			311	0	0	
21-1410	923				1	1	0
21-1416	928					0	0
21-1418	928						1
21-1421	928				2	0	1
21-1429	968				1	2	
21-1430	968				2	0	
21-1439	922	4	2				
21-1442	922	4	1				
21-1448	935				2	0	1
21-1451	935				2	0	1
21-1454	935		3				
21-1457	935		3				
21-1462	931		5				
21-1467	950	6	3				
21-1470	950	6	3				
21-1476	1009				0		
21-1477	1405				1	2	
21-1479	1405	6	4				
21-1482	955				0	2	0
21-1484	1031			130	0	0	
21-1485	951			242	2	0	
21-1487	1031			118	0	0	
21-1488	955			200	1	0	
23-028	4521	4	3				
23-031	4520	5	3				
23-053	4408		5				
23-059	4409	9	4				
23-062	4410	9	4				
23-100	4657	6	5				
23-103	4656	5	5				
23-125	4050				0		
23-158	3984	4	2				
23-161	3983	5	2				
6101-967	8164			266	0	0	
6101-968	8164			267	0	0	
6101-969	8164			257	0	0	
6101-970	8164			257	0	0	
6101-971	8164			314	0	0	0
6101-972	8164			316	0	0	0
6101-973	8164			179	0	0	
6101-974	8164			178	0	0	
6101-975	8164			192	0	0	
6101-976	8164			193	0	0	
6101-977	8164			235	0	0	0
6101-978	8164			236	0	0	0
6101-979	8164			0	0	0	0
6101-982	8164			0	0	0	0
66-1490	7455			248	0	0	
66-903	7455			0	0	0	
66-904	7455			0			
66-905	7455			0	0	0	
66-906	7455			1	1		0
66-907	7455			224	2	0	
66-908	7455			250	2	0	
66-909	7455			228	2	0	
66-910	7455			253	2	0	
66-911	7455			286	0	2	2
66-924	7455			1	0		
66-927	7455			0			
66-930	7455		<1	2	0	0	0
rb-1000	6805			107	0	0	0
rb-1001	1347			133	0	0	0
rb-1002	4079					0	0
rb-1003	3297					0	
rb-1004	2556				0	0	

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ID#	CAT#	PUB	AUR	DIAP LGTH	EIPPH1	EIPPH2	EIPPH3
rb-1005	1347					0	
rb-1010	836			186	0	0	
rb-1011	1347					0	
rb-1012	1347				0		
rb-985	8276			137	0	0	
rb-986	8276			158	0	0	
rb-990	8273				0	0	0
rb-991	8273				0	0	0
rb-993	8273				0	0	
rb-994	8273				0		
rb-998	6805			87	0	0	
rb-999	6805			98	0	0	
sb-949	8268			145	0	0	
sb-950	8268			144	0	0	
sb-951	8268			141	0	0	
sb-952	8268					0	
sb-953	8268			179	0	0	0
sb-954	8268				0	0	0
sb-955	8268				0	0	
sb-956	8268			101	0	0	
sb-957	8268				0		
sb-958	8268			112	0	0	
sb-959	8268			134	0	0	0
sb-960	8268					0	0
sb-961	8268				0	0	0
sb-964	8268				0	0	0
st-532	5238	7	4				
st-535	5238	7	4				
xu3a-638	6406	6	3				
xu3a-641	6406	7	5				
xu3a-674	6487			127	0	0	0
xu3a-675	6486			127	0	0	0
xu3a-676	6484			80	0	0	
xu3a-677	6485			79	0	0	
xu3a-678	6482			90	0	0	
xu3a-679	6483			90	0	0	
xu3a-680	6481			101	0	0	0
xu3a-720	6474				0	0	
xu3a-722	6488						0
xu3a-723	6457			113	0	0	
xu3a-724	6458			111	0	0	
xu3a-725	6456			112	0	0	
xu3a-726	6459			113	0	0	
xu3a-728	6454			137	0	0	0
xu3a-729	6455				0	0	0
xu3a-730	6453			87	0	0	
xu3a-731	6452			98	0	0	
xu3a-732	6451			110	0	0	0
xu3a-733	6419				0	0	0
xu3a-736	6420				0	0	0
xu3a-742	6428				0		
xu3a-743	6427				0		
xu3a-744	6426				0	0	
xu3a-746	6425				0	0	
xu3a-808	7369		7				
xu3a-810	7369		7				

VITA

Bradley J. Adams was born 4/24/68 and grew up in Kansas. Regretfully, he has never spent much time in a wheat field, seen a tornado, caught a glimpse of Dorothy and Toto, or seen the Chiefs go to a Superbowl.

After graduating from Shawnee Mission East High School in 1986, it seemed like a business degree from the University of Kansas was the right step. Fortunately for the entrepreneurs of the world, he stumbled across the romantic field of anthropology and quickly changed gears. After receiving a double major in Anthropology and Spanish, he lived the life of a nomad for several years roaming the west coast as a slave to contract archaeology, beer, motel-life, and beer. Once a fascination with human osteology was discovered, it became apparent that graduate school was the next logical endeavor. Since Knoxville, Tennessee is home to the only spherical building of consequence in the world, as well as a university ... the choice seemed quite obvious.