

**Totah Archaeological Project Faunal Analysis:
The Tommy Site (LA126581)
Field School Sessions 1999-2001**

INTRODUCTION

Three excavation seasons at LA126581, a Pueblo I through Pueblo III habitation site in San Juan County, New Mexico, yielded a large faunal assemblage. A total of 2,224 faunal specimens was analyzed. Total weight of the collection is 2775.99 grams (about six pounds). Faunal material was recovered from a pitstructure (Structure 1), ten contiguous rooms in a masonry room block (Structures 2 through 11), several features within these structures, a midden (Nonstructure 1), and excavation units in the overburden above the masonry room block (Nonstructure 2). All of the faunal material from only one of the 2 x 2 m excavation units in the Nonstructure 1 midden, 142N/102E, was analyzed. However, modified faunal material was pulled from the remaining Nonstructure 1 excavation units and also included in the analysis. The faunal material analyzed from Nonstructure 1 was provenienced only by Level in the midden rather than by excavation unit. The Nonstructure 2 overburden includes an upper occupation level and four features. However, faunal material was only recovered from one of those features. The following sections discuss the methods employed in the faunal analysis, results of taxonomic identification and quantification, and distribution of these remains.

METHODOLOGY

All prehistoric vertebrate remains were inventoried, using Excel for Windows to manipulate the generated data. An Ohaus digital scale, Model CT600-S, was used to record bone weight. Provenience information was also recorded during analysis. All fragments recovered were analyzed by the author, using comparative collections on loan from or housed at the Institute of Applied Sciences, Zooarchaeology Lab, University of North Texas, Denton, Texas. Occasional supplements were required, using conventional osteological keys such as Olsen (1964), Gilbert (1980), and Schmid (1972). Identifications were made to the most specific category possible depending on condition of the bone and available comparative material. Only positive identifications resulted in the assignment of elements to genus or species.

Standard zooarchaeological methods have been used. The animal bones were cleaned and inventoried by San Juan College Field School personnel in Farmington, New Mexico, then submitted for identification and quantification. Both unidentifiable and identifiable pieces were analyzed in similar fashion. That is, the same attributes were recorded: taxon, element and portion of that element, anatomical location of the element, and condition of the bone including any notes on age, taphonomy, burning or breakage patterns, gnawing, and cultural modification if applicable.

Quantification of the assemblage is summarized as number of identified specimens per taxon (NISP) and as minimum number of individuals (MNI) for identified elements. MNI estimates were calculated according to the most frequently occurring element, based on symmetry and element

portion (Munzel 1986). In the mammalian class, teeth were used whenever possible. Teeth retained in socket were recorded but not counted or weighed. A total of 154 teeth in socket were identified but not included in the site total. Loose teeth (those not in socket) were counted and weighed as separate elements. This allowed for MNI calculations without elevating specimen counts or skewing the data. Other attributes in defining MNI include age (based on tooth eruption and occlusal wear and/or epiphyseal fusion), and also on the relative sizes of otherwise similar specimens in the comparative collection. In some cases, complete long bones and proximal or distal ends were considered.

The faunal data tables in this report are standard species lists with the number of occurrences for each animal. Those specimens regarded as unidentifiable (those coded to only class or order) have been consolidated into a few general categories. Elements of nondiagnostic skeletal value (ribs, vertebrae, and long bone shafts; Olsen 1964), are coded in an indeterminate category by class and/or size range. Specifically, specimens counted as “very small mammal” refer to mouse-size mammals, “small mammal” is gopher or rabbit-size, “medium mammal” includes dog or sheep-size animals, and “large mammal” is deer-size. “Indeterminate vertebrate” includes the bones uncertain of class. Recording these specimens in a size category enables the most precise level of observation as the specimen allows. In small samples, taking note of weight and the size categories of nondiagnostic elements broadens the function of the bone assemblage. However, percentages referred to in this report are calculated by number of bones (NISP) rather than weight. Weight of specimens by PD and bag number can be found in the faunal data sheets.

ANALYSIS RESULTS

The following section describes the animals identified in the faunal assemblage. Taxonomic classes identified include amphibian, bird, and mammal (leporidae, rodentia, carnivora, and artiodactyla). Remains from unidentifiable mammals of all sizes and indeterminate vertebrate are also included in the site assemblage. Number of identified specimens (NISP) and minimum number of individuals (MNI) for each taxon are summarized in Table 1, as are weights for each taxon and percentages of site assemblage. Composition of anatomical elements can be found in Table 2.

Assemblage Composition

Class Amphibia

Order Anura: Frog/toad is represented by 72 elements. They were recovered from three structures and one excavation unit. Eight specimens from a large individual comparing favorably to toad (*Bufo* sp.) came from Level 1 of Nonstructure 2. Features 1 and 2 (Level 3, Floor 1) in Structure 2 yielded 65 elements, with a minimum of two individuals. One long bone came from a burial feature in Structure 9 (Feature 1, Level 2), and six elements were found in Structure 11, Levels 1 and 3. The six bones from Structure 11 are also from a large individual comparing favorably to *Bufo* sp. None of these specimens are burned, and are probably intrusive remains not related to subsistence refuse. There are several species of frogs and toads that inhabit the project area, but a specific

identification was not recorded. Because of their moist skin, most frogs and toads are prone to desiccation, and therefore confined to wet or moist habitats. However, some species have adapted to more arid habitats by burrowing into the soil or hiding beneath rocks or logs to avoid the heat (Behler 1995).

Class Aves

Order Anseriformes, Family Anatidae: Mallard duck (*Anas platyrhynchos*) is represented by one element. This wing bone fragment was recovered from an excavation unit in Nonstructure 2 (120N/120E, Level 1). The specimen is not burned. This wide-ranging bird is common in ponds and fresh-water marshes (Robbins 1983).

Order Galliformes, Family Phasianidae: Turkey (*Meleagris gallopavo*) is represented by 80 fragments. The majority were recovered from eight levels in the midden (N=45). Four levels in Nonstructure 2 yielded 14 specimens, and the remaining 21 pieces came from eight different room structures. Seven fragments are burned. Turkey occurs as wild fowl in open woodland environments (Robbins 1983). These fragments may be the remains of game birds. However, the turkey bone fragments recovered from this site are possibly the remains of domesticated individuals, as 91 eggshell fragments are included in the collection. The eggshell fragments were recovered from five different levels in excavation units in the midden and Nonstructure 2. There is considerable evidence of domesticated turkey throughout the Anasazi region, primarily in late Pueblo II and later sites (Lippmeier 1994). At least three individuals were present at the site. Turkey and other bird bones were often used in the manufacture of jewelry and tools. The LA126581 faunal collection includes 13 modified turkey elements, and they will be discussed further in the modified bone section.

