Artiodactyl skeletal part representation at middle period and Early Plateau Pithouse tradition sites on the Interior Plateau, British Columbia: a view from EdRh-31

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Artiodactyl Skeletal Part Representation at Middle Period and Early Plateau Pithouse Tradition Sites on the Interior Plateau, British Columbia: a View from EdRh-31

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ABSTRACT

The earliest occupation of the site of EdRh-31 on the Interior Plateau of British Columbia dates to the Lochnore Phase of the early Plateau Pithouse Tradition. The faunal remains indicate that the people who occupied the site hunted artiodactyls, hunted or snared small animals such as hares, collected freshwater mussels and occasionally fished. Previous research on three sites roughly contemporaneous with EdRh-31 found that artiodactyl metapodials dominate the associated faunal assemblages, leading to the interpretation of these sites to be animal butchering camps. Analysis of the heavily fragmented EdRh-31 bone assemblage, however, suggests that the dominance of artiodactyl metapodials is not necessarily the result of cultural activity but may also reflect a suite of taphonomic processes. While not discounting the possibility that some of these sites functioned as butchering camps, this article draws attention to possible ambiguities in the interpretations of faunal assemblages.

RÉSUMÉ

L'occupation la plus ancienne du site EdRh-31, situé sur le plateau intérieur de la Colombie-Britannique, remonte à la phase Lochnore de la tradition Plateau Pithouse. Les restes fauniques indiquent que les occupants chassaient les artiodactyles, chassaient ou colletaient le petit gibier dont le lièvre, ramassaient des moules d'eau douce et pêchaient à l'occasion. Les recherches antérieures sur trois sites d'ancienneté similaire au EdRh-31 montrent que les métapodes d'artiodactyles dominent les collections fauniques, menant à l'interprétation de ces sites comme des camps de boucherie. Toutefois, l'analyse des ossements très fragmentés du site EdRh-31 ne conduit pas nécessairement à une explication culturelle pour la dominance des métapodes, qui peut aussi résulter de processus taphonomiques. Sans exclure la possibilité que certains de ces sites aient accueilli des activités de boucherie, cet article attire l'attention au potentiel d'ambiguïtés qui guette l'interprétation des collections fauniques.

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Faunal studies of Middle Period and early Plateau Pithouse Tradition (*ca.* 7000 - 3500 BP) sites on the Interior Plateau of British Columbia have noted a predominance of medium (deer-sized) and large (elk-sized) artiodactyl metapodials. Despite differences in the date of occupation and the archaeological context among these sites as well as the paucity of identifiable bones in their faunal assemblages, this pattern was observed independently at Oregon Jack Creek (Rousseau and Richards 1988:54), EeRf-1 (Bussey 1995, Prager 1995) and Rattlesnake Hill (Arcas Associates 1985). The faunal evidence and associated lithic scatters led to the interpretation that these sites represent animal butchering camps (Arcas Associates 1985:iv, Bussey 1995:52, Prager 1995:3, Rousseau and Richards 1988:58). The faunal assemblage from another site in this region, EdRh-31, with calibrated radiocarbon dates of 4830±40 and 4940±40 BP, is examined here with the goal of assessing the function of this site.

The cultural sequences and associated material correlates of the different time periods represented on the Interior Plateau have been summarized by Fladmark (1982), Rousseau (2004) and Stryd and Rousseau (1996). The Middle Period incorporates the Early Nesikep (*ca.* 7000–6000 BP), Lehman (*ca.* 6000–4500 BP) and Lochnore Phases (*ca.* 5500–3500 BP). The Middle Period is followed by the Late Period (*ca.* 3500–200 BP), of which the earliest component is the Shuswap Horizon (*ca.* 3500–2500 BP). The Shuswap, Plateau and Kamloops Horizons of the Late Period, together with the Lochnore Phase of the Middle Period, form the Plateau Pithouse Tradition (Stryd and Rousseau 1996:179).

