FAUNAL ANALYSIS OF THE COREY SITE, NEW YORK

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Introduction

In June 2006, April M. Beisaw, RPA, undertook the faunal analysis of the faunal assemblage recovered from a 1500s-1600s Cayuga Village, for Jack Rossen of Ithaca College. The assemblage included that from the 2003 excavation of the site midden and the 2005 excavation of a shorthouse and row of hearth/pit features.

Faunal Analysis

The analysis of animal bones from archaeological sites, at its empirical core, provides information regarding the diet of a site's occupants and their immediate habitat. Using standard zooarchaeological techniques such as species and element identification, quantification of animal remains produces a list of common food items that can be rank ordered for analysis of preference. Similar quantification can demonstrate exploitation of neighboring ecosystems or climatic shifts.

Recent research has demonstrated the susceptibility of standard zooarchaeological data to biasing factors. These factors can be cultural, such as differential methods of food preparation and disposal, or environmental, such as the differential destruction of bone through decompositional processes. The adoption of taphonomy, originally a paleontological field, into faunal analysis has provided analysts with a means of recovering information lost due to biasing factors. Additionally taphonomic analysis provides a framework for data analysis and interpretation that has moved faunal analysis well past the standard dietary and habitat assessments.

Zooarchaeology

Zooarchaeological analysis, at its simplest, consists of a tabulation of the taxons present in an assemblage. The presence/absence of mammal, fish, bird, reptile, or amphibian remains in a faunal assemblage is determined by the study of the morphology of each bone. Before species identification can be undertaken, the skeletal element that a bone represents must be determined. Element identification also allows estimation of age at death and, in some cases, determination of sex to proceed.

Taxonomic Identification

Zoological classification follows the basic hierarchy: Kingdom, Phylum, Class, Order, Family, Genus, and Species. Zooarchaeology deals exclusively with the Kingdom of Animalia. Some zooarchaeology, including the study of crustaceans, deals with Phylum other than Chordata but for the purposes of this project, only the Chordata Phylum, animals with a spinal cord or vertebral column, were analyzed.

Class identification includes the sorting of a faunal assemblage into mammal, fish, bird, reptile and amphibian remains and usually is undertaken as the initial sort of an assemblage. The simplest method for determining the Order of faunal remains is through analysis of teeth, which preserve well in archaeological contexts. Common Orders encountered in zooarchaeology include carnivores and primates. If teeth are unavailable for this determination the functional morphology of each skeletal element is used for the identification of Order, Family, Genus, and Species.

Element Identification

Within each taxonomic class, such as mammal, fish, or bird, the basic shape and number of the elements of the skeleton are fairly constant. Determining the class of a bone therefore narrows the range of possibilities of the element that it represents. Complete elements are, of course, the easiest

to identify but in many cases even small fragments of a bone contain enough diagnostic morphology to allow for identification. It is therefore important to document the completeness of an element to assess the certainty of identification and to establish the number of each element that is actually represented in an assemblage. For example, four femur fragments do not necessarily equate to four femurs.

Age Determination

Many mammalian bones are made up of a central shaft, or diaphysis, which is capped on each end by an epiphysis. The region between the diaphysis and the epiphysis, the metaphysis, represents the region where bone growth occurs. In juvenile mammals, the epiphysis is not fused to the shaft to allow for this growth. The timing of the fusion of the epiphysis and shaft occurs at different ages for each element. For example, the last element to completely fuse in a human is the collarbone or clavicle, which usually occurs around the age of 35 years, well after the complete fusion of the humerus, which occurs at approximately 21 years of age. The patterns of wear of teeth can also be used to estimate an animal's age. Malnutrition can cause both of these methods to produce a high degree of error.

Taphonomy

Taphonomy is, in general terms, a study of the postmortem, pre-burial, and post-burial histories of faunal remains (Lyman 1994). Taphonomic analysis attempts to reconstruct the chronology of a variety of postmortem processes that have produced a faunal assemblage or a subset of the assemblage. Many of these processes leave signatures on the surface of bone, which, if properly identified, provide a powerful method of assessing natural and cultural formation processes.

Weathering, Sun Bleaching, & Root Etching

The slow decomposition of bone results in a somewhat predictable alteration of the bone surface. Cracking of the surface, parallel to fiber structure, results in surface exfoliation. The loss of the outermost surface causes the bone to have a fibrous appearance, which increases in coarseness with increased exposure until the bone loses integrity (Behrensmeyer 1978). In areas of root activity, chemicals secreted by roots etch the bone surface and accelerate this weathering process. Bone that remains unburied for extended periods of time can also become bleached white by the sun. This bleaching also accelerates the weathering process of a bone.

Carnivore & Rodent Gnawing and Digestive Damage

Unburied and near surface bone is often subject to alteration by scavenging carnivores. In their attempts to remove meat from the bone, and even transport the bone itself, carnivore teeth leave characteristic markings on the bone surface, which can often be identified with the naked eye or minor magnification. While carnivores tend to prefer fresh bone for flesh and marrow procurement, rodents tend to gnaw at dry bone to obtain minerals and to sharpen and shorten their ever-growing incisors. Rodent gnawing leaves a predictable pattern of markings on bone surfaces, which are easily identified by the naked eye. Documentation of carnivore and rodent modification of bone reveals important information regarding disposal practices as well as environmental conditions.

When carnivores swallow bone the acidic digestive environment etches the bone in an attempt to digest it. Only the smallest consumed bone can be digested, larger fragments are regurgitated or passed through the digestive system. These bones show distinctive patterns of damage, often a

smooth polish with pock marked surface texture. Digestively damaged bones suggest the activity of carnivores on site that would be contemporaneous with human occupation. Very high rates of digestive damage suggest that some of the site's faunal assemblage may be the result of carnivore kills.

Burning

When in contact with heat or fire for a relatively short duration of time, bone becomes charred or blackened. Bone that is in contact with heat for long periods of time or is repeatedly heated and cooled attains the white appearance of calcined bone. The effect of burning on the resiliency of bone varies with animal class, skeletal element, and intensity of the burning (Beisaw 2000). Documentation of burned & calcined bone signatures allows for analysis of cooking and disposal practices.

Butchery Cut Marks

In addition to the size and shape of faunal remains allowing for identification of those cuts of meat obtained from a carcass, taphonomic analysis provides information regarding the types of tools used to obtain these cuts. Sawed, chopped, and fractured bones retain signatures of skinning, evisceration, disarticulation, and marrow extraction. For a complete butchery analysis, the location and description of each cut mark should be documented. The results of butchery analysis allow for a variety of cultural and economic analyses to proceed.

Working and Polish

Bone can be used as a raw material for the construction of formal or expedient tools, ornaments, and even musical instruments. The identification of working on a bone can be expected both on the resulting object and on the refuse from the construction of the object. The most common worked bones recovered from North American sites are awls, tubes, and beads. Bone that has been utilized often develops a shine or polish from the rubbing of the bone on the hands of the user or on the object it is being used on, such as animal hides. The identification of worked and polished bone is therefore important to the understanding of the role of this raw material within a site.

