6. FAUNAL ANALYSIS OF UNMODIFIED LARGER MAMMAL REMAINS

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Introduction

I report here on the larger mammal remains from Scattered Village, which consist primarily of artiodactyls (bison, deer, pronghorn), but also include rodents, carnivores, and other taxa. Semken (Chapter 8) reports on the micromammal remains, while Falk (Chapter 7) has analyzed the fish, birds, and reptiles. My analysis includes only the unmodified bone. Modified bones were studied by Ahler and Falk and are discussed separately (Chapter 13).

A total of 8941 bones was identified to taxon and skeletal part from Scattered Village. Most of the bones come from time periods 1-4; some come from contexts that were unassigned (TP0), and only one larger mammal bone was identified from TP5. Thus, the analysis here focuses on the remains from TP1-TP4, with the goal of understanding procurement and subsistence practices at Scattered Village. In the following sections, I address the following broad research questions:

1. What is the taxonomic composition of the fauna, and are there changes through time at Scattered Village?
2. How does the fauna compare with other sites in the region, particularly Slant Village, a Mandan site located about six miles from Scattered Village with an occupation period that overlaps that of Scattered Village?
3. Is there intrasite variability at Scattered Village that is related to depositional context? For example, does the taxonomic composition, bone damage, etc. from midden contexts differ from pit contexts?
4. What does the age/sex composition of bison at Scattered Village tell us about possible procurement strategies?

Identification and Counting

At a minimum, for a bone to be considered diagnostic, it should be identifiable to taxon and skeletal element (see Driver 1991). I followed the protocols for bone identification, recording and counting described by Klein and Cruz-Uribe (1984; see also Cruz-Uribe and Klein 1986). For identifiable bones, I recorded the following items, where relevant: the taxon, body part (e.g., humerus), side, portion of the bone present (proximal, distal or complete), fusion, and the fraction of the portion present. Following Klein and Cruz-Uribe, identification focused on morphologically distinctive parts of the bone (e.g., for long bones, the epiphyses). However, shafts (lacking epiphyses) were also identified where morphology allowed. As is the case with most archaeological faunal samples, the bones from Scattered Village were fragmented, and the Klein and Cruz-Uribe system takes this into account by counting the fraction of the particular portion that is present.

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I studied bones from Grades G1-G5. However, the vast majority of all identified bones included in my study came from the G1-G3 fractions (Table 6.1). Most bones from the G4 and G5 fractions were phalanges and other small bones from smaller mammals such as leporids, muskrat, or prairie dog. Often these were not identifiable even to family, and were thus recorded only as "indeterminate small mammal."

Table 6.1. Distribution of identified specimens by size grade and time period for the non-modified vertebrate sample, Scattered Village (32MO31), 1998 excavations.

Time Period	G1	G2	G3	G4	G5	G?/Mixed	Total
TP0	73	88	116	40	0	1	318
TP1	385	762	895	224	12	0	2,278
TP2	890	1,596	1,079	407	1	3	3,976
TP3	340	320	195	73	4	1	933
TP4	474	460	375	121	0	5	1,435
TP5	0	0	0	1	0	0	1
Total	2,162	3,226	2,660	866	17	10	8,941

I also recorded macroscopic damage on bone surfaces. Types of damage noted included cut marks, carnivore chewing and/or bite marks, porcupine gnawing, small-rodent gnawing, weathering, acid-etching, and burning. Cut marks include only marks from butchering, and not marks from working or shaping the bone for tools.

I calculated both the NISP (number of identified specimens) and the MNI (minimum number of individuals). NISP is very simply calculated—it relies on counting the number of bones attributed to a particular taxon from a particular provenience unit. MNI is more complicated to calculate, and different analysts use different methods, which are often not specified. I used the algorithms published by Klein and Cruz-Uribe (1984). These algorithms take into account, where relevant, the following: the portion of the bone represented (e.g., proximal, distal, or complete, where relevant), the side, fusion, and fraction present. For dentitions, the algorithm takes into account which teeth are present, including both the position in the mouth and whether they are deciduous or permanent.

Ideally, it is best to compare MNIs rather than NISPs when making comparisons among samples. This is because MNIs are less affected by differential fragmentation, differential bone transport, and other possibly confounding factors (Klein & Cruz-Uribe 1984). However, many of the relevant publications for the sites in the region present only NISPs and not MNIs. For this reason I rely on NISPs for most intersite comparisons. The only exception is Slant Village, studied by Schubert & Cruz-Uribe (1997) using the same quantification methods used here.

Bones were identified using comparative collections from the faunal analysis laboratory and Quaternary Sciences comparative collection, Northern Arizona University. Publications describing relevant osteological characteristics such as Brown and Gustafson (1989); Lawrence

(1951), and Olsen (1964) were also used when appropriate. Biogeographic information (Graham and Lundelius 1994, Jones et al. 1985) was also taken into account.

Taxonomy

The scientific and common names of the taxa identified are provided in Table 6.2, which breaks down the Scattered Village sample by time period. Like many village faunas, and archaeological sites in general, the bones from Scattered Village tend to be fragmented, which can complicate identifications. In some cases, I had to lump taxa together in broader groups when it was not possible to make identifications to the species level. These grouping decisions and other taxonomic questions of interest are discussed in this section. Note that the taxonomic abbreviations in Table 6.2 use of "sp." and "cf." to signify degrees of taxonomic uncertainty, following Lucas (1996).

Weasels can be difficult to distinguish from one another, particularly given the sexual dimorphism common in these taxa, and potential overlap in size among different species (Jones et al. 1985). Based on biogeography, likely possible taxa present in the Scattered Village area include *M. frenata* (long-tailed weasel) and *M. nivalis* (least weasel) (Graham and Lundelius 1994, Jones et al. 1985). The size of specimens from Scattered Village range from very small (smaller than available comparative *M. nivalis*) to specimens approaching comparative *M. frenata* in size. Thus, it is probable that both species are represented at Scattered Village, although they are all lumped here simply as "indeterminate small mustelids" (*Mustela* sp.).

The skunk remains from Scattered Village match comparative *Mephitis mephitis* (striped skunk) for size. Spotted skunks (genus *Spilogale*) are smaller than *Mephitis*, and the ranges do not encompass the Scattered Village area. Thus, the skunk remains are identified here as *Mephitis mephitis*.

Canid taxa can also be difficult to distinguish from one another based on fragmentary bones. I have distinguished two size categories here. The first, "small canids" comprises bones deriving from foxes. Both red fox (*Vulpes vulpes*) and swift fox (*Vulpes velox*) were present in the area historically; the gray fox (*Urocyon cinereoargenteus*) may or may not have been present (Schubert & Cruz-Uribe 1997). In any case, these taxa may be distinguished on the basis of posterior characteristics of the mandible (Olsen 1964, Figs. 20 and 22), and only swift fox is definitely represented at Scattered Village. However, it should be recognized that the bones listed in Table 6.2 as "*Vulpes velox*" could potentially derive from other fox species.

The second canid taxonomic grouping used here is "large canids." This includes bones that potentially derive from wolf (*Canis lupus*), domestic dog (*Canis familiaris*), and coyote (*Canis latrans*). Dogs were important in Hidatsa culture (Wilson, 1924). At nearby Slant Village (Schubert & Cruz-Uribe 1997), the "large canid" category was also assumed to include dog, given that dogs were reported to have been present historically at Slant. But as noted by Schubert and Cruz-Uribe, wolves and coyotes were also abundant in the Heart River area, and the Mandans trapped them in pitfalls. Since the Scattered Village bones are fragmented, one can't observe many of the characteristics that have been used to define differences between canid

Table 6.2. Mammalian taxa MNI and NISP data by time period, Scattered Village (32MO31), 1998 excavations.

Taxon / Common Name	TP0 NISP	TP0 MNI	TP1 NISP	TP1 MNI	TP2 NISP	TP2 MNI	TP3 NISP	TP3 MNI	TP4 NISP	TP4 MNI	TP5 NISP	TP5 MNI	TOTAL NISP	TOTAL MNI
Mustela sp. (Indet. small mustelids)	0	0	8	2	18	2	5	3	2	1	0	0	33	8
Mustela vison (mink)	1	1	1	1	1	1	0	0	0	0	0	0	3	3
Taxidea taxus (badger)	0	0	3	1	1	1	2	1	1	1	0	0	7	4
Mephitis mephitis (skunk)	1	1	3	1	3	1	16	2	4	1	0	0	27	6
Canis sp. (wolf/dog/coyote)	65	3	177	4	334	6	65	3	188	3	0	0	829	19
Vulpes velox (swift fox)	15	1	137	3	174	3	34	2	37	2	0	0	397	11
Cynomys ludovicianus (black-tailed prairie dog)	2	1	117	5	94	5	6	1	12	1	0	0	231	13
Spermophilus sp. (ground squirrel)	0	0	1	1	1	1	0	0	0	0	0	0	2	2
Thomomys talpoides (pocket gopher)	14	1	100	5	20	3	5	2	2	1	0	0	141	12
Castor canadensis (beaver)	7	1	149	4	74	3	23	2	18	2	1	1	272	13
Ondatra zibethicus (muskrat)	8	1	19	3	15	2	1	1	2	1	0	0	45	8
Lepus townsendi (whitetailed jackrabbit)	15	2	64	3	165	4	24	2	170	3	0	0	438	14
Sylvilagus sp. (cottontail rabbit)	2	1	69	3	111	5	25	3	9	2	0	0	216	14
Cervus elaphus (elk)	0	0	2	1	0	0	0	0	1	1	0	0	3	2
Indeterminate *Cervid* (deer/elk)	0	0	0	0	1	1	0	0	1	1	0	0	2	2
Medium *artiodactyls* (pronghorn/deer)	53	2	523	6	840	7	129	5	100	3	0	0	1,645	23
Bison bison (bison)	132	3	852	9	2,064	16	590	7	876	9	0	0	4,514	44
indeterminate small animal	3	1	53	2	60	2	8	1	12	1	0	0	136	7
Antilocapra americana (pronghorn)	6	1	88	4	99	4	12	1	5	1	0	0	210	11
Odocoileus sp. (mule or white-tailed deer)	1	1	14	1	22	2	1	1	1	1	0	0	39	6

species (e.g., Morey 1986, Walker and Frison 1982). In addition, I lack the expertise and extensive comparative material that would be necessary to do an intensive study of the canids. Nonetheless, I can make the observation that there appear to be three sizes of "large canids" represented in the Scattered Village sample. There are large specimens that compare well with *C. lupus*. There are also specimens as large or larger than comparative *C. lupus* that may derive from domestic dogs. These are specimens with relatively crowded tooth rows that appear to be domestic. In addition, there are smaller specimens (all of which are much larger than foxes). These might be coyotes, but they may also represent smaller dogs.