An additional 42 fragments from unidentifiable large bird were recovered from Structures 2, 3, 4, and 5, and six levels in excavation units in the midden and Nonstructure 2. This includes 16 pieces from three different features in three structures. It is noted in the comments that at least some of these bones may be the remains of turkey. Seventeen large bird bones are burned, including 14 fragments from two features.

Class Mammalia

Order Lagomorpha, Family Leporidae: Blacktail jackrabbit (*Lepus californicus*) is represented by 238 fragments, with a minimum of ten individuals. Only 21 fragments are burned. The majority were recovered from 10 levels in the midden (N=183). Four levels in Nonstructure 2 yielded 14 specimens, including two pieces from a storage pit feature (Feature 6). The remaining 41 specimens came from ten different room structures, including 23 fragments from various features within these structures. Nine jackrabbit bones are modified. Currently, only one species occupies the project area. The blacktail jackrabbit prefers open prairies and sparsely vegetated deserts (Burt and Grossenheider 1980). It is found mainly at elevations below 6,000 feet, often in brushy areas (Cockrum 1982).

Cottontail rabbit (*Silvilagus* sp.) is represented by 197 fragments. A minimum of nine

individuals were present at the site. Fifteen specimens are burned, and three elements are modified. The majority were recovered from nine levels in the midden (N=116), and four levels in Nonstructure 2 yielded 24 specimens. The remaining 57 fragments came from eight different structures, including 37 pieces from seven different features within these structures. Cottontail rabbits occur within semiarid grasslands and deserts, especially shrubby areas (Hoffmeister 1986). Currently, two species occur near or within the project area, including desert cottontail (*Sylvilagus audubonii*) and mountain cottontail (*Sylvilagus nuttalli*). The desert cottontail prefers open plains, foothills, and low valleys, as well as grass, sagebrush, scattered pinons and junipers; the mountain cottontail prefers thickets, sagebrush, and loose rocks and cliffs (Burt and Grossenheider 1980). Mountain cottontail is generally found above 6,000 feet in treeless, brush covered areas, while desert cottontail generally occupies brushy areas at elevations below 6,000 feet (Cockrum 1982). Based on the elevation of the site, it is reasonable to assume that the bone fragments probably represent the desert cottontail. Osteologically, the two species are too similar to distinguish, especially when specimens are highly fragmented. Cottontail remains are very common in Anasazi faunal assemblages, as rabbits contributed substantially to their food supply. They are an important small game animal, usually easily procured by hunters (Brown 1993), possibly during the tending of fields and gardens.

In addition to cottontail and jackrabbit, the site assemblage includes 35 indeterminate rabbit bones. Nineteen specimens were recovered in three levels in the midden, and nine fragments came from Level 1 of Nonstructure 2. The remaining seven specimens were recovered from three different structures, including three pieces from two features. None of the specimens are burned.

Order Rodentia: Several rodents were identified in the LA126581 faunal assemblage, including Sciuridae, *Cynomys gunnisoni*, *Thomomys* sp., *Castor canadensis*, *Neotoma* sp., and *Erethizon dorsatum*. Many of these species may be intrusive additions to the site assemblage, although rodents are thought to contribute to prehistoric subsistence (Brown 1993), as in garden hunting models. Rodents are also probably represented by many of the specimens recorded as small mammal.

Family Sciuridae is represented by Gunnison's prairie dog (*Cynomys gunnisoni*). Six elements were recovered from four levels in the midden, and a pit feature (Feature 2) in Structure 7 yielded a mandible with teeth. A single tooth was found in Level 1 of Structure 11. None of these specimens are burned. Gunnison's prairie dog is the only species occurring in the project area, preferring areas of open grassland, especially where the soil is compact and well drained (Cockrum 1982). Prairie dogs were cooked and eaten by several Native American groups (Brown 1993). A minimum of six individuals were present at the site.

Family Sciuridae is also represented by four small squirrel bones, recovered from Nonstructure 2 (Level 1), Structure 3 (Feature 1), Structure 7 (Surface 1), and Structure 9 (Level 1). Only the specimen from Structure 7 is burned. These are probably the remains of rock/ground squirrel (*Spermophilus* sp.). Ground squirrels can be a great threat to stored foodstuffs (Lippmeier 1994). Additionally, 20 bones from a larger unidentifiable squirrel (*Sciurus* sp.) were recovered from five levels in the midden, three levels in Nonstructure 2, Structure 6 (Feature 1, Floor 1), and

Structure 8 (Floor 1). Two squirrel bones are burned. These larger squirrel bones may be the remains of prairie dog, but numerous species of squirrels inhabit the project area. Post-cranial elements are very difficult to distinguish species identification, especially when fragmented.

Family Geomidae is represented by pocket gopher (*Thomomys* sp.). Nine specimens were recovered from Nonstructure 2 (Level 2), Structure 5 (Feature 4, Floor 2), Structure 9 (Level 1), and Structure 11 (Level 3). None of the specimens are burned, and a minimum of two individuals were present at the site. Currently, two species of *Thomomys* inhabit the project area, and they are considered harmful to cultivated areas (Burt and Grossenheider 1980). These rodents are fairly difficult to catch but summer thunderstorms may flood their burrows, allowing for easier capture (Lippmeier 1994). Pocket gophers were eaten by several Native American groups, but they also had non-food functions. For example, the Navajo drank a mixture of water, gopher stomach, and flesh as a remedy for stomach aches (Hill 1938).

Family Castoridae is represented by beaver (*Castor canadensis*). One burned toe bone was recovered from Level 3, Surface 1 of Structure 7. The beaver prefers streams and lakes with trees on banks (Burt and Grossenheider 1980), occupying most of the United States. Historically the beaver was exploited as a food resource and for its pelt (Brown 1993).

Family Cricetidae is represented by woodrat (*Neotoma* sp.). One leg bone fragment was recovered from Level 1 of Nonstructure 2. The specimen is not burned. Currently, four species of woodrats occupy the project area, all generally preferring brushland, rocks and cliffs or mountains (Burt and Grossenheider 1980). They build nests or dens, and can create pseudo-features. Burned woodrat houses and their contents can resemble prehistoric hearths. However, the presence of woodrat in a site's faunal assemblage does not always indicate intrusion. Woodrats were sometimes eaten by several Native American groups (Brown 1993).