Other Taphonomic Indicators

A variety of additional taphonomic indicators can be used to obtain a more complete understanding of a faunal assemblage and its creation. For example, small animals are particularly sensitive to climatic variation and therefore their presence absence can be used to assess seasonality, temporal shifts, and changes in hunting ranges to name a few. Another important taphonomic indicator is the association of skeletal elements and animal classes, which can reveal re-deposition events. Related artifact and ecofact analysis as well as a study of the changes in soil microstratigraphy within a feature can reveal the sequence of depositional events that have occurred.

As archaeological excavation is part of the taphonomic history of an assemblage, the effects of excavation and recovery are an integral part of taphonomic analysis. Surface marks and breaks that occur during and after excavation are easily identified. Together with an assessment of the recovery techniques used, (screen aperture size, excavation tools used, etc.) an analysis of the excavations impact on the representativeness of the assemblage can proceed. For example, an excavation that utilizes 3/8" aperture to screen soil should not expect to recover the remains of small animals.

Research Design & Methodology

Upon receiving the faunal collection, an initial bag check served to inventory the collection and to evaluate the variation that is evident is undertaken. As requested, a Microsoft Excel database was constructed to serve as the catalog for this faunal collection. A hardcopy of the faunal catalog accompanies this report as Appendix A. Electronic copies of the report and catalog are included on a compact disc.

Data Collection

Data collection proceeded, in order, by unit and feature number. This number was assigned by the excavators and it represents the context from which a subset of material was obtained. Each bag was cataloged individually, with the unit, level, and date copied from the bag and retained in the faunal catalog. All non-bone material was retained and separated from the bag's bone material with the use of archival quality zip lock bags. None bone material included lithic and pottery fragments, charcoal, other vegetal specimens, and unmodified rocks.

Taxonomic and Species Identification

Minimally, each specimen is identified to the class level. As this level of distinction is possible on virtually every bone fragment, regardless of size, it is the first level of taxonomic analysis undertaken. Species level identification, unless resulting from a complete or near complete adult skeletal element, are always tentative. Levels of certainty are ascribed by the inclusion of a question mark after the ID or by the information provided in the comment field. For certain elements, such as ribs, species level identification is highly problematic and therefore the use of size groups usually represents the level of analysis that is possible. Size groups are also used for bone fragments that are not otherwise identifiable to the less specific family or genus levels.

Element and Side Identification

In most cases, determining the skeletal element is necessary before taxonomic identification, beyond the class level, is possible. Once the element has been identified, a determination of the side it represents, left or right, aides in the assessment of the relative completeness of an individual and in counts of the minimum numbers of individuals (MNI) present in the assemblage.

Age Determination

If a skeletal element is identified to the species level, assessing the age at death and sex of an individual animal can proceed. A variety of charts and tables, which are based on known populations of specific species, are consulted (e.g. Silver 1970). As a variety or environmental and cultural factors can skew these results, age determinations are to be considered estimation, within a range.

Articulation and Completeness Description

To aid in quantification of an assemblage, it is important to maintain a record of the completeness of cataloged specimens. Similarly, retaining data regarding which, if any, articulation is present allows for assessment of the certainty of age and side determinations as well as butchery patterns.

Modifications

Any signs of bone modifications observed are noted in the two modification columns. The first column was used primarily for evidence of burning, gnawing, and digestive damage while the second column was used for cut marks, working, and polish. If more than one modification was observed on a specimen (i.e. digestive damage and charring) this pattern may have been violated to allow for complete recording.

Count and Weight

A count field for each entry is also included in the catalog, which, in general, should equal one. In cases where multiple mend-able fragments were cataloged, the count equals one. When multiple similar fragments whose entry would not have differed from each other where encountered in a given provenience, the specimens were cataloged as a bone group and the count field was used to quantify the number of bone fragments included. All weights are reported in grams using a scale with 0.1 gram sensitivity.

Comments

A comment field is included in the faunal database for three reasons: 1. To further describe the specimen(s), 2. To aid in the assessment of the certainty and value of the description(s), 3. To guide secondary analyses.

Data Analysis

Data analysis for the faunal collections proceeded along three lines: 1. The zooarchaeological quantification of the assemblage, 2. The utilization of database queries to assess patterns, 3. Taphonomic analysis of the assemblage.

Zooarchaeological Quantification

Number of Identified Specimens (NISP)

Also termed Total Number of Fragments (TNF), TNF or NISP calculations have been used to estimate relative abundance of species. Recent research has shown that NISP calculations are taphonomically erroneous and generally misleading. However, given NISP's simplicity it is often provided for comparison with other analyzed assemblages. A degree of mending of bone fragments with recent breaks has been undertaken to strengthen the usefulness of the NISP data for this assemblage. For this project mendable bone was identified but no actual mend was made.

Minimum Number of Individuals (MNI)

The most common method of illustrating the constituents of an assemblage is through a calculation of the minimum number of individuals (MNI) that would have to have existed to create a given sample. There are numerous means of calculating this number and the method selected is usually based on the type of assemblage. Empirically, MNI is determined by the most frequent element in an assemblage. For example, an assemblage with 13 tibias suggests that, minimally, the assemblage represents 7 individuals. Using element siding, 13 left tibias would suggest that minimally 13 individuals are represented.

Taphonomic Analysis

After a complete cataloging of taphonomic indicators is created the contexts for certain subsets of the faunal assemblage are reviewed to assess the site formation processes of the archaeological sites. In particular, evidence of natural and/or cultural re-deposition is evaluated. Where applicable, suggestions for secondary artifact or ecofact analysis, which would aid in this assessment, are made.

Results

Taxonomic Identification

Thirty five taxonomic categories were used to describe the Corey faunal assemblage (Table 1). Material that was not taxonomically identifiable beyond class (mammal, fish, bird, etc.) was cataloged using approximate size groupings. Material identifiable to the genus and/or species level was classified using seven distinct mammal categories.

Site wide MNIs were calculated using the entire faunal database as one assemblage. MNIs were also calculated such that they would be mutually exclusive from other categories. Therefore no MNI is listed for the unidentified fish, since most of these specimens are likely components of those fish that were identified to order, family, or genus. Similarly no MNI is listed for Centrarchidae (Sunfish) as identified Micropterus salmoides belongs to the Centrarchidae family.

Once the faunal remains were identified the University of Michigan Animal Diversity Web was consulted for information on habitat and abundance of each taxonomic group. This information serves as the basis of the descriptive information on each species provided below, unless otherwise noted.

Mammals

Castor canadensis – American Beaver

The American beaver is found throughout North America, in the vicinity of lakes, ponds, rivers, and streams. These aquatic rodents are commonly sought for their waterproof pelts.

Ursus americanus – Black Bear

The black bear is found throughout North America's forests, usually in areas with changing topography. Although they are carnivores, the black bear diet consists mainly of vegetable matter. This species hibernates in the winter months.