Fragmentary ground squirrel remains were identified only as *Spermophilus* sp., although Semken (Chapter 8) identified both *S. tridecemlineatus* (thirteen-lined ground squirrel) and S. *richardsoni* (Richardson's ground squirrel) in the micromammal sample. Two sizes of leporids were recognized. The larger are identified as whitetailed jackrabbit (*Lepus townsendi*). The smaller specimens are identified as simply *Sylvilagus* sp. (cottontail), since both *S. floridanus* (eastern cottontail) and *S. auduboni* (desert cottontail) could be present based on their ranges.

Bison are by far the most abundant species represented at Scattered Village. Their dentitions and skulls are readily distinguished from elk, but bison and elk post-cranial bones can be more difficult to distinguish, particularly when fragmented. However, many large artiodactyl postcranial bones were complete enough to apply the criteria for distinguishing bison and elk bones published by Brown and Gustafson (1989). The overwhelming majority of large artiodactyl postcranial bones were identified as bison; only three bones from the Scattered Village sample were identified as deriving from elk. No elk teeth were found in the sample. Given the overwhelming preponderance of bison in this sample, fragmentary bones which could have come from either bison or elk are identified here as bison.

Smaller artiodactyls also present identification problems. Both pronghorn and deer teeth were identified in the Scattered Village sample, and both taxa are represented by postcranial bones, when criteria from Lawrence (1951) are applied. However, given the fragmentary nature of the bones and the relatively subtle differences between pronghorn and deer, I have lumped all pronghorn and deer bones together in a combined "medium artiodactyl" category. The separate counts listed at the bottom of Table 6.2 for "pronghorn" and "deer" are based on dentitions, which are readily distinguishable. Based on biogeography, the deer present could be white-tailed deer (*Odocoileus virginianus*) or mule deer (*O. hemionus*). I was not able to distinguish between these taxa based on the material in the sample, and thus the deer are identified simply as *Odocoileus* sp. There were also two antler fragments that are simply identified as "Indeterminate Cervid" since I was not able to establish whether they derived from deer or elk.

Species Representation and Relative Abundance

Table 6.2 shows clearly that the Scattered Village mammalian faunal assemblage is dominated by artiodactyls, with bison most common, followed by smaller artiodactyls (pronghorn/deer). Based on dentitions, pronghorn are much more common than deer in the sample, although both are present. Larger canids (wolf/dog/coyote) are also relatively common. Smaller carnivores present in the fauna are weasels, mink, badger, skunk, and fox. Rodents include black-tailed prairie dog, ground squirrel, pocket gopher, beaver, and muskrat. Both jackrabbits and cottontails are also present.

In order to explore the possibility of change through time, Figure 6.1 presents graphically the relative frequencies of different mammalian taxa in time periods 1-4. TP0 (unassigned time period) is excluded from the figure, as is TP5, with only one diagnostic bone. For the purposes of the figure, I have lumped closely related taxa together. Thus, mustelids (badger, skunk, and weasels) are lumped together, as are prairie dog and squirrels (sciurids), and jackrabbits and cottontails (leporids), pronghorn and deer (medium artiodactyls) and bison and elk (large artiodactyls). The top part of the figure represents NISPs, while the bottom presents the comparisons using MNIs. The predominance of bison is most obvious when NISPs are considered (Figure 6.1, top), where the percent NISP ranges from 37.5% to 63.2%. For MNIs, the range is from 19.2% to 32.3%.

One might expect some differences between pre-contact and contact-era contexts at Scattered Village, given that contact with Europeans may have affected the subsistence system of the village inhabitants. Some trends are apparent when NISPs are considered, although they are not so apparent when the MNIs (much smaller numbers) are considered. The most obvious difference is between Periods 2-4 (pre-contact and earliest contact) and Period 1 (latest post-contact) when the percentage of bison drops from over 50% of the identified specimens to less than 40%. A similar trend involving a drop in bison frequency over time was also seen at Slant Village (Schubert & Cruz-Uribe 1997, figure 25). At Scattered Village, the decrease in bison is accompanied by a sight increase in the medium artiodactyls, and also by increases in other taxa such as beaver, prairie dog, fox, and pocket gopher.

Comparisons with Other Middle Missouri Sites

The species frequencies from Scattered Village may be most fruitfully compared with those from nearby Slant Village, a traditional Mandan village whose period of occupation overlaps with Scattered Village. Slant Village time period 2 (1625-1725) is roughly comparable to Scattered Village time periods 1 and 2, while Slant Village period 3 (1575-1625) may be compared to Scattered Village time periods 3 and 4. Interesting comparisons may also be made with vertebrate assemblages from the Big Hidatsa and Lower Hidatsa villages on the Knife River (abbreviated KNRI) reported by Ahler et al. (1993). Small samples from earlier time periods are also available, from Huff Village, which dates to the middle decades of the AD 1400s (Ahler & Kvamme 2000) and site 32M0291 in the Highway 1806 project (Ahler et al. 2000), which dates to the early 1400s. With the exception of Slant Village, only NISPs are published for these sites, so they are used in the following comparisons.

Figure 6.2 presents comparisons for major mammalian groups from these sites. For ease of comparison, bones have been lumped into four categories: large artiodactyls (bison/elk), medium artiodactyls (pronghorn/deer), large canids (dog/wolf/coyote) and "other mammals" (other carnivores, beaver, muskrat, leporids, sciurids, pocket gopher, etc.). Figure 6.2 groups samples according to roughly corresponding time periods.

Large artiodactyls (primarily bison) dominate all the assemblages in Figure 6.2. However, both Scattered Village and Slant Village differ from contemporaneous KNRI samples in the extent to which bison dominates. At the KNRI sites, bison always represent at least 70%

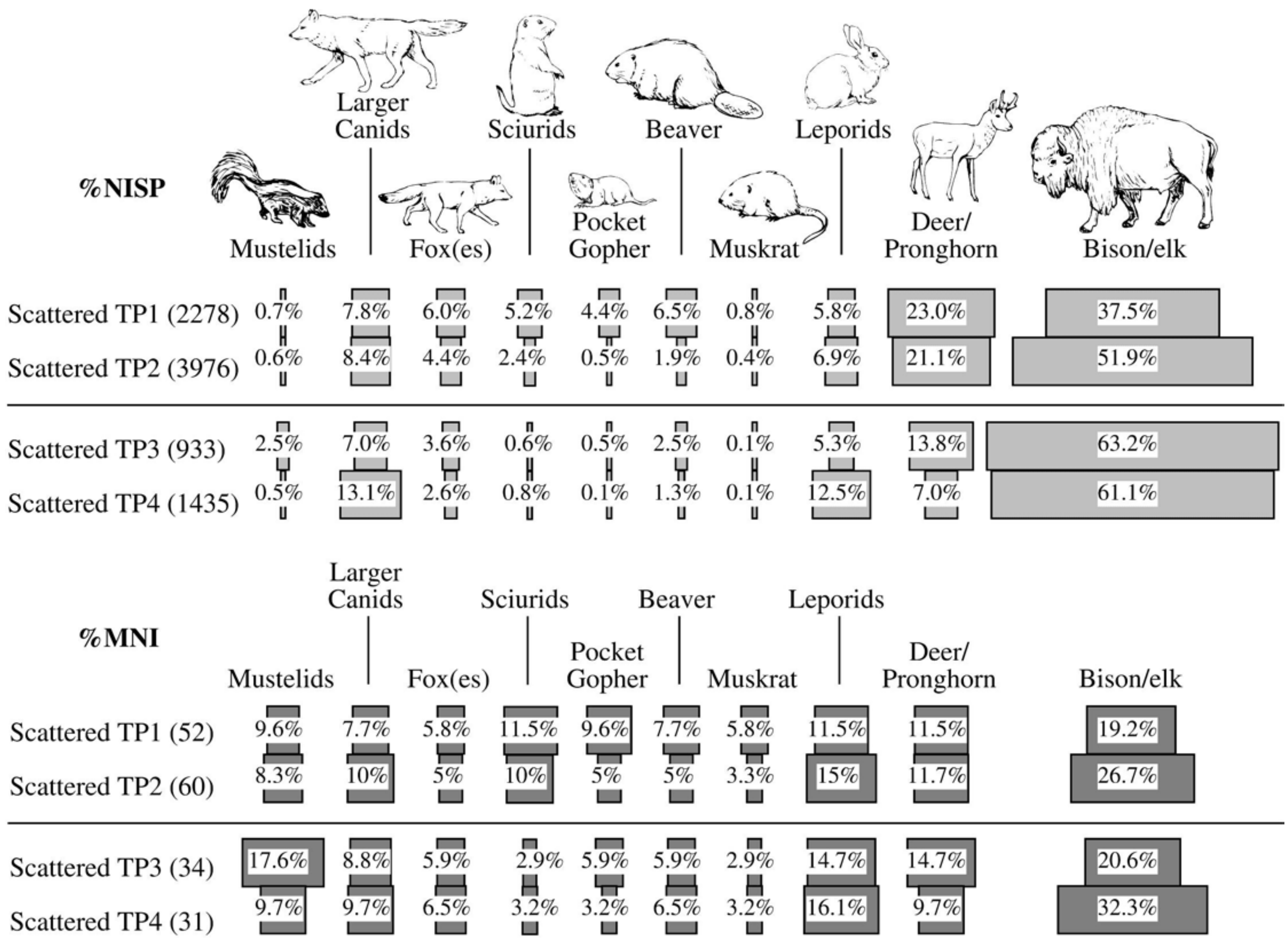

Figure 6.1. Relative frequencies of mammals at Scattered Village, TP1-TP4 (32MO31), 1998 excavations. Bars in the figure are proportional to frequency as expressed by percentage of total NISP for each time period (top) or MNI for each time period (bottom). Numbers in parentheses = total NISP (top) or total MNI (bottom) for that time period.