According to Stryd and Rousseau (1996:197), similarities in artifact types and lithic technology, the construction and usage of pithouses and the focus on salmon (Salmonidae) fishing seem to indicate continuity from the Lochnore Phase to the following Late Period as part of the Plateau Pithouse Tradition. Stryd and Rousseau (1996:198-200) consider the emergence of the Lochnore Phase to be the result of initial Coast Salish migration into the southern interior on a seasonal basis to hunt, collect plants and fish. This would have occurred primarily in the summer months when salmon fishing was relatively poor on the coast and the lower Fraser Canyon. They postulate that, during the fall, these Salish groups returned to their villages in the lower Fraser Canyon to fish salmon. This seasonal usage of the Plateau would have persisted until about 4500 BP when salmon populations were sufficient to allow Salish groups to establish permanent villages on the Plateau (Rousseau 2004, Stryd and Rousseau 1996:199). Wilson (1992), on the other hand, argued for cultural continuity between the Early Nesikep-Lehman Phase and the Lochnore Phase. This proposition is based on the co-occurrence of Lehman and Lochnore

artifacts at EdQx-41 and the observation that materials associated with both phases are often found mixed at sites in the region.

Faunal evidence from sites on the Interior Plateau indicates that, during the Middle Period, deer (*Odocoileus* sp.) and elk (*Cervus canadensis*) were hunted and freshwater mussels (Unionidae) collected (Huculak 2004, Rousseau et al. 1991:14-15, Stryd and Rousseau 1996:191). A major shift in subsistence activities occurred about 4000 BP on the Canadian Plateau with the appearance of the intensive salmon utilization (Kuijt 1989:97, Rousseau 2004) that characterizes more recent time periods (Langemann 1987).

Faunal Data from Contemporary Sites

Few faunal assemblages from Middle Period and early Plateau Pithouse Tradition sites have been analyzed (see Driver 1993, Huculak 2004). This paper compares the artiodactyl skeletal element representation from EdRh-31 with those from other contemporary sites in this area for which data are available. Some of these sites have historical components, but only faunal remains dating to the Middle Period and early Plateau Pithouse Tradition are considered here. The relevant sites, described below, are open-air and, like EdRh-31, are located close to rivers.

Oregon Jack Creek (EdRi-6) is a Lehman Phase, open-air lithic scatter with sub-surface deposits dating to 4850±100 cal BP. The site is located about a kilometer west of the Thompson River and about 11 kilometers southwest of the modern town of Ashcroft. Sediments at the site consist of early Holocene glacio-fluvial gravels topped with aeolian silt and sand veneer. Faunal remains recovered include elk bones and freshwater mussels, and the excavators hypothesized that the site was a short-term elk butchering camp used during the Lehman Phase. Only 13 artiodactyl bones were recovered (Rousseau and Richards 1988).

EeRf-1 is an open-air lithic scatter situated on the south bank of the Thompson River at the outlet of Kamloops Lake near Savona. Material from sub-surface deposits yielded dates of 4220±70 and 5670±60 cal BP. An Early Nesikep Tradition, a Lehman or Lochnore Phase and a historical component were present. Deposits at the site consist of glacial diamictons and glacio-fluvial materials. Elk, mule deer *(Odocoileus hemionus*), bighorn sheep (*Ovis canadensis*), coyote (*Canis latrans*), beaver (*Castor canadensis*), porcupine (*Erethizon dorsatum*), marmot (*Marmota* sp.), squirrel (*Sciuridae*), northern pocket gopher (*Thomomys talpoides*), deer mouse (*Peromyscus* sp.), long-tailed vole (*Microtus longicaudus*), red-necked grebe (*Podiceps grisegena*), white-winged scoter (*Melanitta deglandi*), blue grouse (*Dendragapus* sp.), fish and freshwater mussels are all present in the faunal assemblage.

The abundance of artiodactyl metapodials suggests that the site was a butchering camp (Bussey 1995, Prager 1995).

Rattlesnake Hill (EeRh-61) is an open-air lithic scatter. It is a Lehman Phase site with dates ranging between 6290±120 and 4470±110 cal BP. A possible historical component is present at the site but was not investigated. The site is situated 5.2 kilometers by road northeast of Ashcroft in the Thompson River valley. Sub-surface deposits consist primarily of brown chernozems. Deer, a canid (*Canis* sp.), snowshoe hare (*Lepus americanus*), a large artiodactyl, salmon, fish and freshwater mussels are represented in the faunal assemblage. The predominance of artiodactyl meta-podials was interpreted to mean that the site functioned as a hunting camp at some stage (Arcas Associates 1985).

Landels (EdRi-11) is a lithic scatter with sub-surface deposits located 13 kilometers southwest of Ashcroft at the eastern end of the Upper Oregon Jack Creek. The Early Nesikep/ Lochnore Phase, the Lochnore Phase and the Plateau Horizon are all represented at Landels. The Lochnore Phase material yielded dates ranging from 6000±80 to 3520±70 cal BP. Deer, snowshoe hare and a canid were identified from the Lochnore faunal sample. Local sediments consist of clayey silt (Rousseau et al. 1991).