Tamias striatus – Eastern Chipmunk

The eastern chipmunk is found throughout North America, mainly living in burrows of lightly forested areas. Because they are a burrowing species they may be intrusive to archaeological sites, especially in areas of rock piles.

Canis familiaris – Domestic Dog

The domestic dog is found at archaeological sites throughout North America. This species has been used as hunting aides, pack animals, pets, and a food source.

Taxonomic Name	Common Name	Site MNI
Castor Canadensis	Beaver	1
Ursus americanus	Black Bear	1
Micropterus salmoides	Bigmouth Bass	1
Cyprinidae	Carp/Minnow	1
Siluriformes	Catfish	1
Tamias striatus	Chipmunk	2
Canis familiaris	Domestic Dog	1
Cervus elaphus	Elk	1
Fish, unid	Fish	
Anura	Frog/Toad	
Sciurus carolinensis	Gray Squirrel	3
Rana clamitans	Green Frog	2
Leporidae	Hare/Rabbit	1
Large mammal	Large mammal	
Medium bird	Medium bird	
Medium mammal	Medium mammal	
Mollusc	Mollusk	
Ondatra zibethicus	Muskrat	1
Passeriforme	Perching Bird	
Columba livia	Pigeon	6
Procyon lotor	Raccoon	1
Cricetidae	Rat/Mouse	1
Lutra canadensis	River Otter	1
Salmonidae	Salmon/Trout	1
Small bird	Small bird	
Small mammal	Small mammal	
Catostomidae	Sucker	1
Centrarchidae	Sunfish	
Bufonidae	Toad	1
Testudines	Tortoise/Turtle	1
Phasianidae	Turkey/Pheasant	1
Odocoileus virginianus	White tailed Deer	2
Marmota monax	Woodchuck	1
Peromyscus leucopus	White-footed Mouse	3
Total		**36**

Table 1. Taxons identified in the Corey faunal assemblage including the Minimum Number of Individuals (MNI) calculated for the site as a whole.

Cervus elaphus – Elk

Elk were once common throughout North America but are now only found in western regions. This species prefers open woodlands.

Sciurus carolinensis – Eastern Gray Squirrel

This species of squirrel is common throughout the woodlands of eastern North America. They are most active in the spring, summer, and autumn months. These rodents live in trees, not burrows, and therefore are more likely to represent a food source than an intrusive species in archaeological sites.

Leporidae – Hares and Rabbits

The hares and rabbits family includes 54 species. Hares differ from rabbits in having longer legs and ears and preferring areas of open vegetation.

Ondatra zibethicus – Muskrat

The muskrat is found throughout North America, in marshes, swamps, and bogs associated with lakes, ponds, river, and streams. Muskrats have been sought for their pelts.

Procyon lotor – Northern Raccoon

The northern raccoon is common throughout North America. This species is not habitat specific. Raccoons have been sought for their pelts.

Cricetidae – New World Rats, Mice, Voles, and Hamsters

The cricetidae family of rodents is very diverse and includes the subfamilies of North American rats and mice (Neotominae) to which the white-footed mouse (*Peromyscus leucopus*) belongs.

Lutra canadensis – Northern River Otter

The northern river otter is also known as *Lontra canadensis*. This species was once common throughout North America. Semi-aquatic, this species lives near lakes, ponds, river, streams, and even along the coast. This species has been hunted for its pelts.

Odocoileus virginianus – White tailed Deer

The white-tailed deer is common throughout eastern North America. While deer can inhabit a variety of ecosystems, they prefer areas that include both thick vegetation and open edges to provide protection and food.

Peromyscus leucopus – White-footed Mouse

The white-footed mouse is common throughout eastern North America.

Marmota monax – Woodchuck

The woodchuck is common throughout eastern North America. This species prefers the forest edges and grassy pastures. As a burrowing species, woodchuck remains may be intrusive to archaeological sites.

Birds

Passeriformes – Perching Birds

The order Passeriformes includes perching birds of the world.

Columba livia - Pigeon

The specimens identified as pigeon within this assemblage are likely those of the now extinct passenger pigeon (*Ectopistes migratorius*). However, due to the difficulty in obtaining comparative specimens of extinct species, these specimens could only be compared to the common pigeon, which is not native to North America. The passenger pigeon was a migratory species, moving north in March and south in the late autumn or early winter. The birds were most easily captured during their spring nesting period (Orlandini 1996).

Phasianidae – Turkeys, Grouse, Pheasants, and Partridges

This family includes the turkey and other wild pheasants.

Fish

Micropterus salmoides – Bigmouth Bass

The bigmouth bass is native to eastern North America's lakes, ponds, rivers, and streams. They prefer quiet shallow waters with ample vegetation. This species is considered an important game fish.

Cyprinidae – Carps and Minnows

This family includes 53 species that occur in northeastern North America. Some species are small stream dwellers while others are large riverine inhabitants (Daniels 1996).

Siluriformes – Catfish

This order includes many species of catfish that inhabit freshwater of every continent except Antarctica. Catfish do not have scales.

Salmonidae – Salmons, Salmonids, and Trouts

This family is comprised of relatively large fish that were important food sources to Native Americans (Daniels 1996).

Catostomidae – Suckers

This family of fresh-water fish is common in the lakes and rivers of the Northeast. These relatively large fish were important food sources to Native Americans (Daniels 1996).

Centrarchidae – Sunfish

This family of fish includes species of sunfish, perch, bass, and crappie. The species of bigmouth bass (*Micropterus salmoides*) identified in this assemblage is a member of this family.

Amphibians

Anura – Frogs and Toads

This order includes the frogs and toads of the world.

Rana clamitans – Green Frog

The green frog is common around inland waters of the east cost of North America. Lakes, ponds, river, streams, marshes, swamps, and bogs are the primary habitats of this species. Green frogs spend the winter buried in the substrate below shallow water.

Bufonidae – Toads

This family is made up of the true toads, which have thick and warty skins and tend to be terrestrial.

Reptiles

Testudines – Tortoises and Turtles

This order includes the tortoises and turtles of the world.

Contextual Analysis

Feature 1

This feature contains 263 mammal, bird, fish, and amphibian remains, and totaling 109.5 grams in weight.

ID	Name	Count	Weight	MNI
Cyprinidae	Carp/Minnow	7	0.4	1
Tamias striatus	Chipmunk	3	0.3	1
Fish, unidentified	Fish	36	1.8	
Sciurus carolinensis	Gray Squirrel	5	0.9	1
Rana clamitans	Green Frog	4	0.5	1
Large mammal	Large mammal	65	40.2	
Medium mammal	Medium mammal	60	9.0	
Columba livia	Pigeon	6	1.0	2
Lutra Canadensis	River Otter	1	0.5	1
Salmonidae	Salmon/Trout	2	0.5	1
Small bird	Small bird	40	1.6	
Small mammal	Small mammal	22	1.4	
Odocoileus virginianus	White tailed Deer	11	50.9	1
Marmota monax	Woodchuck	1	0.5	1
Total		**263**	**109.5**	**10**

Table 2. Taxons identified in Feature 1.