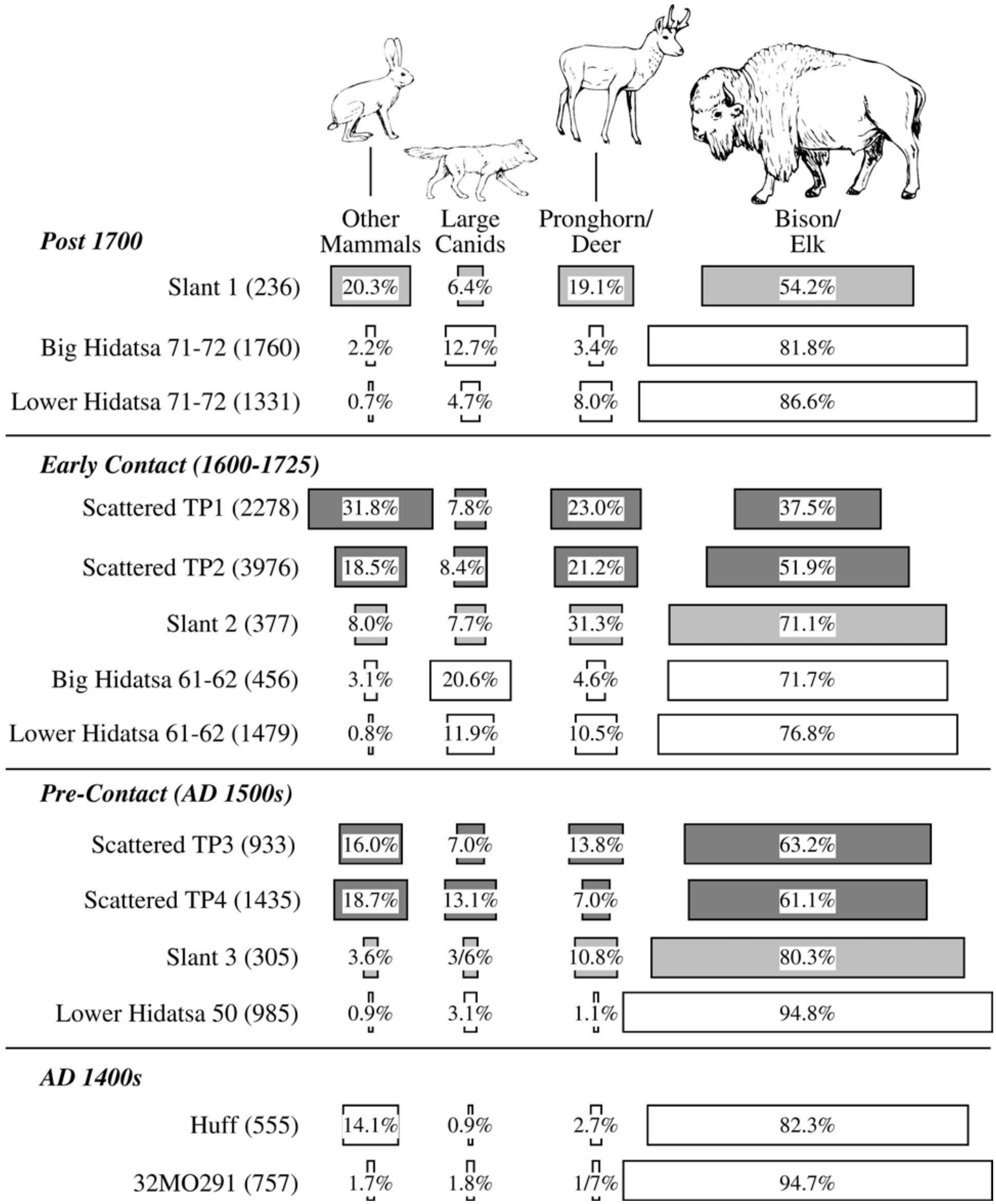

Figure 6.2. Relative frequencies of major mammalian taxonomic groups at Scattered Village, Slant Village, Big Hidatsa, Lower Hidatsa, Huff, and 32MO291. Bars in the figure are proportional to frequency as expressed by percentage of total NISP. Numbers in parentheses = total NISP.

of the NISP; the percentages are lower at Scattered and Slant. Moreover, in the KNRI Hidatsa sites, large canids are usually second in abundance after bison. A different pattern prevails at both Scattered and Slant, where pronghorn/deer tend to be more abundant than large canids. Moreover, both Scattered and Slant have higher percentages of "other mammals." This is not merely a function of sample size, as some of the sample sizes of the KRNI sites are comparable to those from Scattered and Slant, yet the Scattered and Slant samples are much more diverse. This pattern prevails through time; even in the post-AD 1700 samples (not represented at Scattered), Slant is more diverse than Big Hidatsa or Lower Hidatsa (even though the Slant sample is much smaller than either of the KNRI sites). Thus, it appears that villages along the Heart River (Scattered and Slant) are characterized by a more diverse mammalian subsistence pattern than those on the Knife River.

Figure 6.2 also presents comparable data for two earlier sites in the Heart River area, Huff Village and 32MO291, both of which date to the AD 1400s. These sites are both dominated very strongly by bison (especially 32MO291). In this respect they resemble the KNRI sites more than they do Scattered or even Slant.

As noted above, NISPs are not ideal for intersite comparison. They are affected by factors such as differential fragmentation and differential transport (e.g., some taxa may reach the site as whole animals whereas some may be butchered away from the site and only selected parts transported). Thus, when possible, MNIs are preferable for intersite comparisons (Klein and Cruz-Uribe 1984). MNIs are available for both Scattered and Slant Village, but because the Slant Village sample is not large, the MNIs for each time period are too small to be useful for meaningful comparisons.

For the sake of exploring patterns in the Scattered and Slant data, it is possible to recalculate MNIs by taking into account both time period (as was done above) and site area (for Slant) or block (Scattered). In doing these recalculations, I made the assumption that bones from any one area or block could not come from the same individuals as bones from a different area or block. So, for example, for Scattered Village TP1, NISPs and MNIs were calculated separately for each block, and then added to arrive at a total NISP and total MNI for TP1.

Figure 6.3 shows the proportions of bison/elk, pronghorn/deer, large canids and other mammals for both Scattered and Slant Villages, based on the recalculated MNIs. Because MNIs are used and not NISPs, the proportion of "other mammals" is greatly increased compared to the NISP comparison (Figure 6.2), because it includes a number of different taxa. For the most part, the pattern seen in Figure 6.3 reflects the pattern seen in the NISPs in Figure 6.2. Bison/elk remain the most abundant taxa, at about 20-25%. The exception to this is Slant Period 3, where the proportion of bison/elk reaches 44%. At both sites, pronghorn/deer remain second in abundance, followed by large canids. In the NISP counts, "Other taxa" tend to be more common at Scattered than at Slant, and that pattern appears even stronger with the MNIs, with "Other taxa" comprising about 50-60% at Scattered versus 37% at Slant 2 and 16.7% at Slant 3.

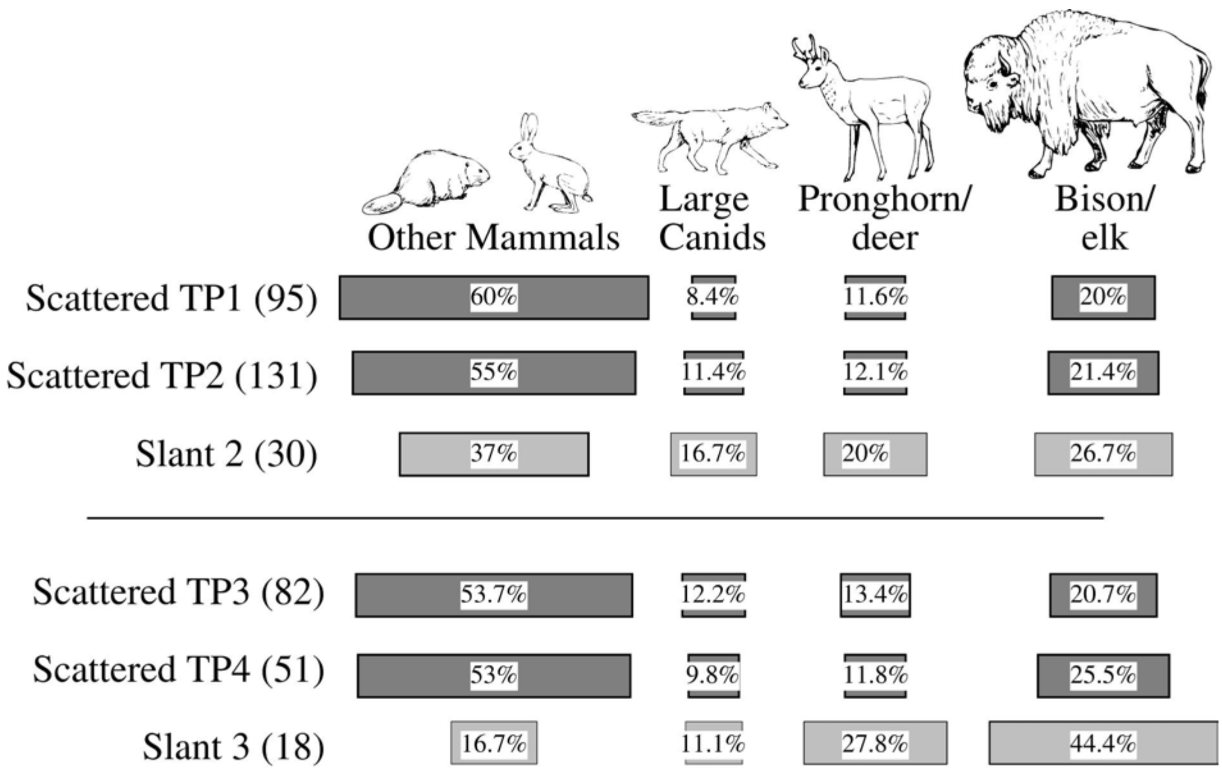

Figure 6.3. Relative frequencies of major mammalian taxonomic groups at Scattered and Slant Villages. Bars in the figure are proportional to frequency as expressed by percentage of MNI. For this figure, MNIs were calculated separately for each block (at Scattered) or area (at Slant), for each time period. The resultant MNIs were then added to arrive at an MNI for each time period. Numbers in parentheses = total MNI. See text for further explanation.

Midden Vs. Pit Contexts at Scattered Village and Slant Village

One of the potentially interesting areas to investigate at both Scattered Village and Slant Village is taxonomic variation between bones deposited in midden contexts versus pit contexts. For example, were certain taxa deposited more frequently in pits and less commonly in middens? Table 6.3 shows the NISPs of different taxa recorded in midden/pit contexts for each time period at Scattered Village. Midden contexts are contexts 8-13 (cluster, roof fall, floor zone, midden dump, sheet midden), while "pit" contexts are contexts 1-3 (cache pit, cache w/ burial, burial pit). Note that the numbers in Table 6.3 do not equal the totals in Table 6.2, because some bones came from either unassigned contexts or contexts other than pits or middens.