Family Erethizontidae is represented by porcupine (*Erethizon dorsatum*). Six elements were recovered from the midden (Level 7), Nonstructure 2 (Level 4), Structure 2 (Level 3, Floor 1), and Structure 4 (Level 2, Surface 1). None of the specimens are burned.

The second largest native North American rodent, the porcupine ranges throughout all of western North America usually preferring forested areas, but may wander if brush is available. Although they are awkward climbers, they are more comfortable in trees than on the ground. Single young are usually born in April or May and are able to climb trees and eat solid food a few hours after birth (Burt and Grossenheider 1980).

They feed on buds, twigs, and inner bark, as well as pine needles, mistletoe, oak leaves, acorns, cactus fruit, and fungi. Several Native American groups have been known to trap or hunt and eat porcupine. They were also exploited for nonsubsistence purposes, such as medicinal, decorative, and functional items. The Navajo combined scorched quills and paws in solution to drink or use topically in case of epidemic; other groups used the quills with dye for embellishing leatherwork

and tattooing (Brown 1993).

Order Carnivora, Family Ursidae: Black bear (*Ursus americanus*) is represented by two toe bones. One element was recovered from the midden (Level 4), and the other specimen came from Nonstructure 2 (Level 1). These bones are not burned. Inhabiting forested mountainous areas, the black bear is an important game animal. The project area is surrounded by the range of the black bear (Burt and Grossenheider 1980), which includes the San Juan and La Plata Mountains. Highly omnivorous, almost any food type is acceptable (Findley 1987). The two elements recovered are extreme lower limb bones and may indicate the use of the pelt and claws (Akins 1985).

Order Carnivora, Family Canidae: Five specimens are recorded as canid (*Canis* sp.: dogs and relatives), representing a minimum of one individual. Two elements were recovered in the midden (Levels 8 and 10), and one element was found on the surface of Nonstructure 2. A mandible fragment with two teeth was found on the bench (Feature 1) in Structure 1, and an ulna was recovered from Level 2 in Structure 11. None of these bones are burned. Fragmentation and minimal diagnostic value prohibited specific identification. Due to close association with humans, these bones are most likely the remains of domestic dog (*Canis familiaris*) rather than coyote or fox. Dogs were used for hunting, trapping, refuse disposal, prevention of intruders, and occasionally in ritualistic ceremonies. Domesticated dogs were common in Anasazi sites by the Basketmaker period (Shelley and Jones 1992), and have been identified at several Pueblo II sites (Lippmeier 1994; Akins 1985). Three basic types of southwestern dogs are recognized by researchers: a large Basketmaker dog, a small slender-nosed (long-faced) dog, and a small short-faced dog (Olsen 1968; Brown 1993).

Order Carnivora, Family Felidae: Bobcat (*Felis rufus*) is represented by one element. It was recovered from the room fill/wall fall in Level 1 of Structure 6. This ulna is not burned, and is modified into a finely crafted awl. The bobcat occurs throughout the Southwest and beyond, preferring rimrock and chaparral areas in the West (Burt and Grossenheider 1980). They live in dens and feed on small mammals, birds and lizards, and are especially fond of cottontails and jackrabbits. Although it was occasionally eaten by some peoples, the bobcat was hunted primarily for its pelt (Brown 1993).

Unidentifiable carnivore is represented by four specimens. Fragmentation prevented specific identification. One toe bone fragment was recovered from Level 14 in the midden. Nonstructure 2, Level 3, yielded a mandible fragment and two tooth fragments. The pieces from Nonstructure 2 are burned.

Order Artiodactyla, Family Cervidae: Deer (*Odocoileus* sp.) is represented by eight teeth. Two specimens were recovered from the midden (Levels 4 and 7), including a deciduous premolar. Also from an immature individual, six enamel fragments were found in an earthen pit feature (Feature 7) in Structure 2. None of these pieces are burned. Mule deer (*Odocoileus hemionus*) is the only deer that currently occupies the project area, preferring a variety of habitats including coniferous forests,

desert shrubs, chaparral, grassland with shrubs, and browses plants as necessary (Burt and

Grossenheider 1980).

Cervidae is also represented by 56 pieces of antler. The specimens were recovered from Structure 2 (Floor 2), Structure 4 (below Surface 1), and Structure 6 (Floor 1). These antler fragments are probably the remains of deer rather than elk (*Cervus canadensis*), as no elk or large artiodactyl remains were identified in the site collection. However, elk was probably available nearby, preferring semi-open forest, mountain meadows in summer, foothills, plains, and valleys (Burt and Grossenheider 1980).

Order Cervidae, Family Antilocapridae: Pronghorn antelope (*Antilocapra americana*) is represented by a maxilla fragment with a deciduous tooth retained in socket. It was recovered from a storage pit feature (Feature 6) in Nonstructure 2, Level 2. The specimen is not burned. The pronghorn antelope prefers open prairies and sagebrush plains (Burt and Grossenheider 1980).

Additionally, those specimens recorded as medium artiodactyl (N=163) and at least some of the large mammal (N=686) bones found are most likely the remains of mule deer and pronghorn. The specimen recorded as small artiodactyl is probably the remains of an immature individual.

Assemblage Condition

In general, the faunal sample is in good condition. A total of 926 specimens show evidence of taphonomic patterns, including exfoliation and root etching as the most common (Table 3). Abrasion, longitudinal cracking, humic staining, and splintering are also noted, but occurrences are minimal. Occasionally, multiple weathering patterns were consolidated. The majority of the site collection is devoid of any taphonomy (N=1298, 58%).

Burning is often associated with human consumption activities and refuse disposal, but burning of structures can also result in the charring or incineration of many remains not associated with cooking or food use. The burned specimens in this site assemblage most likely reflect subsistence processing activities and subsequent trash disposal. At LA126581, only 237 specimens are burned, 11% of the site sample. Summaries of burning patterns and distribution of these burned specimens can be found in Tables 4 and 5.

Animal scavenging activities at the site were relatively low. Seven specimens are rodent gnawed, and 13 specimens show evidence of carnivore gnawing (Table 6). They were recovered from the midden, Nonstructure 2, and Structures 2, 3, 9, and 11.