Twenty eight percent of the feature's specimens are burned, gnawed, worked, or show digestive damage. Forty-two specimens are calcined (21.1 grams), ten are charred (21.8 grams), and one

appears to have had some exposure to heat (0.3 grams). All of the burned bones are fragments of unidentified medium to large mammal bone with the exception of four deer foot bones (navicular, metatarsal, phalange) and two green frog leg bones. Nineteen unburned specimens (9.4 grams) show evidence of digestive damage including unidentified medium to large mammal bone and two fragments of deer phalange. Carnivore gnawing was evident on one woodchuck tibia (0.5 grams) and rodent gnawing on one medium mammal long bone (0.2 grams). One large mammal long bone (3.1 grams) shows evidence of working and was probably used as an awl or needle.

One hundred eighty nine specimens (53.1 grams) appear unmodified and include carp/minnow (n=7), chipmunk (n=3), unidentified fish (n=36), gray squirrel (n=5), green frog (n=2), large mammal (n=11), medium mammal (n=49), pigeon (n=6), river otter (n=1), salmon/trout (n=2), small bird (n=40), small mammal (n=22), and deer (n=5).

Feature 2

This feature contains 17 mammal, bird, and fish remains, totaling 22.9 grams in weight.

ID	Name	Count	Weight	MNI
Fish, unidentified	Fish	2	0.1	1
Sciurus carolinensis	Gray Squirrel	1	0.2	1
Large mammal	Large mammal	8	10.6	
Medium mammal	Medium mammal	2	3.2	
Columba livia	Pigeon	2	4.2	1
Odocoileus virginianus	White tailed Deer	2	4.6	1
Total		**17**	**22.9**	**4**

Table 3. Taxons identified in Feature 2.

Forty seven percent of the feature's specimens are burned, gnawed, worked, or show digestive damage. Four specimens are calcined (1.5 grams) and one is charred (3.9 grams). All of the burned bones are fragments of unidentified medium to large mammal bone with the exception of the calcined deer pelvis fragment. One unburned specimen (0.4 grams) show evidence of digestive damage, a large mammal bone. Carnivore gnawing was evident on one large mammal long bone (1.1 grams). One medium mammal long bone (3.0 grams) shows evidence of working and was possible part of an awl.

Nine specimens (13.0 grams) appear unmodified and include unidentified fish (n=2), gray squirrel (n=1), large mammal (n=3), pigeon (n=2), and deer (n=1).

Feature 3

This feature contains 693 mammal, bird, fish, amphibian, and mollusk remains, totaling 255.7 grams in weight.

Twenty seven percent of the feature's specimens are burned, gnawed, polished, cut marked, or show digestive damage. One hundred thirty specimens are calcined (30.2 grams) and seventeen are charred (12.7 grams). All of the burned bones are fragments of unidentified small, medium, and

ID	Name	Count	Weight	MNI
Canis familiaris	Domestic Dog	1	5.5	1
Cervus elaphus	Elk	2	28.0	1
Fish, unidentified	Fish	183	4.4	
Sciurus carolinensis	Gray Squirrel	9	1.4	1
Rana clamitans	Green Frog	4	0.3	1
Large mammal	Large mammal	93	146.1	
Medium mammal	Medium mammal	195	24.7	
Mollusc	Mollusk	20	8.4	1
Columba livia	Pigeon	6	1.1	1
Cricetidae	Rat/Mouse	6	0.5	
Salmonidae	Salmon/Trout	8	0.6	1
Small bird	Small bird	63	2.8	
Small mammal	Small mammal	85	4.6	
Odocoileus virginianus	White tailed Deer	10	26.6	1
Peromyscus leucopus	White-footed Mouse	8	0.7	3
Total		**693**	**255.7**	**11**

Table 4. Taxons identified in Feature 3.

large mammal bone with the exception of four deer foot bones (metatarsals and phalanges), one gray squirrel tibia, one pigeon coracoid and small bird humerus, and one mouse metatarsal. Thirty-four unburned specimens (10.3 grams) show evidence of digestive damage including unidentified medium and large mammal bone, a charred deer phalange, and a gray squirrel calcaneus. Carnivore gnawing was evident on one elk carpal (12.0 grams), a deer metatarsal (3.6 grams), and a large mammal vertebra (3.0 grams). Cut marks were identified on five specimens (80.8 grams) of medium and large mammal long bone. One large mammal long bone (0.6 grams) shows evidence of a polish.

Five hundred and four specimens (104.7 grams) appear unmodified and include domestic dog (n=1), elk (n=1), unidentified fish (n=183), gray squirrel (n=7), green frog (n=4), large mammal (n=26), medium mammal (n=111), mollusk (n=20), pigeon (n=5), rat/mouse (n=5), salmon/trout (n=8), small bird (n=62), small mammal (n=58), deer (n=5), and white-footed mouse (n=8).

Feature 12a

This feature contains 57 mammal, bird, fish, and mollusk remains, totaling 37.5 grams in weight.

Thirty percent of the feature's specimens are burned or polished. Fourteen specimens are calcined (2.8 grams) and two are charred (2.2 grams). All of the burned bones are fragments of medium to large mammal ribs and long bones. One medium mammal long bone (2.1 grams) shows evidence of a polish.

Forty specimens (30.4 grams) appear unmodified and include catfish (n=1), unidentified fish (n=5), large mammal (n=12), medium mammal (n=3), mollusk (n=12), small mammal (n=6), deer (n=5), and turkey/pheasant (n=1).

ID	Name	Count	Weight	MNI
Siluriformes	Catfish	1	0.1	1
Fish, unidentified	Fish	5	0.3	
Large mammal	Large mammal	26	18.2	1
Medium mammal	Medium mammal	6	2.9	
Mollusc	Mollusk	12	15.2	1
Small mammal	Small mammal	6	0.3	1
Phasianidae	Turkey/Pheasant	1	0.5	1
Total		**57**	**37.5**	**6**

Table 5. Taxons identified in Feature 12a.

Feature 12b

ID	Name	Count	Weight	MNI
Micropterus salmoides	Bigmouth Bass	1	0.1	1
Cyprinidae	Carp/Minnow	25	1.0	1
Siluriformes	Catfish	17	0.7	1
Tamias striatus	Chipmunk	3	0.3	1
Canis familiaris	Domestic Dog	2	1.6	1
Fish, unidentified	Fish	228	10.3	
Anura	Frog/Toad	8	0.7	
Sciurus carolinensis	Gray Squirrel	15	0.7	1
Rana clamitans	Green Frog	1	0.1	1
Large mammal	Large mammal	253	187.5	
Medium bird	Medium bird	1	0.7	
Medium mammal	Medium mammal	263	32.7	
Mollusc	Mollusk	8	1.0	1
Columba livia	Pigeon	33	2.6	5
Cricetidae	Rat/Mouse	7	0.6	1
Salmonidae	Salmon/Trout	6	0.6	1
Small bird	Small bird	86	2.8	
Small mammal	Small mammal	760	23.3	
Bufonidae	Toad	1	0.1	1
Odocoileus virginianus	White tailed Deer	21	118.8	1
Total		**1739**	**386.2**	**17**

Table 6. Taxons identified in Feature 12b.