The time periods vary with regard to the amount of bone in each context. In TP1, most of the bone was recovered from pits rather than middens, while in TP2 and TP4, much of the bone came from midden contexts. In TP3, bones came about equally from both contexts. There are significant differences in the distribution of taxa in midden vs. pit contexts in each of the four time periods (see chi-square values at the bottom of the table), but there are no readily interpretable consistent patterns. The only exception to this is bison/elk, which are consistently more common in middens in every time period at Scattered Village. In contrast, at Slant Village, there is no significant difference between the taxonomic composition in pit and midden contexts (Table 6.4).

Table 6.3. Distribution of collapsed taxa NISP according pit versus midden context, controlled by time period, Scattered Village (32MO31), 1998 excavations. Counts top; percentages middle, standardized cell residuals bottom. Cell residual values >+1.0 shaded for emphasis. Chi-square is run separately for each time period.

	TP1		TP2		TP3		TP4	
Grouped Taxa	Pit	Midden	Pit	Midden	Pit	Midden	Pit	Midden
mustelids	13	2	13	10	19	1	0	7
large canids	160	17	93	238	40	18	93	95
fox	26	5	40	133	22	7	13	24
sciurids	102	1	20	73	4	0	1	11
pocket gopher	12	2	7	13	1	1	0	2
beaver	140	8	22	52	18	3	8	10
muskrat	18	1	8	7			0	2
leporids	118	15	64	212	39	6	151	28
bison/elk	772	79	505	1,551	272	248	187	690
pronghorn/deer	493	25	330	510	52	54	17	83
mustelids	86.7%	13.3%	56.5%	43.5%	95.0%	5.0%	.0%	100.0%
large canids	90.4%	9.6%	28.1%	71.9%	69.0%	31.0%	49.5%	50.5%
fox	83.9%	16.1%	23.1%	76.9%	75.9%	24.1%	35.1%	64.9%
sciurids	99.0%	1.0%	21.5%	78.5%	100.0%	.0%	8.3%	91.7%
pocket gopher	85.7%	14.3%	35.0%	65.0%	50.0%	50.0%	.0%	100.0%
beaver	94.6%	5.4%	29.7%	70.3%	85.7%	14.3%	44.4%	55.6%
muskrat	94.7%	5.3%	53.3%	46.7%			.0%	100.0%
leporids	88.7%	11.3%	23.2%	76.8%	86.7%	13.3%	84.4%	15.6%
bison/elk	90.7%	9.3%	24.6%	75.4%	52.3%	47.7%	21.3%	78.7%
pronghorn/deer	95.2%	4.8%	39.3%	60.7%	49.1%	50.9%	17.0%	83.0%
mustelids	-.2	.8	2.6	-1.6	2.2	-2.6	-1.5	1.1
large canids	-.3	.9	-.1	.0	1.1	-1.3	3.9	-2.8
fox	-.5	1.7	-1.3	.8	1.3	-1.5	.2	-.2
sciurids	.7	-2.5	-1.2	.8	1.1	-1.3	-1.5	1.0
pocket gopher	-.3	.9	.6	-.4	-.1	.2	-.8	.6
beaver	.3	-1.0	.2	-.2	1.7	-2.0	.8	-.6
muskrat	.1	-.4	1.8	-1.1			-.8	.6
leporids	-.4	1.5	-1.6	1.0	2.5	-3.0	11.9	-8.4
bison/elk	-.5	1.6	-3.1	2.0	-1.7	2.0	-6.0	4.2
pronghorn/deer	.7	-2.4	6.0	-3.8	-1.2	1.4	-2.8	2.0
Total	1,854	155	1,102	2,799	467	338	470	952
	92.3%	7.7%	28.2%	71.8%	58.0%	42.0%	33.1%	66.9%
Chi-Square:	TP1	X^2=24.72	df=9	p=.003	TP2	X^2=86.35	df=9	p=<.0001
	TP3	X^2=53.05	df=8	p=<.0001	TP4	X^2=311.8	df=9	p=< .0001

Table 6.4. Distribution of collapsed taxa NISP according to pit versus midden context, Slant Village (32MO26), 1980 excavations. Counts top; percentages middle, standardized cell residuals bottom. Cell residual values >+1.0 shaded for emphasis.

Taxa	Pit	Midden	Total
mustelids	1	1	2
large canids	21	33	54
fox	22	24	46
sciurids	5	1	6
beaver	4	6	10
muskrat	4	0	4
leporids	13	9	22
bison/elk	365	266	631
pronghorn/deer	76	54	130
mustelids	50.0%	50.0%	100.0%
large canids	38.9%	61.1%	100.0%
fox	47.8%	52.2%	100.0%
sciurids	83.3%	16.7%	100.0%
beaver	40.0%	60.0%	100.0%
muskrat	100.0%	.0%	100.0%
leporids	59.1%	40.9%	100.0%
bison/elk	57.8%	42.2%	100.0%
pronghorn/deer	58.5%	41.5%	100.0%
mustelids	-.1	.1	
large canids	-1.7	2.0	
fox	-.8	.9	
sciurids	.9	-1.0	
beaver	-.7	.8	
muskrat	1.2	-1.3	
leporids	.2	-.2	
bison/elk	.5	-.5	
pronghorn/deer	.3	-.3	
Total	511	394	905
	56.5%	43.5%	100.0%
	Chi-Square = 14.927	df = 8	p = .061

Inside House and Outside House Contexts at Scattered Village

Table 6.5 shows the distribution of different taxa between two different contexts at Scattered Village – bones found inside house structures, and those from contexts outside of houses. One apparent tendency is for smaller mammals (particularly fox, sciurids, pocket gopher, beaver) to be more common in “inside house” contexts than outside. The only exception to this tendency is leporids, which tend to be found more often in the outside contexts, although this trend is not particularly strong.

Table 6.5. Distribution of collapsed taxa NISP according to inside versus outside house context, controlled by time period, Scattered Village (32MO31), 1998 excavations. Counts top; percentages middle, standardized cell residuals bottom. Cell residual values >+1.0 shaded for emphasis. Chi-square is run separately for each time period.

	TP1		TP2		TP3	
Taxa	In	Out	In	Out	In	Out
mustelids	3	7	2	21	10	12
large canids	43	79	20	299	28	26
fox	57	72	15	148	19	13
sciurids	31	36	10	81	1	4
pocket gopher	58	75	5	13	4	1
beaver	21	46	13	49	3	7
muskrat	4	5	0	10	1	0
leporids	31	53	12	232	21	19
bison	193	332	192	1,722	166	379
pronghorn/deer	190	271	22	673	24	94
mustelids	30.0%	70.0%	8.7%	91.3%	45.5%	54.5%
large canids	35.2%	64.8%	6.3%	93.7%	51.9%	48.1%
fox	44.2%	55.8%	9.2%	90.8%	59.4%	40.6%
sciurids	46.3%	53.7%	11.0%	89.0%	20.0%	80.0%
pocket gopher	43.6%	56.4%	27.8%	72.2%	80.0%	20.0%
beaver	31.3%	68.7%	21.0%	79.0%	30.0%	70.0%
muskrat	44.4%	55.6%	.0%	100.0%	100.0%	.0%
leporids	36.9%	63.1%	4.9%	95.1%	52.5%	47.5%
bison	36.8%	63.2%	10.0%	90.0%	30.5%	69.5%
pronghorn/deer	41.2%	58.8%	3.2%	96.8%	20.3%	79.7%
mustelids	-.5	.4	.1	.0	1.0	-.7
large canids	-.7	.6	-1.2	.4	2.4	-1.7
fox	.9	-.7	.4	-.1	2.6	-1.8
sciurids	.9	-.7	.9	-.3	-.5	.4
pocket gopher	.8	-.6	2.9	-.9	1.8	-1.3
beaver	-1.0	.8	3.5	-1.0	-.2	.1
muskrat	.2	-.2	-.9	.3	1.2	-.8
leporids	-.3	.3	-1.8	.5	2.1	-1.5
bison	-.9	.7	2.8	-.8	-1.1	.8
pronghorn/deer	.7	-.5	-4.6	1.4	-2.4	1.7
Total	631	976	291	3,248	277	555
	39.3%	60.7%	8.2%	91.8%	33.3%	66.7%
Chi-Square	TP1	9.10	df=9	p=.428		
	TP2	61.49	df=9	p=< .0001		
	TP3	44.54	df=9	p=< .0001		

Bone Damage and Preservation

Like many fossil bone assemblages, the faunal remains from Scattered Village tend to be fragmented. Complete long bones, for example, tend to be very rare, and even smaller bones such as phalanges are often broken. For example, of the 46 bison humeri recorded from TP2, only three are complete; of the 273 bison first phalanges recorded from TP2, only 25 are complete. Some of this fragmentation is no doubt due to pre-depositional activities (e.g., butchering, smashing of bones for marrow extraction, chewing by carnivores and gnawing by rodents), while some may be due to post-depositional processes such as profile compaction (Klein & Cruz-Uribe 1984). Although the Scattered Village bones tend to be fragmented, they are generally well preserved (i.e., not weathered or decalcified), and it is possible to observe surface damage on most specimens. The good preservation quality is shown by the presence of preserved horncore sheath tips (keratin), which were recovered from both midden and pit contexts from TP1, TP2, and TP4.

The bone damage described here is limited to damage that was not a result of intentional modification of the bone to create tools or use as an expedient tool. That type of damage is addressed in the section on modified bone. The damage described here includes cut marks (i.e., from the butchering process), burning, carnivore chewing, acid-etching resulting from carnivore digestion, porcupine gnawing, small-rodent gnawing, natural abrasion (e.g., from water rolling) and weathering. Damage was assessed only by macroscopic examination and it is recognized that intensive microscopic study might reveal more damage, particularly cut marks and chewing marks, which was not readily visible to the naked eye (Milo 1994).

Table 6.6 presents the numbers of damaged bones from Scattered Village for each damage category, along with comparable data from Slant Village (Schubert & Cruz-Uribe 1997, Table 24). The bottom part of Table 6.6 breaks down the Scattered Village and Slant Village damage further by context (pits vs. middens) and by time period. In general, surface damage tends to be relatively rare on the Scattered Village bones, as it is at Slant. (Note that the numbers for both Scattered and Slant reflect only the number of identified specimens with damage.) Weathering is very uncommon (present on less than 1% of the bones at Scattered), as is abrasion. This suggests that the bones were buried relatively quickly and not exposed to the elements for a long time. This is the case both for bones from pits as well as those from middens (Table 6.6, bottom). Rodent gnawing is also very uncommon at both Scattered and Slant.