In addition to weathering, burning, and gnawing, spiral fractures were distinguished during analysis. Spiral fractures are the result of impact, such as striking with a hammerstone or breaking on an anvil. It is a common, expedient technique used in tool manufacturing. Usually associated with large mammal long bones, spiral fracturing can also occur during trampling, carnivore gnawing, or any other severe impacts not necessarily associated with human activity. A total of 236 specimens are spirally fractured (Table 6). The spiral fracturing suggests that they were broken possibly during the process of marrow extraction for "bone grease". The bones are broken into small pieces and

boiled in water. The floating fat is then skimmed from the top of the pot. The substance is used for frying and other culinary purposes. This practice has been well documented over time, and is a method used by many different cultures (Leechman 1950). The small quantity of burned bone also supports this theory. The remainder of the incomplete larger mammal elements are angularly fractured. Fragmentation also makes for easier disposal.

Modified Bone

Modified bone refers to faunal specimens with evidence of human alteration such as cutting, grinding, or other modifications, as well as finished bone tools or jewelry. The typology often used to organize large bone artifact assemblages is based on "Bone Artifacts From Arroyo Hondo Pueblo" (Beach and Causey 1984) in *The Faunal Remains from Arroyo Hondo Pueblo, New Mexico* (Lang and Harris 1984). This classification system was originally developed by A. V. Kidder in *The Artifacts of Pecos* in 1932. Included are five functional categories: awls, ornaments, musical instruments, stone-knapping tools, and hide-processing tools. Each category is then sub-divided into several different types, according to faunal source, anatomical element used, and manufacturing form. The studies mentioned above were developed to accommodate the particular assemblage. Beach and Causey revised Kidder's scheme to include types not found in the Rio Grande district. Both of these large faunal artifact assemblages yielded very diverse artifact types.

Categories have been consolidated to accommodate the specific modified faunal assemblage from LA126581. A total of 83 modified bones were recovered, including awls, rubbing tools, butchered bone, beads, a gaming piece, tinklers, a batten, and miscellaneous unidentifiable modified fragments. The majority were recovered from 11 levels in the midden (N=52), and three levels in Nonstructure 2 yielded eight modified pieces. The remaining 23 artifacts were recovered from nine different structures. Modified bone summaries can be found in Tables 7 through 11.

After provenience information, weight, and all other diagnostic attributes were recorded, modified pieces from LA126581 were generally categorized according to morphology and probable function. Measurements of complete artifacts and any information on surface observations (striations, polishing, etc.) were documented. The following section discusses these artifacts by type of modification/tool function, the animals exploited and element used, and context of recovery.

Type I. Pointed Bone Tools

Pointed bone tools (awls, punches, drills, needles, pins, etc.) include those artifacts which are used to punch or expand holes in a variety of materials such as animal hides, textiles, or basketry. They are primarily manufactured from the long bones of birds, small mammals (particularly rabbits), artiodactyls, and other large mammals. One or both articular ends of the bone may be removed, and the shaft split longitudinally. The edges are ground, and the end is shaped to a sharp, beveled, or rounded tip.

Based on animal class and/or size, nine subdivisions within this category are necessary. Pointed bone tools made from medium artiodactyl and large mammal are Types A through F. Types G, H, and I include the utilization of bones from other animals.

Medium Artiodactyl and Large Mammal Awls

Type I-A. Long bone, proximal end retained (N=3)

The proximal end of the bone forms the handle of this tool type. Manufactured from medium artiodactyl ulnae, three specimens are included in the LA126581 faunal assemblage. One was recovered from Level 4 in an excavation unit in the midden, one came from Structure 1 (Floor 1), and the third was found in a bell-shaped pit feature (Feature 8, subfloor) in Structure 1. These awls are finely crafted, ranging in length from nine to almost 13 centimeters (cm), suggesting that the two shorter artifacts were probably broken at least one time and resharpened for continued use. They are not burned, and striations are visible on the surfaces.

Type I-B. Split long bone, distal end retained (N=2)

The distal end of the bone forms the handle of this tool type. Metapodials are the most common element used. Other long bones such as the tibia or radius are also utilized, but the LA126581 specimens are manufactured from metapodials. The shaft is split longitudinally, and the distal condyle fits comfortably as a handle. The shorter specimen (5.2 cm) is finely crafted, and was recovered from the fourth level in Excavation Unit 138N/100E in the midden. It is not burned. The second piece came from Level 1 of Structure 11. It measures 15 cm in length, and is charred on the lower portion of the shaft.

Type I-C. Dewclaw Awl (N=2)

These two awls are manufactured from the dewclaw (an accessory metapodial). Ancestors to our modern deer originally had five toes. As the need for speed in open spaces arose, the deer lost its "thumb" completely, and eventually developed enlarged, stronger center toes. The dewclaw is a remnant of the lost digits (Rue 1982). These bones require little modification to function as a punch-type tool, as they are naturally shaped like a large, flat toothpick. They were recovered from adjacent excavation units in the midden. The one from Excavation Unit 140N/100E, Level 2, is from an immature individual, as evidenced by the unfused distal end. It measures 5.3 cm in length. The other specimen was found in Level 5 of Excavation Unit 142N/102E, and is 6 cm long. Both specimens are striated, ground, and polished. They are not burned.

Type I-D. Splinter Awl (N=6)

These tools are manufactured from splintered long bone fragments and have a fairly wide range of shapes and lengths. They can be finely crafted and finished pieces, or crudely made. Many found have unfinished edges or butt-ends (handles). The six splinter awls found at LA126581 all have unshouldered tips, and were found in a variety of contexts. The specimen from the bench (Feature 1) in the Pitstructure (Structure 1) is biconically drilled on the butt-end and was probably suspended by some type of cordage. The tip is broken, and the surface is severely root etched and exfoliated. It is 5.4 cm long. A finely crafted, highly polished piece from the floor of Structure 2 measures 15 cm in length. Oblique and longitudinal striations are visible on the surface. The remaining four specimens were recovered from two levels (Levels 1 and 4) in two excavation units (140N/100E and 144N/108E) in the midden. These pieces range from 6.7 cm to 12.6 cm in length. None of the splinter awls are burned.

Type I-E. Distal Awl Fragments (N=5)

These specimens are broken mid-shaft, the distal portions of fairly large awls that were not assigned to any formal type. Although they are fairly short, they may have been used after fracturing but the broken butt-ends have not been smoothed. Four of them are highly polished and have sharp tips. The fifth is severely exfoliated and the tip is broken. Two specimens were found in two excavation units in the midden: 140N/100E, Level 3 and 144N/104E, Level 15. A thermal feature (Feature 1) on the floor of Structure 6 yielded a burned awl. The remaining two pieces were recovered from Structure 8 (Floor 1) and Structure 9 (Level 1).