EdRh-31: Description of the Site and Excavations

EdRh-31 is situated on a flat terrace approximately 35 meters above the Thompson River on the Interior Plateau near Ashcroft. It was investigated as part of a rescue excavation in advance of development. Two portions of the site were excavated: Areas A and B (Figure 1). A standard 1m x 1m excavation unit was employed. Five and 10 cm arbitrary levels were used except when stratigraphic divisions (distinct layers or cultural features) were clearly evident. All excavated matrix was sieved through 3 mm (1/8 inch) wire mesh screens. Sediments ranged from sandy loams, clayey silt to silty sand (Muir et al. 2006).

Ten 1 m^2 excavation test units were placed within Area A, where intact cultural deposits ranged between 30 and 60 cm in depth. Animal bone recovered from these deposits yielded a radiocarbon date of 4940±40 BP, calibrated to 3790-3650 BC (Muir et al. 2006).

In addition to débitage fragments, five formal and three unformed stone tools were recovered. All eight are made of microcrystalline basalt, three coarse-grained and five fine-grained. The formal lithics consist of three projectile points, one knife/scraper and an indeterminate biface.

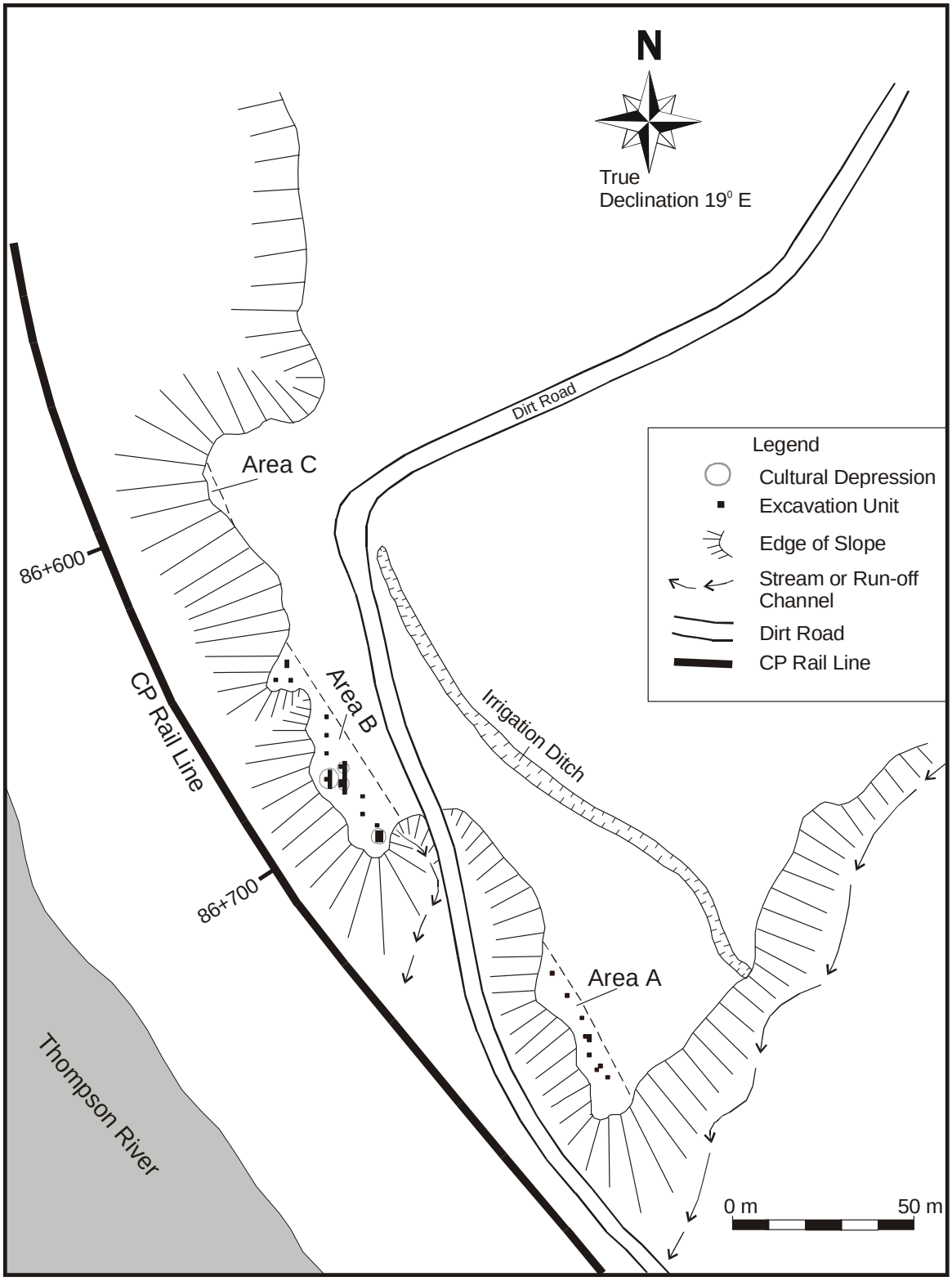

Fig. 1: The location of Area A and B at EdRh-31 (from Muir et al. 2006, used with permission).

Unformed lithics consist of one side scraper, one core and one utilized flake. Only one projectile point has diagnostic features; it is incomplete, leaf-shaped with wide side-notching and a pointed convex base. This lithic is characteristic of the Lochnore Phase (Muir et al. 2006:48, Stryd and Rousseau 1996:193) and corroborates the radiocarbon date for Area A.

A total of thirty-four 1 m^2 units were excavated in Area B. Animal bone recovered from a stratum ranging in depth from 15-85 cm has been radiocarbon-dated to 4830±40 BP (calibrated to 3670-3530 BC) indicating that these deposits are roughly contemporaneous with those from Area A (Muir et al. 2006).

Four cooking and storage pit features dating to within the last 200 years were also excavated in Area B (Figure 1); these contained well-preserved organic remains, stone cobbles, many salmon bones as well as historical artifacts (Muir et al. 2006). The fauna from these much younger pit features will not be considered here; all faunal material associated with the Lochnore Phase came from units adjacent to these features.