Carnivore damage (both chewing and acid-etching) is also uncommon at Scattered Village, although it is more common there than at Slant Village. Dogs were present at both Scattered and Slant, but it appears that they did not have extensive access to discarded bones at either site. At Slant, a large portion of the sample derived from pits, whereas at Scattered Village, more than half of the identified bones came from midden contexts (Table 6.6, bottom). Thus, the higher percentage of carnivore damage on the Scattered Village bones may reflect easier carnivore access to bones discarded on middens rather than buried in pits. As might be predicted, carnivore damage at Scattered is more common on bones from midden contexts than from pits (Table 6.6, bottom).

The proportions of burnt bones and cut bones are reversed at Scattered Village when compared to Slant. Burnt bones are more common at Scattered (6.83%) than at Slant (2.29%), while cut bones are much less common at Scattered (2.21%) than at Slant (9.91%). The Slant sample is much smaller than the Scattered sample, and sample size may be a factor. However, the Scattered Village sample from TP3 (933 bones) is very comparable to that from Slant (918 bones), and the same pattern holds even in the Scattered TP3 sample (Table 6.6, bottom). Thus, it appears that there are some processing differences between Scattered and Slant, with cut marks much less common overall at Scattered Village. When the Scattered sample is broken down by time period (Table 6.6, bottom), the pattern holds across time periods, except for TP4, where burning is less common than in the other 3 periods (3.48% vs. 7-8%), and cut marks tend to be more common.

The extent of damage does vary among taxa at Scattered and Slant Villages (Table 6.7). Burning, for example, tends to be less common on pocket gopher bones, which may occur at Scattered Village naturally. It also tends to be less common on potential fur-bearing species (beaver and muskrat). Cut marks tend to be most common on the larger taxa (bison/elk, pronghorn/deer, large canids, and beaver). Carnivore chewing is most apparent on bison and pronghorn/deer, while acid-etching from carnivore digestion occurs on smaller taxa, as would be expected given the size of the bones.

Table 6.6. Bone damage recorded on Scattered Village and Slant Village specimens, presented for whole site samples and also controlling for pit/midden context and by time period. Data from Slant Village are from Schubert and Cruz-Uribe (1997:Table 28).

	Scattered Village (TP0-TP5)		Slant Village	
Type of Damage	n	%	n	%
Burnt	611	6.83%	21	2.29%
Cut	198	2.21%	91	9.91%
Carnivore	100	1.12%	2	0.22%
Acid-etched	160	1.79%	7	0.76%
Porcupine-gnawed	2	0.02%	0	0.00%
Small-rodent gnawed	26	0.29%	4	0.44%
Abraded	3	0.03%	1	0.11%
Weathered	79	0.88%	0	0.00%
Total	8,951		918	

	Scattered Village				Slant Village			
	Pits		Middens		Pits		Middens	
Type of Damage	n	percent	n	percent	n	percent	n	percent
Burnt	238	5.71%	337	7.81%	12	2.29%	8	2.04%
Cut	78	1.87%	102	2.36%	56	10.67%	29	7.38%
Carnivore	39	0.94%	57	1.32%	0	0.00%	2	0.51%
Acid-etched	48	1.15%	96	2.22%	3	0.57%	4	1.02%
Porcupine-gnawed	1	0.02%	1	0.02%	0	0.00%	0	0.00%
Small-rodent gnawed	16	0.38%	9	0.21%	1	0.19%	3	0.76%
Abraded	0	0.00%	2	0.05%	0	0.00%	0	0.00%
Weathered	36	0.86%	33	0.76%	0	0.00%	0	0.00%
Total	4,171		4,316		525		393	

	Scattered Village								Slant Village					
Type of Damage:	TP1		TP2		TP3		TP4		TP1		TP2		TP3	
Burnt	177	7.75%	297	7.47%	75	8.04%	50	3.48%	3	1.27%	8	2.12%	10	3.28%
Cut	39	1.71%	68	1.71%	36	3.86%	46	3.20%	18	7.63%	37	9.81%	35	11.48%
Carnivore	22	0.96%	49	1.23%	7	0.75%	18	1.25%	1	0.42%	1	0.27%	0	0.00%
Acid-etched	29	1.27%	101	2.54%	9	0.96%	17	1.18%	1	0.42%	5	1.33%	1	0.33%
Porcupine-gnawed	0	0.00%	2	0.05%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Small-rodent gnawed	16	0.70%	7	0.18%	1	0.11%	2	0.14%	3	1.27%	1	0.27%	0	0.00%
Abraded	0	0.00%	2	0.05%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Weathered	23	1.01%	33	0.83%	9	0.96%	8	0.56%	0	0.00%	0	0.00%	0	0.00%
Total	2,283		3,978		933		1,437		236		377		305	

Skeletal Part Representation

Skeletal element frequencies can provide important clues about procurement and butchering strategies. If an animal is killed and deposited in a site whole, and the bones are not broken or subject to any post-depositional destructive processes, then we would expect the number of bones to equal the number in the skeleton. For example, if there are 10 bison represented in an assemblage, there should be 10 atlas vertebrae, 20 humeri, etc. Of course, this situation does not normally pertain in archaeological faunas, and skeletal elements are usually found in "anatomically *un*expectable" frequencies. Among the important factors that may influence skeletal element frequencies are transport considerations, butchering practices, destruction by carnivores, and differential preservation of bones. In addition, differential recovery (e.g., screening biases) can affect skeletal frequencies. This last factor is easiest to control. At Scattered Village all materials recovered during the excavation and monitoring phases of the project were water-screened through 1/16" mesh, and therefore there should not be recovery biases with this sample (Chapter 2).

Table 6.7. Frequency and percentage of bone damage type by grouped taxa for Scattered Village and Slant Village.

Scattered Village	Burnt		Cut		Chewed		Acid		Porcupine		Small Rod		Abraded		Weath'd		Total Damaged		Total Bone
Taxa	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n
(weasels, mink, skunk)	1	*1.4*	0	*0.00*	0	*0.00*	0	*0.00*	0	*0.00*	0	*0.00*	0	*0.00*	0	*0.00*	1	*1.43*	70
(wolf, coyote, dog)	59	*7.1*	9	*1.*	6	*0.72*	29	*3.50*	0	*0.00*	1	*0.12*	0	*0.00*	13	*1.57*	117	*14.11*	829
(foxes)	24	*6.1*	3	*0.76*	0	*0.00*	17	*4.28*	0	*0.00*	3	*0.76*	0	*0.00*	0	*0.00*	47	*11.84*	397
(prairie dog, squirrel)	17	*7.4*	1	*0.43*	1	*0.43*	5	*2.16*	0	*0.00*	1	*0.43*	0	*0.00*	0	*0.00*	25	*10.82*	231
(pocket gopher)	4	*2.8*	0	*0.00*	0	*0.00*	1	*0.70*	0	*0.00*	0	*0.00*	0	*0.00*	0	*0.00*	5	*3.50*	143
(beaver)	13	*4.8*	7	*2.57*	1	*0.37*	3	*1.10*	0	*0.00*	4	*1.47*	0	*0.00*	0	*0.00*	28	*10.29*	272
(muskrat)	2	*4.4*	0	*0.00*	0	*0.00*	0	*0.00*	0	*0.00*	1	*2.22*	0	*0.00*	0	*0.00*	3	*6.67*	45
(jackrabbit, cottontail)	43	*6.6*	1	*0.15*	0	*0.00*	24	*3.67*	0	*0.00*	4	*0.61*	0	*0.00*	0	*0.00*	72	*11.01*	654
(bison, elk)	323	*7.2*	139	*3.08*	63	*1.39*	12	*0.27*	1	*0.02*	1	*0.02*	3	*0.07*	54	*1.20*	596	*13.19*	4517
(pronghorn, deer)	109	*6.6*	35	*2.13*	28	*1.70*	66	*4.01*	1	*0.06*	11	*0.67*	0	*0.00*	11	*0.67*	261	*15.87*	1645

Slant Village	Burnt		Cut		Chewed		Acid		Small Rod		Total Damaged		Total Bone
Taxa	n	%	n	%	n	%	n	%	n	%	n	%	n
(wolf, coyote, dog)	2	*3.64*	4	*7.27*	0	*0.00*	0	*0.00*	2	*3.64*	8	*14.55*	55
(foxes)	0	*0.00*	1	*33.33*	0	*0.00*	0	*0.00*	1	*33.33*	2	*66.67*	3
(beaver)	0	*0.00*	1	*10.00*	0	*0.00*	0	*0.00*	0	*0.00*	1	*10.00*	10
(jackrabbit, cottontail)	0	*0.00*	0	*0.00*	0	*0.00*	1	*4.55*	0	*0.00*	1	*4.55*	22
(bison, elk)	11	*1.72*	73	*11.39*	2	*0.31*	3	*0.47*	0	*0.00*	89	*13.88*	641
(pronghorn, deer)	8	*6.02*	12	*9.02*	0	*0.00*	3	*2.26*	1	*0.75*	24	*18.05*	133

Skeletal frequencies for all Scattered Village taxa except bison can be found in Appendix B. Since bison are represented by large enough numbers to enable analysis of the skeletal element frequencies, bison data are presented here in Table 6.8. To simplify comparisons, Figure 6.4 lumps skeletal elements according to major parts of the body. It presents the percent of maximum MNI, by time period. It is more valid to use MNIs, rather than NISPs for analyzing body parts, because of problems of differential fragmentation (although the skeletal part tables present the data for both). For comparative purposes, the figure also presents bison skeletal parts for Slant Village (from Schubert & Cruz-Uribe 1997, table 29).

As expected, all skeletal parts are not represented equally. For bison, the patterns for TP1 and TP2 look very similar. In both cases, the assemblages are dominated by phalanges (representing 100% of the maximum MNI). The second most common bones are pedal sesamoids, found on the body in close association with the phalanges. Of course, both these types of bones (phalanges and sesamoids) are represented in the body by numerous bones (e.g., eight first phalanges per animal), but using MNIs eliminates that confounding factor. Carpals and tarsals also tend to be well represented. These are all small, hard, compact bones that tend to preserve well. Small hard bones such as phalanges, sesamoids, carpals, and tarsals are also well represented in TP3 and TP4, although the pattern is not as striking as in TP1 and TP2.

One useful method for trying to understand skeletal element frequencies was developed by Grayson (1988; see Klein and Cruz-Uribe 1989 for another application). In this method, the analyst plots the abundance of different skeletal elements against bone density and food value. A strong positive correlation with bone density might indicate that selective destruction has had an important influence on the skeletal element frequencies at a site. (This is the case, for example, at stone age prehistoric sites from southern Africa, that are frequently dominated by small, hard bones). Such destruction might be predepositional (e.g., smashing of bones in the butchering process, for extraction of marrow, etc.) or post-depositional (e.g., caused by profile compaction, leaching, etc.) On the other hand, a strong correlation with food value might indicate that selective transport has been important. For example, if low food value bones are left at a kill site, and only high value bones transported to the village, we would expect a positive correlation between abundance and food value.