This feature contains 1739 mammal, bird, fish, amphibian, and mollusk remains, totaling 386.2 grams in weight.

Thirty three percent of the feature's specimens are burned, gnawed, worked, or show digestive damage. Three hundred twenty four specimens are calcined (39.5 grams), one hundred ninety four are charred (86.3 grams), and two have been exposed to some heat (5.6 grams). All of the burned bones are fragments of unidentified small, medium, and large mammal bone with the exception of a chipmunk femur, a dog phalange, one carp and one catfish vertebra and twenty eight additional fish bones, one frog leg bone, a squirrel tarsal and tooth, nine pigeon bones, a mouse metatarsal, sixteen small and medium bird bones, nine deer foot bones, and a deer mandible and humerus. Fifty-nine unburned specimens (17.4 grams) show evidence of digestive damage including fragments of unidentified medium and large mammal rib, crania, and tarsals, a deer phalange, and a pigeon coracoid. Carnivore gnawing was evident on one medium mammal long bone (0.6 grams) and a large mammal rib (4.4 grams). One medium mammal long bone (0.5 grams) appears to have been worked into a bone tube.

One thousand one hundred and fifty seven specimens (231.9 grams) appear unmodified and include bigmouth bass (n=1), carp/minnow (n=24), catfish (n=16), chipmunk (n=2), dog (n=1), unidentified fish (n=202), frog/toad (n=7), gray squirrel (n=12), green frog (n=1), large mammal (n=96), medium mammal (n=117), mollusk (n=6), pigeon (n=23), rat/mouse (n=6), salmon/trout (n=6), small bird (n=71), small mammal (n=556), toad (n=1), and deer (n=9).

Feature 12c

This feature contains 616 mammal, bird, fish, and amphibian remains, totaling 34.7 grams in weight.

ID	Name	Count	Weight	MNI
Siluriformes	Catfish	11	0.6	1
Tamias striatus	Chipmunk	5	0.5	1
Canis familiaris	Domestic Dog	2	0.1	1
Fish, unidentified	Fish	360	9.9	
Anura	Frog/Toad	2	0.2	1
Sciurus carolinensis	Gray Squirrel	1	0.1	1
Large mammal	Large mammal	16	3.5	
Medium mammal	Medium mammal	42	5.5	
Columba livia	Pigeon	10	1	1
Small bird	Small bird	79	1.6	
Small mammal	Small mammal	72	2.3	
Catostomidae	Sucker	2	0.1	1
Centrarchidae	Sunfish	1	0.1	1
Odocoileus virginianus	White tailed Deer	14	9.1	1
Total		**616**	**34.7**	**9**

Table 7. Taxons identified in Feature 12c.

Eleven percent of the feature's specimens are burned, gnawed, or show digestive damage. Forty four specimens are calcined (3.2 grams), and sixteen are charred (9.6 grams). All of the burned bones are fragments of unidentified small, medium, and large mammal ribs and long bone with the exception of fourteen fragments of deer metatarsal, two large mammal teeth, and eleven small bird bones. Seven unburned specimens (1.0 grams) show evidence of digestive damage including fragments of unidentified medium and large mammal long bone.

Five hundred forty nine specimens (20.9 grams) appear unmodified and include catfish (n=11), chipmunk (n=5), dog (n=1), unidentified fish (n=360), frog/toad (n=2), gray squirrel (n=1), large mammal (n=1), medium mammal (n=29), pigeon (n=10), small bird (n=68), small mammal (n=58), sucker (n=2), and sunfish (n=1).

Feature 17

This feature contains 8 mammal remains, totaling 1.3 grams in weight.

ID	Name	Count	Weight	MNI
Medium mammal	Medium mammal	8	1.3	1
Total		**8**	**1.3**	**1**

Table 8. Taxons identified in Feature 17.

All specimens appear unmodified and include both long bone (n=4) and cranial elements (n=4).

Midden Units

The 2003 excavation of units within the site midden yielded 2401 fragments of mammal, fish, bird, amphibian, reptile, and mollusk remains, totaling 1003.8 grams.

Forty five percent of the feature's specimens are burned, gnawed, sun bleached, cut marked, polished, worked, or show digestive damage. One thousand two hundred and four specimens are calcined (389.7 grams), one hundred ninety one are charred (124.4 grams), and ten have been exposed to some heat (6.0 grams). All of the burned bones are fragments of unidentified small, medium, and large mammal bone with the exception of deer humerus, ulna, radius, antler, tooth, and many foot bones, a black bear phalange, dog lumbar vertebra, a fragment of turtle carapace. Twenty-three unburned specimens (7.5 grams) show evidence of digestive damage including fragments of unidentified medium and large mammal long bones, squirrel femur and tarsal, a deer tarsal, and a large mammal mandible fragment. Rodent gnawing was evident on one medium mammal long bone (0.2 grams) and sun bleaching was recorded on 6 specimens (3.5 grams) including small, medium, and large mammal crania, vertebra, rib, and long bone fragments and a fragment of fish crania.

Cut marks were recorded on two calcined fragments of deer antler, a fragment of charred large mammal long bone. Larger cut marks, described as hack marks, were noted on one deer antler. In all 4 specimens showed these cut marks (4.7 grams). A clear polish was noted on 14 specimens (7.6 grams), all medium and large mammal long bone, deer antler and deer metacarpal. Two of these specimens were calcined, six were charred, and one was heat-treated. Eleven additional

specimens (9.6 grams) showed a lighter polish, including large mammal long bone fragments, a vertebra fragment, and a section of deer metatarsal. These polished specimens occurred in units 2, 3, 4, 6, 7, 8, and 9 and mostly in levels 3 and 4. Two additional specimens appear to be both polished and worked, these are charred and calcined large mammal long bone fragments from level 4 of units 6 and 8. Five additional specimens (1.3 grams) may have evidence of working. These are charred medium and large mammal long bone fragments and an unburned deer metatarsal from levels 3 and 4 of units 2, 6, and 8. Clear working was evident on six specimens (3.4 grams) of medium and large mammal long bone. Three of these are charred and one is calcined. These worked specimens occur in levels 3, 4 and 5 of units 1, 4, 6, and 9. One artifact is clearly an awl (unit 1W level 4) while another may also be an awl (unit 6S level 3). One worked specimen is a bone bead or tube fragment from unit 6N, level 4.