Type I-F. Awl Tips (N=3)

Similar to Type I-E, these specimens are also the broken distal portions of awls, but are much shorter, with very little or no shaft present. Two specimens were recovered from Excavation Unit 138N/100E in Levels 3 and 4. The third artifact came from a storage pit feature (Feature 6) in Nonstructure 2.

Type I-G. Other Mammal Awls (N=3)

A broken awl made from a cottontail tibia was recovered from Level 3 of Excavation Unit 117N/96E in Nonstructure 2. Oblique striations are visible near the tip. A finely crafted complete jackrabbit tibia awl was recovered from Level 1 of the midden (Excavation Unit 144N/106E). It is 11.2 cm long. The room fill/wall fall of Structure 6 (Level 1) yielded a bobcat ulna awl, also complete and very finely crafted. Measuring 15.5 cm in length, it is highly polished, the facets are ground, and oblique striations are visible on the shaft.

Type I-H. Turkey Awls (N=4)

The LA126581 assemblage includes four awls manufactured from turkey long bones. Two levels in two excavation units in the midden (144N/104E and 144N/108E) yielded one artifact each. Measuring 9.4 cm in length, the tip is broken on the one from Level 1. The piece from Level 3 has a ring and snap modification on the butt end, and the pointed tip is a broken, reworked edge. This piece may have originally been a bead or tube prior to fracturing and subsequent reuse. It is 4.8 cm long. The other two artifacts were recovered in Nonstructure 2, Level 2. The piece made from a tibiotarsus is finely crafted and striated, but broken mid-shaft. The radius awl is obliquely striated and the tip is not very sharp.

Type I-I. Other Awls (N=4)

These small awls are manufactured from unidentifiable fragments of indeterminate vertebrate and mammal. Two specimens were recovered from two levels in Excavation Unit 144N/106E in the midden. The piece from Level 1 compares favorably to a jackrabbit tibia, but absence of diagnostic attributes prevented specific identification. It is 3.2 cm long. An exfoliated short, splinter awl (3.3 cm) was found in Level 2. Two needle-like pieces were recovered from Structure 7, Surface 3. The proximal ends are broken, and they measure 3.2 cm and 3.3 cm in length.

Type II. Other Large Mammal Items

This category includes various types of large mammal bone modification other than pointed tools. For purposes specific to this study, this modification type has five sub-divisions (Types J through N).

Type II-J. Blunt Tools (N=4)

These specimens are grouped together because of their similarity in shape and blunt working ends. Two levels in Excavation Unit 140N/100E in the midden yielded one specimen each. The metacarpal tool from Level 6 is broken at mid-shaft and the broken, ragged edge has been ground to a blunt shape. The piece is 14 cm long and highly polished and striated. The fragment from Level 8 has been deeply scored and snapped around the circumference of the bone shaft, and the longitudinal edges are ground smooth. The piece is obliquely striated and measures 7 cm in length. A crude, severely etched and exfoliated spatulate-shaped piece came from the bench (Feature 1) in the pitstructure (Structure 1). It is broken mid-shaft, and is 11 cm long. A specimen manufactured from a large mammal rib fragment was recovered from Level 3 in Structure 11. Measuring 8.6 cm, this piece is split longitudinally and the broken edges are ground smooth. These tools may have been multi-functional. They appear to have been used on non-abrasive surfaces, such as hides or fibers.

Type II-K. Batten (N=1)

Battens are weaving tools used on looms to keep warp threads separated while the weft is inserted (Barnett 1991, page 30). They are long, flat bone fragments. Manufactured from a medium artiodactyl metapodial, this specimen was recovered from Level 1 of Structure 9, and is highly fragmented. Eight fragments mend together to form an incomplete tool that measures 22.6 cm in length. The top half is charred and heavily etched and exfoliated. The lower portion is highly polished and striated. In general, the piece is finely crafted.

Type II-L. Scored Bone Fragments (N=3)

Three large mammal long bone fragments exhibit deep transverse scoring around the circumference of the bone. It is similar to the modification used in bead/tube manufacturing. These specimens were grouped together because of the lack of diagnostic attributes. The highly polished specimen from the midden (138N/100E, Level 4) has been snapped at the groove, but the edge is ragged and unfinished. The fragment from Level 3 in Nonstructure 2 has a finished ring and snap modification. Structure 11 (Level 1) yielded a deeply scored fragment. This piece may have broken during the first stages of modification.

Type II-M. Cut Bone (N=4)

Cut marks are visible on four specimens in the LA126581 faunal collection, indicating evidence of disarticulation and butchering. Three medium artiodactyl elements were recovered from three levels in the same excavation unit (142N/102E) in the midden. The sample is comprised of a charred, distal metapodial fragment from Level 1, an astragalus from Level 2, and another astragalus from Level 12. Nonstructure 2, Level 2, yielded a small, charred long bone fragment from an unidentifiable large mammal.

Type II-N. Unclassified Miscellaneous Tool Fragments (N=12)

These 12 specimens are unidentifiable modified fragments, probably from awls and other

tools, but because of fragmentation, a specific assignment was not recorded. They were recovered from several levels in five excavation units in the midden and three surface rooms (Structures 2, 5, and 11). Manufactured from large mammal and medium artiodactyl long bone fragments, seven specimens are burned. These pieces are remnants of indeterminate tool shafts and handles.

Type III. Bone Beads, Fragments, and Debris

These artifacts are most frequently manufactured from the long bone shafts of birds and small mammals. Other mammal bones were used also, but pieces considered not too large or heavy were better suited (Kidder 1932). The articular ends are removed by scoring grooves around the circumference of the bone until the bone wall is weakened, then snapped apart at the groove ("ring and snap"). The broken edge was then ground smooth and sometimes beveled. The scoring marks are often still visible on the shafts. Kidder arbitrarily categorizes this type by length: specimens less than 4.5 inches (11.5 cm) are beads, and those longer than 4.5 inches are tubes. The four complete specimens found at LA126581 all measure less than 4.5 inches. The longest one is 7.5 cm, approximately 3 inches. For purposes specific to this study, this modification type includes three categories: complete specimens, fragments, and manufacturing debris (Types O, P, and Q).

Type III-O. Complete Beads (N=4)

Manufactured from indeterminate vertebrate, turkey, and jackrabbit long bone fragments, only four complete beads were recovered from LA126581. They all exhibit complete ring and snap modification, and are striated and polished. Three specimens were found in two levels of three different excavation units in the midden, and one came from a pit feature (Feature 4) in Floor 2 of Structure 5.