For analysis of the Scattered Village bison, I used Kreutzer's (1992) figures for bison volume density, and Metcalf & Jones (1988) Food Utility Index (FUI) figures as a general index of food utility. (These figures are included in Table 6.8). The FUI reflects the meat, marrow, and grease value of each skeletal element. Given the preponderance of small, hard bones in the Scattered Village bison sample, we might expect a positive correlation between abundance and bone density. But in fact, as Figure 6.5 (top) shows, there are in fact slightly negative (although not significant) correlations between density and skeletal abundance in the Scattered Village bison. The Slant Village bison sample showed a similar pattern (Schubert & Cruz-Uribe 1997), with no significant correlation between skeletal part abundance and density. Thus, although some dense bones such as phalanges and tarsals are well represented at both Scattered and Slant, other dense bones are not. For example, the atlas and axis vertebrae, both of which are dense, are relatively uncommon. So, factors other than density are at work.

The correlations between food value (FUI) and bison skeletal part abundance are also not significant (Figure 6.5, bottom), and with the exception of TP4, they are negative. Thus, food utility as measured by the FUI does not appear to be a significant factor in the skeletal element distributions. Again, looking back at the FUI numbers in Table 6.8, it is clear that some bones with low food utility (e.g., phalanges, carpals) tend to be very common, while others (e.g., atlas

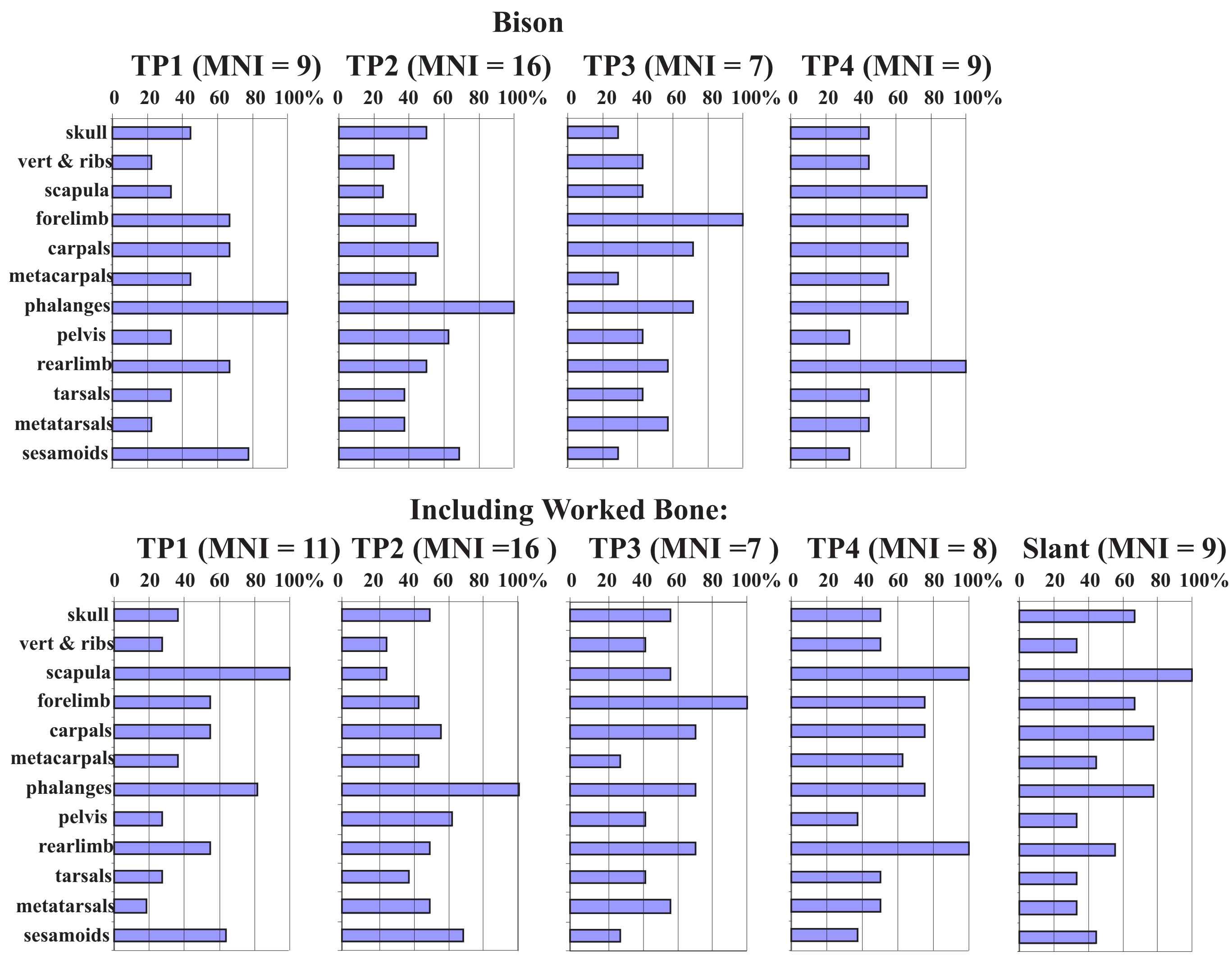

Figure 6.4. Top: relative frequencies of bison skeletal elements recovered from Scattered Village, from each time period (TP1-TP4). The MNI for each body part is expressed as a percentage of the maximum MNI. Bottom: worked bone has been added into the Scattered Village numbers. Bottom right: relative frequencies of bison/elk skeletal elements recovered from Slant Village (numbers from Schubert and Cruz-Uribe 1997, table 29).

Table 6.8. Skeletal part representation for bison by time period, Scattered Village (32MO31), 1998 excavations. No bison bones were identified from TP5. Volume density figures are from Kreutzer (1992) and the Food Utility values (FUI) from Metcalfe and Jones (1988).

	TP0		TP1		TP2		TP3		TP4		Scan	Vol.	
Skeletal Part	NISP	MNI	NISP	MNI	NISP	MNI	NISP	MNI	NISP	MNI	Site	Density	FUI
frontlet	1	1	1	1	6	2	2	2	5	3			1
occipital condyle	0	0	1	1	3	2	1	1	4	3			
auditory bulla	0	0	2	1	9	3	0	0	4	2			
premaxilla	1	1	1	1	13	7	1	1	5	3			
maxilla	10	2	17	3	30	4	7	2	20	3			235
mandible	17	2	42	4	87	8	12	2	36	4	DN4	0.53	1,600
mandibular condyle	3	2	3	2	11	6	6	4	5	4	DN7	0.79	
hyoid	0	0	5	2	9	2	2	1	6	3			
atlas	0	0	2	2	4	1	1	1	0	0	AT2	0.91	524
axis	1	1	3	2	9	3	1	1	1	1	AX1	0.65	524
cervical vertebrae 3-7	2	1	8	2	30	2	6	2	6	2	CE1	0.37	1,905
thoracic vertebrae	3	1	15	2	49	2	25	2	24	2	TH1	0.42	2,433
lumbar vertebrae	2	1	12	2	62	4	25	3	35	4	LU2	0.11	1,706
sacrum	0	0	1	1	0	0	1	1	2	2	SC1	0.27	
caudal vertebrae	0	0	18	1	27	1	3	1	8	1			
ribs	7	1	99	2	297	5	116	2	149	3	RI2	0.35	2,650
scapula	6	1	15	3	26	4	13	3	13	7	SP1	0.5	2,295
proximal humerus	1	1	9	3	17	5	7	3	16	4	HU1	0.24	2,295
distal humerus	1	1	12	6	32	5	11	4	16	5	HU5	0.38	1,891
proximal radius	3	2	11	2	29	6	13	7	12	4	RA1	0.48	1,323
distal radius	0	0	9	2	27	7	12	6	22	6	RA5	0.35	1,039
proximal ulna	1	1	6	1	12	2	8	2	9	2	UL2	0.69	
distal ulna	0	0	1	1	15	5	6	4	11	5			
carpals	4	1	27	6	55	9	34	5	39	6	LUNAR	0.35	653
proximal metacarpal	1	1	15	4	20	3	4	2	7	5	MC1	0.59	461
distal metacarpal	5	3	11	3	44	7	7	2	18	5	MC5	0.46	364
first phalange	10	2	110	5	273	13	37	4	66	5	P11	0.48	443
second phalange	12	3	82	9	171	16	40	5	53	6	P21	0.41	443
third phalange	6	2	57	8	100	12	31	5	37	6	P31	0.32	443
pelvis	3	2	9	3	30	10	8	3	10	3	AC1	0.53	2,531
proximal femur	2	2	5	2	23	4	7	3	16	6	FE2	0.34	5,139
distal femur	1	1	7	2	19	4	10	1	16	5	FE6	0.26	5,139
patella	1	1	1	1	12	6	4	2	7	4			
proximal tibia	0	0	2	1	25	3	5	2	15	4	TI1	0.41	3,225
distal tibia	1	1	17	6	35	8	16	4	23	8	TI5	0.41	2,267
lateral malleolus	2	2	8	4	14	8	7	4	13	9	LATMAL	0.56	
calcaneum	1	1	7	3	6	3	7	3	11	4	CA3	0.49	1,424
astragalus	3	2	6	3	28	6	6	3	7	3	AS1	0.72	1,424
naviculo-cuboid	1	1	2	1	19	6	3	2	6	3	NC3	0.77	1,424
cuneiform tarsals	1	1	7	3	18	6	6	3	9	4			1,424
proximal metatarsal	1	1	2	1	17	6	6	4	10	4	MR1	0.52	1,003
distal metatarsal	3	1	11	2	39	5	12	3	19	4	MR5	0.4	792
proximal sesamoids	5	1	100	7	170	11	33	2	49	3			
distal sesamoids	7	1	25	4	74	9	17	2	15	2			
indet fragments	4	1	48	1	80	1	18	1	39	1			
Totals For Bones	105	3	793	9	1,947	16	571	7	820	9			
Totals For Teeth	27	2	59	4	117	8	19	2	56	4			
Grand Totals	132	3	852	9	2,064	16	590	7	876	9			

and axis) are uncommon. It is possible, however, that transport decisions do play a role in the bison skeletal frequencies. The preponderance of phalanges and sesamoids, especially in TP1 and TP2, suggests that they may have been transported to the site while still attached to hides.