ID	Name	Count	Weight	MNI
Castor Canadensis	Beaver	1	0.2	1
Ursus americanus	Black Bear	7	8.3	1
Siluriformes	Catfish	5	0.6	1
Tamias striatus	Chipmunk	1	0.1	1
Canis familiaris	Domestic Dog	9	6.2	1
Fish, unidentified	Fish	6	0.7	
Anura	Frog/Toad	1	0.1	1
Sciurus carolinensis	Gray Squirrel	22	5.7	2
Leporidae	Hare/Rabbit	2	0.4	1
Large mammal	Large mammal	1556	699.9	
Medium bird	Medium bird	4	1.2	
Medium mammal	Medium mammal	557	99.8	
Mollusc	Mollusk	11	1.3	1
Ondatra zibethicus	Muskrat	2	0.5	1
Passeriforme	Perching Bird	2	0.2	
Columba livia	Pigeon	4	0.5	1
Procyon lotor	Raccoon	4	1.8	1
Salmonidae	Salmon/Trout	2	0.3	1
Small bird	Small bird	3	0.2	
Small mammal	Small mammal	63	7.7	
Testudines	Tortoise/Turtle	3	0.7	1
Phasianidae	Turkey/Pheasant	1	0.7	1
Odocoileus virginianus	White tailed Deer	129	164.5	2
Marmota monax	Woodchuck	7	2.7	1
Total		**2401**	**1003.8**	**19**

Table 9. Taxons identified in Midden units.

Nine hundred fifty eight specimens (469.7 grams) appear unmodified and include beaver (n=1), black bear (n=6), catfish (n=5), chipmunk (n=1), dog (n=8), unidentified fish (n=5), frog/toad (n=1), gray squirrel (n=20), hare/Rabbit (n=2), large mammal (n=604), medium bird (n=4), medium mammal (n=155), mollusk (n=11), muskrat (n=2), pigeon (n=23), perching bird (n=2), pigeon (n=4), raccoon (n=4), salmon/trout (n=2), small bird (n=3), small mammal (n=47), turkey/pheasant (n=1), deer (n=62), woodchuck (n=7).

Shorthouse Units

The 2005 excavation of units within the shorthouse yielded 452 fragments of mammal, remains, totaling 182.0 grams.

ID	Name	Count	Weight	MNI
Ursus americanus	Black Bear	1	1.9	1
Canis familiaris	Domestic Dog	1	0.3	1
Large mammal	Large mammal	346	133.0	
Medium mammal	Medium mammal	80	12.9	
Small mammal	Small mammal	3	0.4	
Odocoileus virginianus	White tailed Deer	21	33.5	1
Total		**452**	**182.0**	**3**

Table 10. Taxons identified in Shorthouse units.

Ninety percent of the feature's specimens are burned, gnawed, weathered, or show evidence of polish. Three hundred sixty two specimens are calcined (100.6 grams), thirty-nine are charred (20.2 grams), and two have been exposed to some heat (1.1 grams). All of the burned bones are fragments of unidentified small, medium, and large mammal long bones, vertebra, and ribs with the exception of deer mandible and foot bone fragments. Carnivore gnawing was evident on one large mammal long bone and one deer mandible fragment (4.9 grams) and weathering was recorded on 2 specimens of large mammal long bone (2.0 grams). A clear polish was noted on one specimen (0.2 grams) of large mammal long bone from unit 16 and a possible polish was noted on a similar bone (1.2 grams), this time charred, from unit 15.

Forty-four specimens (53.1 grams) appear unmodified and include black bear (n=1), dog (n=1), large mammal (n=28), medium mammal (n=4), and deer (n=10).

Comparison

Bone Modification

Numerous types of bone modification were identified within the faunal assemblage. The percentage of modified bone in each context is illustrated in the figure below.

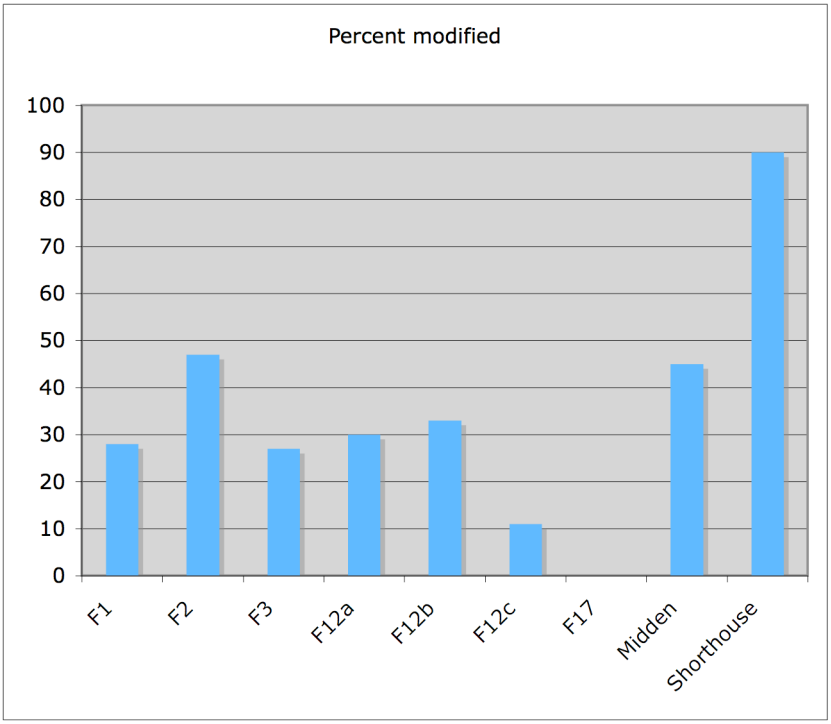

Figure 1. Chart showing the percent of modified bone by feature.

Since the features included material from flotation, which inflates specimen counts, the weight of each category of modification per unit was used to construct a comparative table and chart of bone modifications across the site. The table shows the composition of each unit by raw weight in grams while the chart shows the normalized contents of each unit by the percentage weight of each bone modification.

By weight	F1	F2	F3	F12a	F12b	F12c	F17	Midden	Shorthouse
Calcined	21.1	1.5	30.2	2.8	39.5	3.2	0	389.7	100.6
Charred	21.8	3.9	12.7	2.2	86.3	9.6	0	124.4	20.2
Heat	0.3	0	0	0	5.6	0	0	6	1.1
Digestive	9.4	0.4	10.3	0	17.4	1	0	7.5	0
Carnivore	0.5	1.1	16.6	0	5	0	0	0	4.9
Rodent	0.2	0	0	0	0	0	0	0.2	0
Sun/Weather	0	0	0	0	0	0	0	3.5	2
Worked	3.1	3	0	0	0.5	0	0	4.7	0
Cut	0	0	80.8	0	0	0	0	4.7	0
Polished	0	0	0.6	2.1	0	0	0	17.2	1.4
Unmodified	53.1	13	104.7	30.4	231.9	20.9	1.3	469.7	53.1

Table 11. Comparison of bone modifications by weight per feature.

By raw weight the features appear to show some differentiation with 1 and 2 containing the most worked bone, 3 containing the most cut and carnivore gnawed bone, 12a containing the most polished bone, and 12b containing the most bone showing digestive damage. When the raw weights are divided by the total weight of the bone in each context the interpretation changes slightly. Feature 1 now has the most burned and digestive damaged bone, 2 still has the most worked bone, feature 3 still has the most cut and carnivore gnawed bone, 12a still has the most polished bone, and 12c has the most burned bone.