Type III-P. Bead Fragments (N=7)

Six bead fragments were recovered from three levels in four excavation units in the midden, and one fragment was found in Level 2 of Nonstructure 2. They are manufactured from indeterminate vertebrate and turkey long bone fragments ranging in length from 1.8 to 5.5 cm.

Type III-Q. Bead Manufacturing Debris (N=2)

This category includes the faunal specimens with evidence of production: portions of the elements discarded during manufacture after being scored and snapped. Recovered from two levels in two excavation units in the midden (146N/110E, Level 1, and 142N/102E, Level 6), both specimens are the remains of turkey long bones.

Type IV. Specialized Items

The following modification type includes Types R through V.

Type IV-R. Tibia Tinkler (N=7)

The LA126581 modified faunal sample includes one complete tibia tinkler and six tibia tinkler fragments. Six specimens are manufactured from jackrabbit remains, and the seventh is made from cottontail. They were recovered from six levels in four excavation units and one trench in the

midden. The proximal articular surface of the complete specimen (Trench, Level 1) has been sheared away, the distal end removed by a crude ring and snap, and the fibula scar is ground. The fragments exhibit these various modifications: four pieces are sheared on the proximal ends, the fibula scar is ground on two pieces, and one distal fragment is drilled on the posterior face. A thin strip of rawhide was passed through a perforation to attach the piece to others in the group (Barnett 1991, page 108). Barnett also states that tinklers "... were generally worn in a series on the arms, legs, waist, or across the chest during a dance, usually of a ceremonial nature. A series, or several series of these tinklers give a pleasing short light clinking sound when rattled together ."

One complete tibia tinkler was recovered from Bodo Industrial Park Project (5LP425) in Durango, La Plata County, Colorado, and five tibia tinklers were recovered from the Windy Wheat Hamlet (5MT4644) during the Dolores Archaeological Project.

This artifact type, according to Hayes and Lancaster (1975:170), seems to be indigenous to the northern San Juan drainages and is not found in sites south of the San Juan River. The "pierced tubes" or "tinklers" also seem to be a Pueblo I phenomenon and are not reported from earlier or later sites (Brisban 1986).

Type IV-S. Game Piece (N=1)

Sometimes called gaming pieces or dice, this type of artifact includes small pieces of worked bone that are found throughout the Southwest. They are manufactured from the remains of small mammals and birds, as well as large mammals. Cut from long bone or flat bone sections, they are then ground to the desired shape. Most are also ground around the cut edges, and often the faces may be incised or decorated. Only one game piece was recovered at LA126581. It was found in a thermal feature (Feature 2) on Surface 1 of Structure 4. The specimen is broken into four fragments that mend together, measuring 2.5 cm long and 1 cm wide. Manufactured from an indeterminate mammal bone, it is decoratively incised with intersecting diagonal lines on one face. The utilization of bone, seeds, wood, and other materials as gaming pieces is well documented in ethnographic descriptions (Culin 1975).

Type IV-T. Possible Bitsitsi Whistle (N=1)

Bitsitsi whistles are made of two pieces of bone that are the same size, and slightly concave. The edges are ground smooth, and the surfaces are well polished. Small sections of bird long bone shafts were usually the material of choice. For use, they were tied together, concave sides inward, possibly with a reed passed between them (Beach and Causey 1984). These whistles are so named because they resemble a type used in ceremonies at Zuni Pueblo (Brown 1993). Manufactured from a turkey leg bone, the LA126581 fragment was recovered from the midden (Excavation Unit 144N/108E, Level 2). It resembles a broken bead, and three edges are ground smooth.

Type IV-U. Punched Bone (N=1)

One turkey wing bone shaft exhibits a punched hole (as opposed to drilled). The hole penetrates only one bone wall, and appears to be an unfinished modification. Both articular ends of the bone are broken and absent. Perhaps this specimen was to be a tinkler or whistle, but specific modification type was not assigned. It was recovered from the midden (142N/102E, Level 1).

Type V-V. Miscellaneous Unclassified Modified Fragments (N=3)

This category includes three small fragments of unknown function. A jackrabbit femur shaft fragment was recovered from Level 1 of Nonstructure 2. The broken longitudinal edges are ground smooth. A cottontail tibia shaft was recovered from a thermal feature (Feature 1) on Floor 1 of Structure 2. It is burned shiny black, and is obliquely striated and polished. Level 1 (room fill/wall fall) in Structure 8 yielded a turkey tarsometatarsus fragment. It is also obliquely striated. These may be broken awl shaft fragments, but the absence of diagnostic attributes prevented specific identification.

DISTRIBUTION

The following section is organized by provenience, and discusses recovery by study unit. Distribution of faunal remains can be found in Tables 12 through 15.

Nonstructure 1 (N=930)

A total of 930 faunal specimens were recovered from 15 levels in nine excavation units in the midden, 42% of the entire LA126581 faunal assemblage. This includes 52 modified elements. The sample is dominated by large mammal (N=188), jackrabbit (N=183) and cottontail (N=116), but also includes smaller quantities of indeterminate vertebrate, eggshell, unidentifiable large bird, turkey, unidentifiable mammal, small and medium mammal, indeterminate rabbit, squirrel, prairie dog, porcupine, unidentifiable carnivore, bear, canid, small and medium artiodactyl, and deer. Some of these may be intrusive remains, but is generally representative of animals commonly exploited for prehistoric subsistence. Ninety four specimens from ten different levels are burned. Level 6 yielded the majority of faunal remains (N=150), but Levels 1, 4, 7, and 8 also yielded over 100 specimens each. Totals from the other ten levels range from 1 to 66.

Nonstructure 2 (N=712)

A total of 712 faunal specimens were recovered from the surface and five levels in Nonstructure 2. This includes eight modified elements and 84 fragments from a storage pit feature (Level 2, Feature 6). Only 50 specimens are burned, and most of these came from Level 1 (N=27). Unidentifiable large mammal remains dominate the sample (N=398). The remainder of the collection is comprised of indeterminate vertebrate, frog/toad, eggshell, unidentifiable large bird, mallard duck, turkey, unidentifiable small and medium mammal, rabbits, squirrels, pocket gopher, woodrat, porcupine, unidentifiable carnivore, bear, canid, medium artiodactyl, and pronghorn antelope. Level 1 yielded the majority of specimens (N=343), and Level 2 yielded 206 pieces. Again, the sample represents subsistence refuse, as well as some probable intrusive remains.