One possible confounding factor in interpreting skeletal element frequencies at Scattered Village is the fact that some elements that are very common at Scattered Village (e.g., sesamoids) do not have published density or FUI figures. Another potentially confounding factor is the use of bones as tools. As noted above, I did not examine the worked bones (see Falk, this volume). However, I did have access to Falk's database of his identifications of worked bones. I then added those bison bones that I would consider identifiable and countable using the Klein & Cruz-Uribe (1984) system into my counts to produce the bottom part of Figure 6.4. Overall, the general pattern of skeletal part representation does not change much by including the worked bone. For example, sesamoids and phalanges remain common. The major difference is in the scapula counts. Given how common worked scapulae are, it is not surprising that including the worked bones into the counts raises the scapula numbers. And since the worked bones are included in the Slant Village number, adding these into the Scattered Village sample increases the resemblance between the skeletal patterns from Scattered and Slant (Figure 6.4, bottom).

Although deer/pronghorn are not as common at Scattered Village as bison, they still provide an interesting point of contrast to the bison (Figure 6.6). I have lumped TP3 and TP4 to increase sample size. Overall, skeletal elements are more evenly represented in the medium artiodactyls than in the bison. Given the small sample sizes it is difficult to make much of this observation, but it does suggest that perhaps deer/pronghorn were more likely to be transported to Scattered Village as whole animals, whereas the much larger bison may have been butchered away from the village and only certain skeletal elements brought back.

It is also interesting to compare the skeletal frequencies between midden and pit contexts to see if discard patterns vary among the two. In order to have adequate sample sizes, for the purpose of this comparison, I lumped together TP1 and TP2, and TP3 and TP4 (Figure 6.7). The figure shows that for each lumped time period, the skeletal frequencies from the midden contexts are very similar to those from the pit contexts. Thus, there do not appear to be major differences in bison skeletal element discard patterns between these two contexts.

Bison Age and Sex

Although the bone sample from Scattered Village is large, when broken down by time periods the samples are small enough so that it is difficult to do much in the way of analyzing age/sex composition of the individual taxa. It is possible, however, to make some tentative observations regarding the bison.

Bivariate plots of measurements on bison bones can be used to investigate sex ratios (e.g., Speth, 1983). Very few bones at Scattered Village were complete enough to measure. The largest samples are the distal tibia and distal metacarpal, while smaller samples are available for other elements. Figure 6.8 presents bivariate plots for distal mediolateral diameter vs. distal antero-posterior diameter for these elements, with all time periods included.

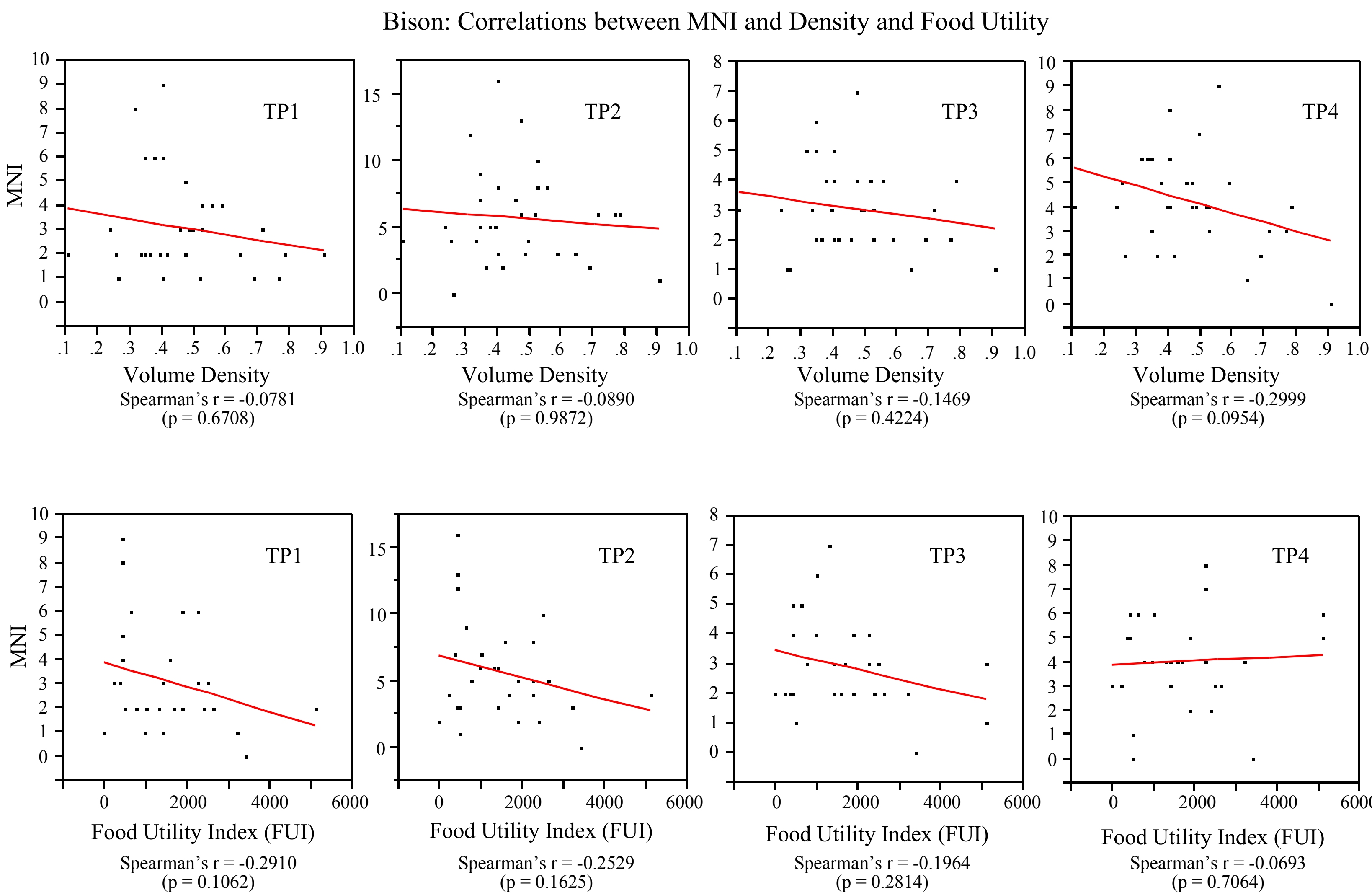

Figure 6.5. Top: scatterplots showing correlations between volume density and skeletal part frequencies (MNI) for bison from Scattered Village. Bottom: scatterplots showing correlations between food utility and skeletal part frequencies (MNI) for bison from Scattered Village.

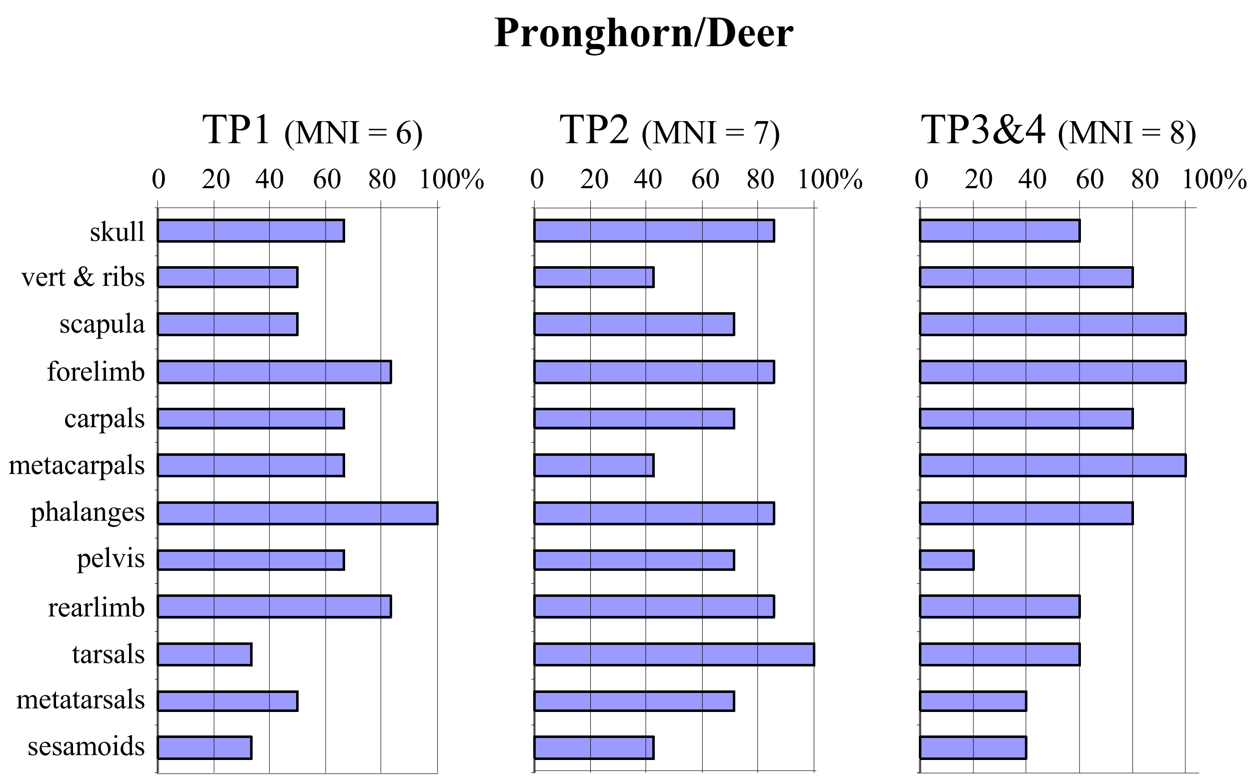

Figure 6.6. Relative frequencies of pronghorn/deer skeletal elements recovered from Scattered Village, from each time period, with TP3 & TP4 combined. The MNI for each body part is expressed as a percentage of the maximum MNI.

The separation into two groups (presumed to reflect two sexes) is clearer in the distal metacarpal, and somewhat more ambiguous in the distal tibia, a situation similar to that found by Speth (1983) in measurements of modern bison. Nonetheless, for both these bones, it appears that the sexes are about equally represented. Speth (1983) points out that differential butchering by sex may occur, and thus the sex ratio may vary among different elements. Thus, ideally one should look at the sex ratio on a wide variety of elements. However, this is not possible with the Scattered Village sample, and we can only conclude that based on the elements we can analyze, there is no preference for one sex over the other.

Age may be determined by tooth eruption and wear as well as by bone fusion. Bison are born in the spring. One of the indications of age is the identification of fetal/neonate individuals, who would have died in the spring. At Scattered, bones that seem to be fetal/neonate were recognized in all time periods (Table 6.9). The percentage of fetal/neonate individuals is about the same in each of the time periods, suggesting no change in the rough proportions of these individuals over time.