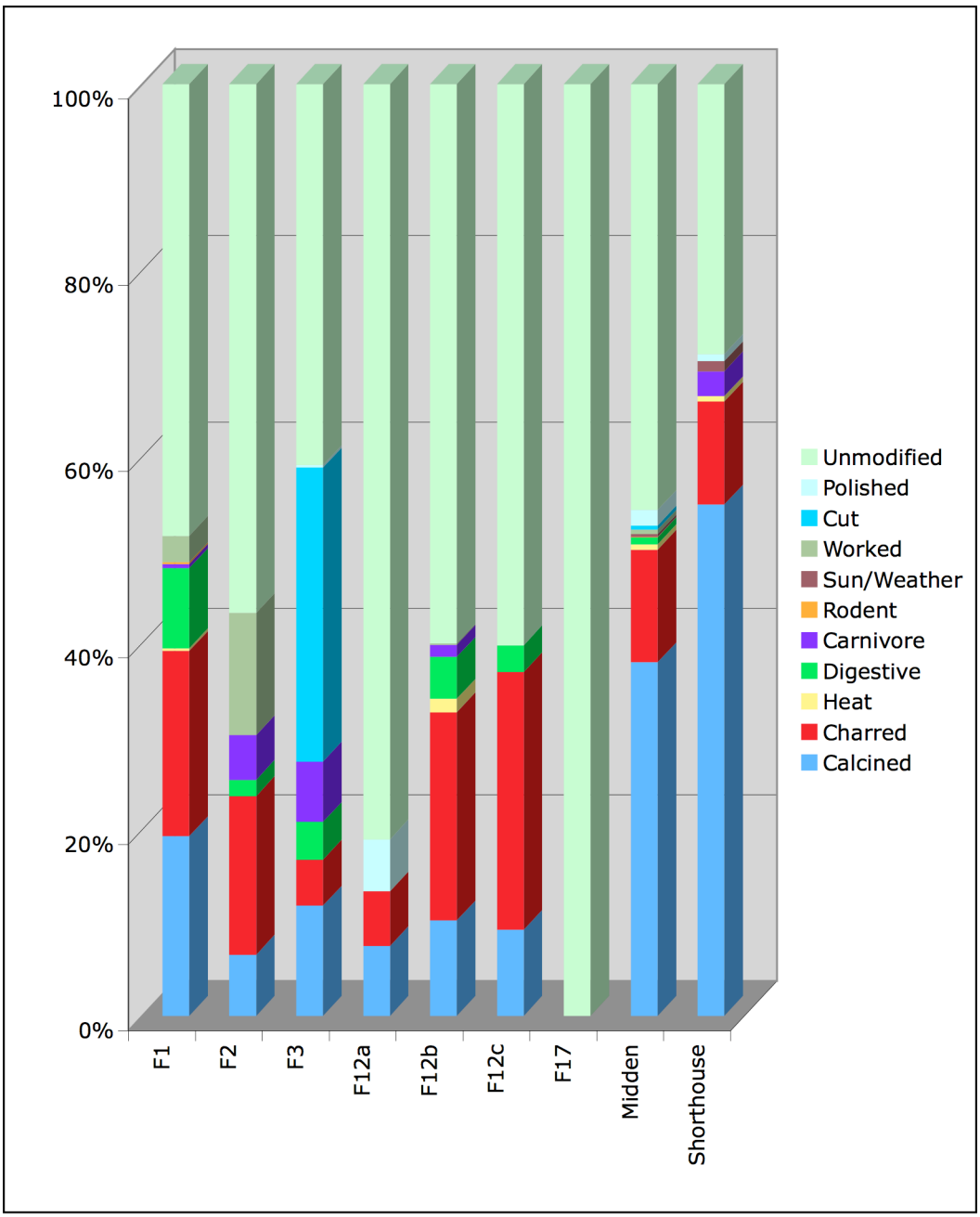

Figure 2. Comparison of relative percentage of bone modification by feature.

One means of interpreting these differences is that each contains the refuse of different activities that were taking place around the shorthouse. With high amounts of burned and digestive damaged bone, Feature 1 appears to be a receptacle for general refuse from cooking. Due to the delay between ingestion and regurgitation of bone that produces digestive damage, it is likely that dogs were active in the vicinity of this feature. The recovery of an awl suggests some type of leather or basketry work may have occurred here too. The contents of Feature 2 are very similar to Feature 1, only with more carnivore gnawed than digestive damaged bone. Another awl fragment was also recovered from this context. The higher amounts of cut bone and lower amounts of burned bone suggest that Feature 3 was in the vicinity of a butchery location. The overall rates of carnivore gnawing and digestive damage are high here, which also supports this interpretation. Feature 12a contains very little burned bone and no carnivore gnawed or digestive damaged bone. However, this feature contains more polished bone than any other feature. This polish is difficult to interpret further than an analogy to the shine that is produced on the handles of worked bone from skin oils or on objects used in the hide tanning process. It is possible that some oil-dependent or oil-producing activity occurred near this location. Features 12b and c are very similar in their contents, with the exception of no worked bone, to Feature 1.

When comparing the contents of midden to shorthouse units, the most difference appears to be in the higher amounts of calcined and carnivore gnawed bone in the shorthouse. A high amount of calcined bone is common in habitation areas as it is a byproduct of cooking and is scattered about during hearth cleanings. The higher amounts of carnivore gnawed bones suggest that does were allowed to consume scraps in and around the habitation area and not relegated to picking through the refuse midden.

Species

The taxonomic contents of the units and features varied across the site. The tables below summarize the raw counts (NISP or TNF) and the relative percentage of each taxonomic category used, per unit or feature.

By raw counts both Feature 12b and 12c appear to have high amounts of fish bone. However, by percentage of each feature's contents it becomes clear that Features 3 and 12c contains a much higher percent of fish than 12b. Similarly while 12b has the highest number of pigeon bones, Feature 2 contains a much higher percentage of pigeon. The counts and percentages of small species, such as fish, pigeon, and small rodents is much lower in the midden and shorthouse units than in the features but this is likely due to the use of flotation to recover small bones from features.

NISP	F1	F2	F3	F12a	F12b	F12c	F17	Midden	Shorthouse
Beaver								1	
Black Bear								7	1
Bigmouth Bass					1				
Carp/Minnow	7				25				
Catfish				1	17	11		5	
Chipmunk	3				3	5		1	
Domestic Dog			1		2	2		9	1
Elk			2	5					
Fish	36	2	183		228	360		4	
Frog/Toad					8	2		1	
Gray Squirrel	5	1	9		15	1		22	
Green Frog	4		4		1				
Hare/Rabbit								2	
Large mammal	65	8	93	26	253	16		1556	346
Medium bird					1			4	
Medium mammal	60	2	195	6	263	42	8	557	80
Mollusk			20	12	8			11	
Muskrat								2	
Perching Bird								2	
Pigeon	6	2	6		33	10		4	
Raccoon								4	
Rat/Mouse			6		7				
River Otter	1								
Salmon/Trout	2		8		6			2	
Small bird	40		63		86	79		3	
Small mammal	22		85	6	760	72		63	3
Sucker						1			
Sunfish						1			
Toad					1				
Tortoise/Turtle								3	
Turkey/Pheasant				1				1	
White tailed Deer	11	2	10		21	14		129	21
Woodchuck	1							7	
White-footed Mouse			8						

Table 12. Summary of taxons identified as NISP per feature.