Structure 1 (N=16)

Only 16 specimens were recovered from the pitstructure. Faunal material was recovered from two levels, including Floor 1 and three features. The sample is comprised of indeterminate vertebrate, medium and large mammal, rabbits, canid, and medium artiodactyl. None of these pieces are burned. The bench (Feature 1) yielded nine fragments, including the drilled awl and one crude, spatulate-shaped tool. One cottontail mandible fragment was found in a bell-shaped pit (Floor 1,

Feature 2), and a second awl came from the another bell-shaped pit (Subfloor, Feature 8). A third awl was recovered from a non-feature area on Floor 1.

Structure 2 (N=225)

Five levels in Structure 2 yielded a total of 225 faunal specimens, including 124 pieces from three features. Only 11 fragments are burned. Faunal material was recovered from room fill/wall fall (Levels 1 and 2) and three floors. The structure sample is dominated by frog/toad (N=57), indeterminate vertebrate (N=40), and antler fragments (N=34). The 57 frog/toad bones from Features 1 and 2 are probably intrusive, as are some of the small and very small mammal bones. The remainder of the collection is comprised of unidentifiable large bird, turkey, unidentifiable mammals of all sizes, rabbits, porcupine, medium artiodactyl, and deer remains, and most of this can be considered subsistence refuse. Three modified bones were recovered from Structure 2: a large mammal splinter awl from Floor 1, a medium artiodactyl modified fragment from Floor 2, and a striated cottontail tibia shaft fragment from a thermal feature (Feature 1) on Floor 1. A pit feature (Feature 7) on Floor 3 yielded 45 specimens, including 23 cottontail bones, six deer tooth fragments, and nine medium mammal bones.

Structure 3 (N=18)

Eighteen faunal specimens were recovered from room fill/wall fall (Levels 3 and 4), Floor 1 (Level 5), and below Floor 1 (Level 6). The sample is dominated by large mammal remains (N=9), and the remainder of the sample is comprised of large bird, turkey, small rodent, rabbits, small squirrel, and medium artiodactyl. Floor 1 yielded the majority of faunal remains (N=15), including three fragments from a cist (Feature 1).

Structure 4 (N=70)

Structure 4 yielded 70 faunal specimens, dominated by indeterminate vertebrate (N=17) and unidentifiable large bird (N=9). Rabbit remains are also high in quantity: four indeterminate rabbit, five jackrabbit, and eight cottontail bones. The remainder of the sample is diverse, comprised of turkey (N=1), unidentifiable mammal (N=8), small mammal (N=4), large mammal (N=6), small rodent (N=3), porcupine (N=1), medium artiodactyl (N=2), and antler (N=2). They were recovered from room fill/wall fall (Level 1), Surface 1 (Level 2), and below Surface 1 (Level 3). The majority came from Level 2, Surface 1 (N=50). Five different features yielded 40 specimens, including the only modified fragment. The gaming piece was found in a thermal feature (Feature 2) on Surface 1. A total of 29 fragments are burned, and 26 of these pieces came from the Surface 1 recovery.

Structure 5 (N=71)

Indeterminate vertebrate (N=18), large mammal (N=16), and jackrabbit (N=16) remains dominate the collection from Structure 5. The remainder of the sample is comprised of unidentifiable large bird, turkey, rabbits, pocket gopher, and medium artiodactyl. They were recovered from room fill/wall fall (Levels 1 and 2) and two floors, including two features on Floor 1 and one feature on Floor 2. The majority came from Floor 2 (N=62), and 52 of these pieces came from the pit feature (Feature 4). An unidentifiable modified fragment was found on Floor 2, and a jackrabbit bead was found in a pit feature (Feature 4) on the same floor. Six specimens from Floor 2 and two specimens

from Floor 1 are burned.

Structure 6 (N=48)

Forty eight faunal specimens were recovered from room fill/wall fall (Level 1) and Floor 1 (Level 2) in Structure 6. Dominated by antler fragments (N=20) and large mammal (N=10), the sample also includes indeterminate vertebrate, turkey, small mammal, rabbits, squirrel, bobcat, and medium artiodactyl. Twelve pieces came from room fill/wall fall, and 36 fragments were found on Floor 1. This includes the bobcat awl from the room fill/wall fall, and one medium artiodactyl awl from a thermal feature (Feature 1) on the floor. Nine specimens found on the floor are burned, and seven of these came from Feature 1.

Structure 7 (N=39)

Four levels in Structure 7 yielded a total of 39 faunal specimens. They were recovered from room fill/wall fall (Levels 1 and 2), two surfaces (Surfaces 1 and 3) and two pit features (Features 2 and 4) on Surface 1. The sample is dominated by small mammal remains (N=19), and 18 of these came from Levels 1 and 2 in the fill of the structure. The remainder of the collection is comprised of indeterminate vertebrate, turkey, large mammal, jackrabbit, small squirrel, prairie dog, and beaver. The single prairie dog and beaver bones came from Surface 1 (Level 3). The prairie dog mandible is the only piece from Feature 2, and Feature 4 yielded one indeterminate vertebrate and one large mammal long bone fragment. Five specimens were found on Surface 3, including the two needle-like tools. The 18 small mammal bones (Level 2), one indeterminate vertebrate (Level 1), and the small squirrel and beaver bones (Level 3, Surface 1) are burned.

Structure 8 (N=21)

Three levels in Structure 8 yielded 21 faunal specimens. One indeterminate vertebrate and three turkey bones came from room fill/wall fall (Level 1), one bone each of turkey, large mammal, cottontail, squirrel, and medium artiodactyl came from Floor 1 (Level 2), and three indeterminate vertebrate, eight large mammal, and one cottontail bone were recovered below the floor (Level 3). This includes one unidentifiable modified turkey bone fragment from the room fill/wall fall, and a large mammal awl from Floor 1. Seven of the large mammal bones from Level 3 are burned.

Structure 9 (N=30)

A total of 30 faunal specimens were recovered from three levels in Structure 9. The majority came from Level 1 (N=28), including an awl and the batten. The sample is comprised of unidentifiable small and large mammal, jackrabbit, small squirrel, pocket gopher, and medium artiodactyl. The frog/toad element from the burial (Feature 1) in Level 2 is probably intrusive. Level 3 yielded a second jackrabbit bone fragment. The batten is the only burned specimen from this structure.

Structure 10 (N=6)

Faunal recovery at Structure 10 was minimal. Four large mammal bones came from Level 2, and Level 3 yielded two jackrabbit bones. None of these pieces are burned or modified.