In addition to débitage fragments, a total of 18 formal and unformed lithics were recovered from the prehistoric component of Area B. These include four fragmented projectile points, one asymmetrical contracting stemmed knife and four indeterminate biface fragments. Of the four projectile point specimens, three are the bases of small leaf-shaped tools, two of which display side notching. The fourth projectile fragment is a tip of a triangular point with denticulation along both lateral edges. Of three scrapers found, one is a complete thumbnail scraper (Muir et al. 2006), a type of tool common in the Shuswap Horizon (3500–2500 BP) (Rousseau 2004:15). Six unformed tools include one utilized flake, two side scrapers and three cores. Seventeen of the 18 tools are manufactured from microcrystalline basalts; 14 of these are fine-grained (dacite) and three are coarse-grained. The remaining tool is made of Ducks Meadow vitric tuff (Muir et al. 2006:49-50).

Faunal Remains

The analytical procedures used in this study follow those described by Driver (1991, 1992). Each specimen that could be assigned to a skeletal element was deemed “identifiable”. All identifiable bone and tooth specimens were assigned to an appropriate species, genus, family or class. Number of Identified Specimens (NISP) and Minimum Number of Individuals (MNI) were used to quantify the faunal remains. The strengths and weaknesses of these methods are discussed by many authors, including Grayson (1984), Klein and Cruz-Uribe (1984), Plug and Plug (1990) and Reitz and Wing (1999).

Skeletal part representation was calculated for artiodactyls, which in

the case of EdRh-31 may include cervids such as deer and elk and bovids such as bighorn sheep (Table 3). Indeterminate medium and large mammal specimens were assumed to belong to artiodactyls. For comparative purposes, artiodactyl skeletal part representation was also calculated for the faunal assemblages from Landels (EdRi-11) (Rousseau et al. 1991:322-334), Oregon Jack Creek (EdRi-6) (Rousseau and Richards 1988:55) and EeRf-1 (Prager 1995).

At EdRh-31, a total of 830 faunal specimens were recovered from Area A. Of these, only 43 (5.1%) were identified. These include a coyote-sized canid, deer, snowshoe hare and vole (Table 1). Five long bone fragments from medium-sized mammals displayed spiral fractures. Chop marks were also observed on three medium-sized artiodactyl specimens, all toe and ankle bones. All bone remains from Area A with visible aging criteria were from adult individuals.