% NISP	F1	F2	F3	F12a	F12b	F12c	F17	Midden	Shorthouse
Beaver								0.1	
Black Bear								0.3	0.2
Bigmouth Bass					0.1				
Carp/Minnow	2.7				1.4				
Catfish				1.8	1.0	1.8		0.2	
Chipmunk	1.1				0.2	0.8			
Domestic Dog			0.1		0.1	0.3		0.4	0.2
Elk			0.3	8.8					
Fish	13.7	11.8	26.4		13.1	58.4		0.2	
Frog/Toad					0.5	0.3			
Gray Squirrel	1.9	5.9	1.3		0.9	0.2		0.9	
Green Frog	1.5		0.6		0.1				
Hare/Rabbit								0.1	
Large mammal	24.7	47.1	13.4	45.6	14.5	2.6		64.8	76.5
Medium bird					0.1			0.2	
Medium mammal	22.8	11.8	28.1	10.5	15.1	6.8	100.0	23.2	17.7
Mollusk			2.9	21.1	0.5			0.5	
Muskrat								0.1	
Perching Bird								0.1	
Pigeon	2.3	11.8	0.9		1.9	1.6		0.2	
Raccoon								0.2	
Rat/Mouse			0.9		0.4				
River Otter	0.4								
Salmon/Trout	0.8		1.2		0.3			0.1	
Small bird	15.2		9.1		4.9	12.8		0.1	
Small mammal	8.4		12.3	10.5	43.7	11.7		2.6	0.7
Sucker						0.1			
Sunfish						0.1			
Toad					0.1				
Tortoise/Turtle								0.1	
Turkey/Pheasant				1.8					
Deer	4.2	11.8	1.4		1.2	2.3		5.4	4.6
Woodchuck	0.4							0.3	
Mouse			1.2						

Table 13. Summary of taxons identified as percent NISP per feature.

The table below summarizes the contents of units and features using much more general taxonomic groupings. This allows the relative components of the features to be examined without much influence from recovery methods. Here the contents of Features 1 and 2 look very similar, as are those of the midden and shorthouse. Features 3 and 12c contain high amounts of fish and 12a contains a high amount of mollusks but almost no fish.

% NISP	F1	F2	F3	F12a	F12b	F12c	F17	Midden	Shorthouse
Mammal	63.9	76.5	58.2	75.4	75.7	24.7	100.0	98.3	100.0
Fish	17.1	11.8	27.6	1.8	15.9	60.4	0.0	0.5	0.0
Bird	17.5	11.8	10.0	1.8	6.9	14.4	0.0	0.6	0.0
Amphibian	1.5	0.0	0.6	0.0	0.6	0.3	0.0	0.0	0.0
Reptile	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Mollusk	0.0	0.0	2.9	21.1	0.5	0.0	0.0	0.5	0.0

Table 14. Summary of taxonomic classes identified as percent NISP per feature.

Summary

Features 1 and 2 are very similar in faunal contents and likely represent the general refuse from cooking and sewing, hide working, or basket making. Feature 3 mainly contains the pre-cooking refuse from the processing of a variety of food animals, which attracted the site's dog inhabitants. Feature 12a seems to be a processing area of mammal and mollusks. The high amounts of polished bone here may be from the processing of an elk hide or similar oil-rich activity. Feature 12b and c likely represents general cooking activity areas, similar to Features 1 and 2, with 12b being more related to mammal cooking and 12c more related to fish cooking. The midden and shorthouse assemblage contain mainly calcined and charred mammal bone. The lack of diversity in the assemblage is likely a partial function of the difference in recovery methods between these contexts and the features. The midden did contain a much higher diversity of species, although in very low numbers. The shorthouse's all mammal contents may simply be a function mammal bone's resilience to trampling and therefore ease of preservation and recovery in high traffic areas.

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Appendix A: Faunal Catalog

Appendix B: Credentials

April M. Beisaw, RPA

Education

1998 MA in Anthropology, Binghamton University, New York

1996 BA in Chemistry/Anthropology, Rutgers University, New Jersey

Experience

Eleven years of experience with prehistoric and historic sites in Arizona, California, Colorado, Maryland, Michigan, New Jersey, New Mexico, New York, Texas, Utah, and Wisconsin. . Specializations include zooarchaeology, taphonomy, human osteology, forensic anthropology, public archaeology, and cultural resource management.

Selected Publications and Presentations

2006 Plague or Promise? Frogs and Toads from New York's Engelbert Site (2006). Paper presented at the 71st Annual Meeting of the Society for American Archaeology, San Juan, Puerto Rico

2006 Evaluating Iroquois Occupational Continuity with a Historical Ecology-Based Zooarchaeology (2006). Presentation at the 30th Annual Biological Sciences Research Symposium, Binghamton University, NY

2005 Differentiating the Dogs: Morphological & Ancient DNA Analysis of Archaeological Canids (2005). Paper presented at the 70th Annual Meeting of the Society for American Archaeology, Salt Lake City, UT (with Della Stumbaugh)

2004 Faunal Analysis of Texas, New Mexico, and Arizona Portions of the AT&T NexGen/Core Project. Prepared for Western Cultural Resource Management, Farmington, NM.

2004 Faunal Analysis of the White Mesa 42SA22483 Site, San Juan County, Utah. Prepared for Abajo Archaeology, Bluff UT.

2004 Faunal Analysis of the Gothic Town Hall (5GN1525) Renovation, Colorado. Prepared for Alpine Archaeological Consultants, Montrose, CO.

2003 Faunal Analysis of the Hamblin and Wellington Town Sites (42JB388 & 42WS1585), Utah. Prepared for Alpine Archaeological Consultants, Montrose, CO.

2002 Faunal Analysis of the 1994 Belair Mansion (18PR135) Collection, Bowie, MD. Prepared for James G. Gibb, Archaeological Consultant, Annapolis, MD.

2001 Turtle Ecology and Feature Taphonomy in the Chesapeake Region. Presented at the Annual Meeting of the Society for American Archaeology, New Orleans, LA.

2000 Faunal Analysis of the 1999 Berwind (5LA2175) Collection. Prepared for the Colorado Coalfield War Archaeology Project, University of Denver, Colorado.

2000 Cultural Influences on the Differential Decomposition of Animal Bone. Presented at the annual meeting of the Society for American Archaeology, Philadelphia, PA.

2000 Eating Like a Pig in a Colonial Tavern: The Taphonomy of Tavern Assemblages. Presented at the annual meeting of the Society for Historical Archaeology, Quebec, Canada (with Kate Levendosky).

1998 Differential Decomposition and Recovery: Bone Taphonomy at the Thomas/Luckey Site, Ashland, NY. Unpublished Masters Thesis. Binghamton University, Binghamton, NY.