Structure 11 (N=38)

Three levels in Structure 11 yielded 38 faunal specimens. The majority came from Level 1 (N=23), and 13 fragments came from Level 3. The sample is dominated by large mammal remains (N=14), but also includes frog/toad, turkey, very small and small mammal, rabbits, prairie dog, pocket gopher, canid, and medium artiodactyl. The frog/toad remains are probably intrusive, and the very small mammal, prairie dog, and pocket gopher may also be non-cultural items. Four modified fragments came from Level 1, and the rib rubbing tool came from Level 3. The single canid bone and one of the medium artiodactyl bones were found in Level 2. Six large mammal bones and one medium artiodactyl bone from Level 1 are burned.

SUMMARY

Over 2,000 faunal specimens were recovered from excavation units in the overburden above surface rooms, a midden, a pitstructure, and ten surface rooms at LA126581. The diverse taxonomic recovery is evidence of an environment rich in faunal resources. The large amount of faunal material suggests that the site was occupied by a fairly large population or was occupied for a considerable amount of time. The recovery of small mammals may represent some intrusive activity, but they undoubtedly supplemented the diet of the site occupants. Game animals such as rabbits and deer were probably not heavily relied upon for food, but rather as the occasion arose to supplement the diet. These animals also provided material for tools. On-site bone tool and ornament production and related activities are suggested by the numerous modified specimens. The turkey and dog remains are evidence of domestication. Some animals may be related to ceremonial activities, or they may have been used for other utilitarian purposes. In general, the faunal sample is secondary refuse from subsistence debris.

BIBLIOGRAPHY

Akins, Nancy J.

- 1985 Prehistoric Faunal Utilization in Chaco Canyon: Basketmaker III Through Pueblo III. Environment and Subsistence of Chaco Canyon, edited by F. J. Mathien, pp.305-445. Publications in Archeology, 18E, Chaco Canyon Studies. National Park Service, U.S. Department of the Interior, Santa Fe.

Barnett, Franklin

- 1991 Dictionary of Prehistoric Indian Artifacts of the American Southwest. Northland Publishing, Flagstaff, Arizona.

Beach, Marshall A. and Christopher S. Causey

- 1984 Bone Artifacts from Arroyo Hondo Pueblo. The Faunal Remains From Arroyo Hondo Pueblo, New Mexico: A Study in Short-Term Subsistence Change. Arroyo Hondo Archaeological Series, vol. 5. School of American Research Press.

Behler, John L.

- 1995 National Audubon Society Field Guide to North American Reptiles and Amphibians. Chanticleer Press, New York.

Brisban, Joel

- 1986 Excavations at Windy Wheat Hamlet (Site 5MT4644), A Pueblo I Habitation. Dolores Archaeological Program: Anasazi Communities at Dolores: Early Anasazi Sites in the Sagehen Flats Area. Compiled by Allen E. Kane and G. Timothy Gross, page 720. Bureau of Reclamation, Engineering and Research Center, Denver.

Brown, Marie

- 1993 Natural History and Ethnographic Background. Across the Colorado Plateau: Anthropological Studies for the Transwestern Pipeline Expansion Project, J. W. Gish, et al. Volume XV, Part 3. Office of Contract Archaeology, University of New Mexico, Albuquerque.

Burt, William H. and Richard P. Grossenheider

- 1980 A Field Guide to the Mammals. Peterson Field Guide Series, edited by R. T. Peterson, 3rd edition, Houghton Mifflin.

Culin, Stewart

- 1975 Games of the North American Indians. In Twenty-Fourth Annual Report of the Bureau of American Ethnology to the Smithsonian Institution, 1902-1903, by W. H. Holmes, Chief. Originally published by the Government Printing Office in 1907. Dover Publications, New York.

Cockrum, E. Lendell

- 1982 Mammals of the Southwest. University of Arizona Press, Tucson.
- Findley, James S.
 1987 The Natural History of New Mexico Mammals, New Mexico Natural History Series. Published by University of New Mexico Press.
- Gilbert, B. M.
 1980 Mammalian Osteology. Revised from Mammalian Osteo-Archaeology: North America (Missouri Archaeology Society). B. M. Gilbert, Publisher, Laramie.
- Hayes, Alden C., James A. Lancaster
 1975 Badger House Community, Mesa Verde National Park, Colorado. National Park Service Publications in Archeology 7E.
- Hill, W. W.
 1938 The Agricultural and Hunting Methods of the Navajo Indians. Yale University Publications in Anthropology No. 18. Yale University, New Haven.
- Hoffmeister, D. F.
 1986 Mammals of Arizona. University of Arizona Press and Arizona Game and Fish Department, Tucson.
- Kidder, A.V.
 1932 The Artifacts of Pecos. Yale University Press, Andover, Massachusetts.
- Lang, R. W., and A. H. Harris
 1984 The Faunal Remains From Arroyo Hondo Pueblo, New Mexico: A Study in Short-Term Subsistence Change. Arroyo Hondo Archaeological Series, vol. 5. School of American Research Press.
- Leechman, Douglas
 1951 Bone Grease. American Antiquity, Vol. 16, No. 4, pg. 355-356.
- Lippmeier, Heidi
 1994 Faunal and Shell Remains. In Archaeological Data Recovery Excavations at the Sanders Great House and Six Other Sites Along US Highway 191 South of Sanders, Apache County, Arizona, vol. 2, prepared by T. Fletcher. Zuni Archaeology Program Report No. 471, Research Series No. 9, Zuni Archaeology Program, Zuni Pueblo, New Mexico.
- Munzel, S.
 1986 Quantitative Analysis and the Reconstruction of Site Patterning. Paper presented at

the Vth International Conference of the International Council for ArchaeoZoology,
Aug. 25-30, Bordeaux.

Olsen, S.J.

1964 Mammal Remains from Archaeological Sites, Part I: Southeastern and Southwestern United States. Papers of the Peabody Museum of Archaeology and Ethnology, Harvard University, Cambridge. Vol.56(1).

Robbins, Chandler S., B. Bruun, and H. S. Zim.

1983 A Guide to Field Identification: Birds of North America. Revised edition by Western Publishing, Racine, Wisconsin.

Rue, L. L., III

1982 The Deer of North America. Outdoor Life Books. Crown, New York. Page 33.

Schmid, Elizabeth

1972 Atlas of Animal Bones. Elsevier Publishing, Amsterdam.

Shelley, Steven D. and Bruce A. Jones

1992 Faunal Analysis. Cultural Dynamics in the Lukachukai Valley: The N-13 Project, by J. H. Altschul and S. D. Shelley, Statistical Research, Technical Series, No. 16, Part 2.