The presence of fetal/neonate individuals based on the postcranial bones corresponds with evidence from the dentitions. Bison dentitions at Scattered Village are not numerous

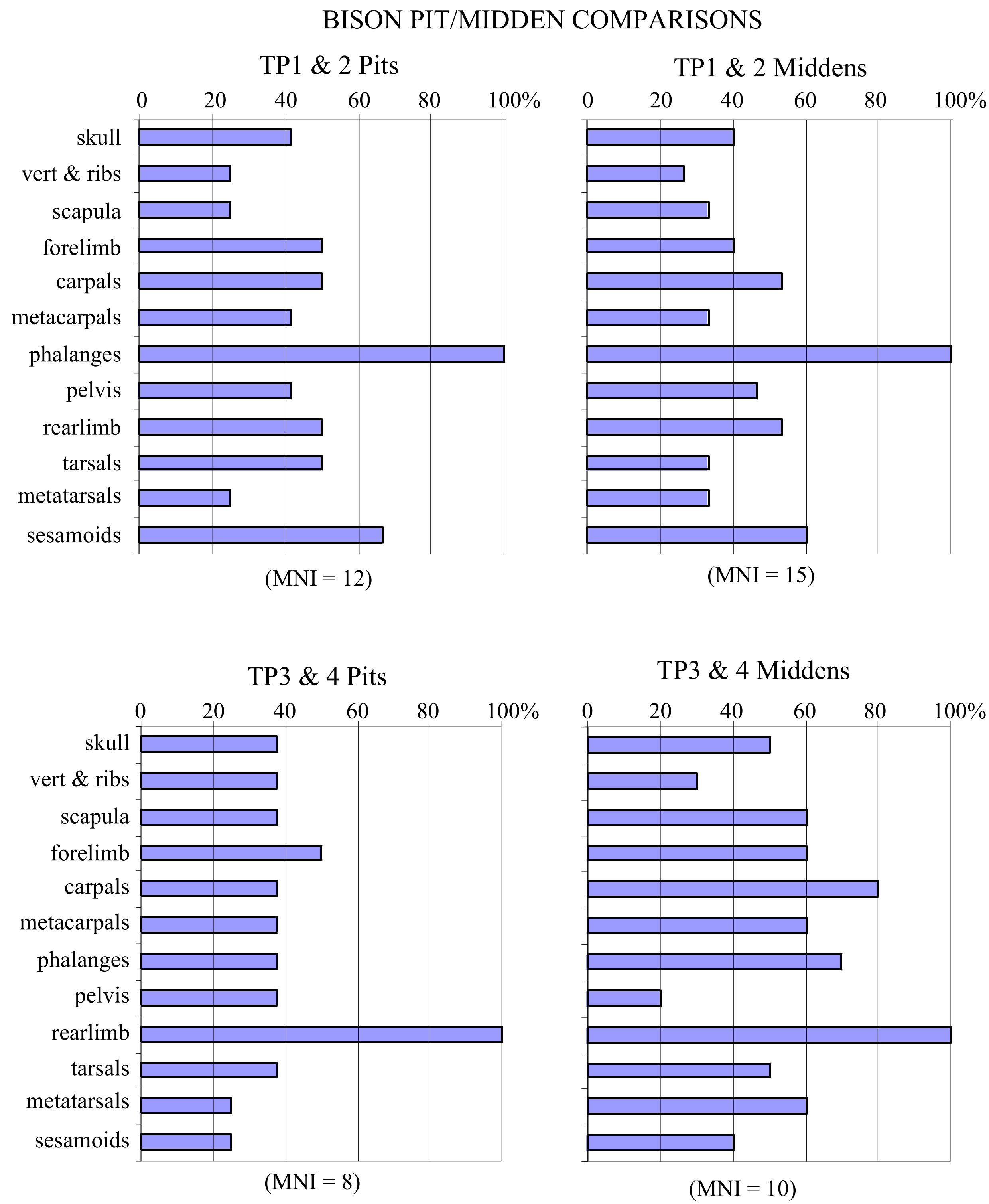

Figure 6.7. Relative frequencies of bison skeletal elements recovered from Scattered Village, from pit contexts (left) and midden contexts (right). TP1 and TP2 are lumped together, as are TP3 and TP4. The MNI for each body part is expressed as a percentage of the maximum MNI.

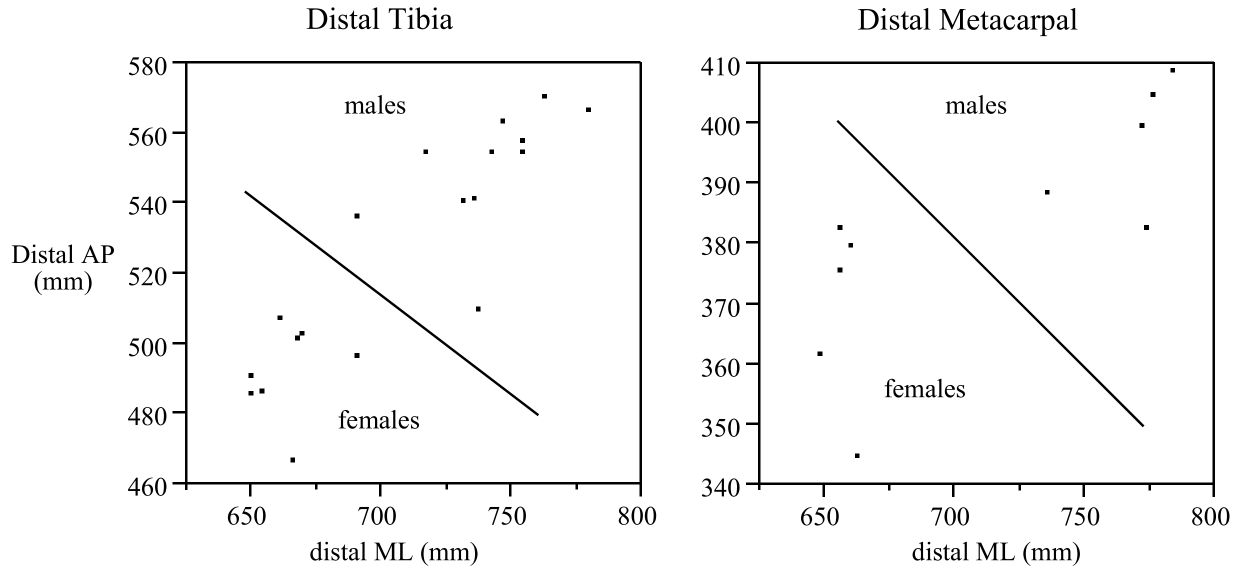

Figure 6.8. Bivariate scatterplots of distal mediolateral diameter vs. distal antero-posterior diameter for bison distal tibiae (left) and distal metacarpals (right) from Scattered Village, all time periods included.

Table 6.9. Count and percentage of identified fetal/neonate bison bones by time period, Scattered Village (32MO31), 1998 excavations.

Time Period	# Fetal/Neonate	Total #	% F/N
TP1	29	852	3.40%
TP2	70	2064	3.39%
TP3	23	590	3.90%
TP4	38	876	4.34%

enough to do an extensive analysis of the periodicity of tooth height, and hence seasonality (see Wilson, 1980). Nonetheless, the dentitions do provide some information. For both dP4s and M3s, I measured the height of the crown, although the samples are small. I also recorded (subjectively) the wear of the tooth. This at least provides some indication of the wear, even when the tooth is broken in such a way that it is no longer measurable (see Klein and Cruz-Uribe, 1984). The following inventory shows the wear states of the 14 bison lower dP4s in the Scattered Village sample.

Unworn/erupting	5
Very early wear	1
Early wear	2
Medium wear	4
Late wear	2

All time periods are lumped, and TP0 is also included. Five of the 14 teeth are entirely unworn and/or just erupting. These dentitions would correspond well with the postcranial bones identified as fetal/neonate. However, other dP4s are in a variety of wear stages, including early, medium, and late wear. This suggests that although some bison were procured in the spring, they were also procured at other times of the year as well.

Summary

1. The fauna from Scattered Village, like other Middle Missouri village sites, is dominated by bison, followed by medium artiodactyls (pronghorn and deer). There are also a variety of carnivores (including most importantly larger canids) as well as rodents and leporids. There are some differences in the taxonomic composition among the different time periods at Scattered Village, the most notable of which is a decrease in bison over time. This change is particularly noticeable in TP1 (latest post-contact), where bison drops to less than 40% of the NISP. However, this trend is less apparent when MNIs are considered rather than NISPS.

2. Scattered Village and neighboring Slant Village both differ from contemporaneous KNRI sites in the extent to which bison dominates. While bison comprise at least 70% of the NISP at the KNRI sites, the percentages are lower at both Scattered and Slant. In addition, at the KNRI sites, larger canids (dog/wolf) tend to be second in abundance, whereas this place is taken by pronghorn/deer at both Scattered and Slant. Moreover, both Scattered and Slant have higher percentages of "other mammals" (smaller carnivores, leporids, rodents). Thus, it appears that the inhabitants of both the Heart River sites exploited a more diverse large mammal fauna than inhabitants of the KNRI Hidatsa sites.

3. The Scattered Village bones are well-preserved, although fragmented (like many archaeological faunal samples). The most common damage on the Scattered Village bones is burning (present on approximately 7% of the identified bones), followed by cut marks (present on about 2%). These proportions are quite different than those at Slant Village, where only about 2% of the bones were burnt and almost 10% showed cut marks, suggesting different processing activities at these two sites.

4. Bison skeletal frequencies at Scattered Village are dominated by small, hard bones such as phalanges, sesamoids, carpals, and tarsals. This pattern is particularly striking in the assemblages from TP1 and TP2. This pattern might be attributed to preservation, but other hard, dense bones (e.g., atlas and axis vertebrae, dentitions) are not particularly common. There are also no significant correlations between skeletal abundance and food value. It is possible that the predominance of bison phalanges and sesamoids reflects their transport to the site while still attached to hides. There do not appear to be differences in discard patterns of bison bones between midden and pit contexts. The deer/pronghorn samples are small, but in contrast to the bison, show a more even skeletal part representation, suggesting that these animals, much smaller than bison, were more often transported whole.

5. Both male and female bison are represented in the Scattered Village fauna, in roughly equal proportions. The presence of fetal/neonate individuals suggests that at least some animals were obtained in the spring, but the different wear stages of the deciduous bison teeth also suggests that they were not obtained exclusively at this time of year.