Area B yielded a total of 470 bone remains of which only 34 (7.2%) were identified. These include deer, a rodent, other small mammals and fish. Six recovered egg shell fragments could not be attributed to taxon. With the exception of one sub-adult medium-sized artiodactyl and two juvenile rodent specimens, all of the bones with visible aging criteria came from adult individuals. No spiral fractures were noted on shaft fragments from Area B.

For EdRh-31, freshwater mussel was not counted due to heavy fragmentation. A total of 39 grams of freshwater mussel was recovered for Area A and B combined (Muir et al. 2006:74).

Species	Area A	Area B	Total NISP
medium canid (coyote or dog)	2/1	-	**2**
Odocoileus sp. (deer)	1/1	2/1	**3**
cervid (deer or moose)	2/1	1/1	**3**
medium artiodactyl (deer or bighorn sheep)	21/1	7/2	**28**
Lepus americanus (snowshoe hare)	1/1	-	**1**
Microtus sp. (vole)	1/1	-	**1**
small rodent	1/-	6/2	**7**
small mammal		1/1	**1**
medium mammal	13/-	4/-	**17**
large mammal	1/1	-	**1**
egg shell	-	6/1	**6**
fish	-	7/1	**7**
Unionacea (freshwater mussel)	x	x	**N/A**
Total NISP	**43**	**34**	**77**

Table 1: Species present at EdRh-31 (NISP/MNI). N/A = not applicable; x = present

A bone tool was recovered from Area B. This specimen is a polished, ground and incised barbed bone projectile point. The tool is manufactured from a mammal long bone fragment and is complete save for a small portion of the base (Muir et al. 2006).

The faunal assemblage from EdRh-31 suggests that the people who utilized the site employed a variety of strategies to obtain protein. These could have included hunting, snaring, gathering and fishing. The freshwater mussels are probably *Margaritifera falcate*, *Anodonta* spp. or *Gonidea angulata* (Lindsay 2003, Lyman 1984), which are abundant in the river systems of British Columbia (Clarke 1981). The rodent remains appeared to be in better condition than the other fauna, suggesting that they may have been subsequently introduced through disturbance.

Skeletal part frequencies at EdRh-31, Landels, Oregon Jack Creek and EeRf-1 show that metapodials dominate the artiodactyl samples from the Middle Period and early Plateau Pithouse Tradition (Table 2). While these samples are all rather small, the NISPs for metapodial is greater than those for cranium, vertebra, rib, scapula, pelvis and upper limbs combined.

Discussion

As with EdRh-31, archaeofaunas from other Middle Period and early Plateau Pithouse Tradition sites are poorly preserved and heavily fragmented, producing very few identifiable specimens (Arcas Associates 1985, Bussey 1995:52, Fladmark 1982, Kuijt 1989, Robinson and Eldridge 1998:42, Rousseau et al. 1991:83). For example, 35 (9.5%) of the mammal bones at Rattlesnake Hill (EeRh-61) were identifiable (Arcas Associates 1985:112). (If fish are included, the identifiable portion of the assemblage increases to 17.2%.) At Landels (EdRh-11), only 448 (1.4%) of the recovered 30,446 bones were identified, the majority of which date to the Plateau Horizon (Rousseau et al. 1991). At the site of EdRh-14, which yielded dates of 4940±50 and 5750±60 cal BP, 57 bones (2.8% of the assemblage) were identifiable (Robinson and Eldridge 1998:42).

At Oregon Jack Creek (EdRi-6), EeRf-1, Landels (EdRh-11) and Rattlesnake Hill (EeRh-61), the faunal assemblages indicate a dominance of medium and large artiodactyl metapodials (Table 2). Notwithstanding the small sample, the EdRh-31 faunal assemblage also fits this pattern.

Marshall and Pilgram (1993:261) summarized the various cultural and natural processes that influence skeletal part frequencies in archaeological faunal assemblages. These include carcass transport, food sharing, meat processing, bone density and diagenetic actions (see also Brain 1981, Lyman 1994, Shipman 1981, Reitz and Wing 1999). The determination of the processes responsible for skeletal part frequencies in archaeofaunas is a challenging task, often producing ambiguous results. Lyman (1994:63) pointed out that different cultural and natural processes may produce similar archaeological patterns, a phenomenon known as “equifinality.”

Skeletal Part	EdRh-31	Landels (EdRi-11)	EeRf-1	Oregon Jack Creek (EdRi-6)	Total NISP	Density Categories
Skull (Total = 46)						
antler	1				**1**	Intermediate
skull indet.	12	2	2		**16**	Low to High
mandible		1	1		**2**	High
teeth	4	10	11	1	**26**	High
hyoid			1		**1**	Low
Vertebrae, Ribcage, Pectoral/Pelvic Girdle (Total = 36)						
atlas		1			**1**	High
cervical vt.	1	1			**2**	Intermediate to High
lumbar vt.		3			**3**	Intermediate to High
vertebrae indet.	2	1	5		**8**	High
ribs	6	6	2		**14**	Low
scapula			3	1	**4**	Low to High
pelvis		1	3		**4**	Intermediate to High
Limbs (Total = 151)						
humerus	3	1	1		**5**	Low to High
femur		3*	2	1	**6**	Intermediate
radius		2	3		**5**	Intermediate to High
ulna			1		**1**	Intermediate to High
tibia		1	7	1	**9**	Low to High
carpals	1		2	2	**5**	High
tarsals	2	7	7		**16**	High
metacarpal	1	2	4	3	**10**	High
metatarsal	5	1	12		**18**	High
metapodial	9	14	10		**33**	High
1st phalanx	4	7			**11**	High
2nd phalanx	2	4			**6**	High
3rd phalanx	1	3			**4**	Intermediate
phalanx indet.		4	11	4	**19**	Intermediate to High
sesamoid		3			**3**	High
Total NISP	**54**	**78**	**88**	**13**	**233**	

Table 2: Medium and Large Mammal NISP for EdRh-31, Landels (Rousseau et al. 1991:322-334), Oregon Jack Creek (Rousseau and Richards 1988:55) and EeRf-1 (Prager 1995). Bone density categories from Brain (1981).

The predominance of artiodactyl metapodials at sites such as EdRh-31 may have resulted from a number of different processes. The relative abundance of artiodactyl metapodials may reflect the function of the sites. Previous research on fauna from Middle Period and early Plateau Pithouse Tradition sites in fact suggested that some may have been

butchering stations (Arcas Associates 1985:iv, Bussey 1995:52, Prager 1995:3, Rousseau and Richards 1988:58). Many animals are likely killed some distance from residential sites and decisions must be made as to which parts will be taken back. Lower leg bones such as phalanges and metapodials of medium to large animals are often left behind at short-term kill-sites or butchering camps as they have marginal utility with regards to meat, fat and grease compared to the shoulders and haunches (Binford 1978, Bartram 1993, Driver 1990, Enloe 1993, Jones 1993, Perkins and Daly 1968, Speth 1983).

The artiodactyl skeletal element frequencies from Middle Period and early Plateau Pithouse Tradition sites are similar to what other researchers have found at kill sites or butchering stations. However, no sites in this region have produced an abundance of bones from the meatier parts of artiodactyl skeletons such as upper haunches, ribs and vertebrae, which would indicate that they were locations to which meat was transported. Taphonomic processes may produce skeletal part profiles similar to those that result from cultural behavior (Brain 1967, 1969, 1981). A common feature of sites on the Interior Plateau such as EdRh-31 is the high degree of bone fragmentation. Marshall and Pilgram (1993:261) have noted that, initially, bone breakage tends to increase NISP. However, in the case of heavily fragmented samples, a greater proportion of bones becomes too small to identify so then NISP decreases. Lyman and O'Brien (1987:496) commented that when bones are "…reduced beyond the minimal identifiable size, then the proportion of identifiable fragments will be decreased." It may be possible in cases of very intense bone fragmentation that most of the originally deposited skeleton had been recovered during excavation. However, the high levels of fragmentation would hamper element and species identification (see Todd and Rapson 1988, Watson 1972). Lyman and O'Brien (1987:496) refer to this effect as an "analytic absence" of elements and perhaps even of taxa. The high intensity of mammal bone fragmentation at EdRh-31 and contemporary sites on the Interior Plateau suggests that numerous skeletal elements and possibly even some taxa represented in the faunal assemblages were not identified.

Although the artiodactyl skeletal profiles at EdRh-31 and other Middle Period and early Plateau Pithouse Tradition sites may reflect site function, taphonomic factors such as intense meat processing, meat preparation, cooking, differential bone preservation and diagenetic processes may have contributed to the observed artiodactyl skeletal pattern and high proportion of unidentifiable bones. It is possible that butchering contributed to the high degree of fragmentation of archaeofaunas such as that at EdRh-31. However, it remains difficult to

assess the impact of butchering. Actualistic (Jones 1993, Parsons and Badenhorst 2004) and archaeological (Trolle-Lassen 1990) studies have shown that butchered animals yield few cut or chop marks. However, bone breakage patterns may be an important avenue for future research in the region (cf. Villa and Mahieu 1991).

Spiral fractures may occur on fresh breaks (e.g., Haynes 1983) and may offer insights into the taphonomic history of the faunal samples. Five out of 18 (28%) medium mammal long bones from EdRh-31 display spiral fractures; however, these were the only such fractures observed among the 1300 specimens in the entire sample. This suggests that post-depositional bone fracturing had a considerable impact on this assemblage. Comparative data on spiral fractures from other Middle Period and early Plateau Pithouse Tradition sites indicate that at Landels, only one spiral fracture was recorded, on a medium mammal tibia shaft (Rousseau et al. 1991:331). Neither Prager (1995) nor Arcas Associates (1985) mention the presence or absence of spiral fractures on artiodactyl long bones from EeRf-1 or from Rattlesnake Hill, respectively.

The low number of spiral fractures at EdRh-31 and Landels suggests that post-depositional processes likely contributed to bone fragmentation, which in turn would have affected skeletal element representation at these sites. As these are both open-air sites, the faunal remains were not shielded from natural elements such as heat and moisture fluctuations that fracture and destroy animal bones (e.g., Meadow 1978).

In addition, the soil pH at these open air sites probably contributed to the fragmentation of the faunal remains. The ideal pH for bone preservation is neutral (7.8-7.9). Both alkaline and acidic soils are not conducive to bone preservation (Reitz and Wing 1999:117). Middle Period and early Plateau Pithouse Tradition sites on the Interior Plateau are often situated on glacio-fluvial gravels topped with aeolian sand of varying depths (e.g., Rousseau and Richards 1988:43). Leaching of sediments in many parts of the Thompson River basin created a calcium carbonate layer (Sanger 1970) which is dry and alkaline (Arcas Associates 1985:26). A calcareous deposition is often found on bones such as those from Lillooet (Langemann 1987:22-23). These alkaline soil conditions are not conducive to bone preservation (cf. Reitz and Wing 1999) and may have been one of the most important taphonomic factors affecting Middle Period and early Plateau Pithouse Tradition archaeofaunas. It does not seem as if the presence of mussel shells, which are very fragile at EdRh-31, neutralized the deposits.

Bone density studies will be useful to apply to sites on the Interior Plateau. However, such studies will have to take note of methodological issues

(e.g., Ioannidou 2003, Lam et al. 2003, Lam and Pearson 2005, Lyman 1994, Pavao and Stahl 1999, Symmons 2002). Brain's (1981:139) ordinal density categories show that many of the well-represented bones in the studied assemblages have high densities. Low density elements such as rib, sternum and thoracic vertebra are either present in low numbers or completely absent (Table 2). It can therefore be surmised that bone density had some impact on the skeletal part representation of artiodactyls at Middle Period and early Plateau Pithouse Tradition sites. This does not imply that human behaviors did not contribute to the observed patterns at sites such as EdRh-31.

An important factor that must be considered in comparing artiodactyl skeletal element counts is that different analysts use different methods of identification. For example, the system proposed by Driver (1991, 1992) considers each bone specimen that can be assigned to an element as "identifiable," even if only to class level such as "medium mammal." Table 2 includes all bones identified as "medium mammal," which refers to an animal the size of deer. Other analysts have used other methods. For example, Prager (1995:1) considers "identifiable" bone as those specimens that can be identified to at least the family level. This latter approach no doubt underestimates the abundance of certain skeletal elements in archaeofaunas such as rib and long bone shaft fragments which may not be readily identified to family level.

From Table 2 it is clear that metapodials are well represented in Middle Period and early Plateau Pithouse Tradition sites. These elements are of marginal utility (Binford 1978). Some elements, such as metapodials, even if highly fragmented, can be assigned to an element with greater ease and confidence than others. Fragmented shafts of humeri, radii, femora and tibiae are often difficult to separate from one another (but see Marean and Spencer 1991). On the other hand, metapodial diaphyses, with their deep groove and square shape, are easily recognizable (more so in cervids than in bovids), even when highly fragmented. Remnants of the inner bone wall in metapodial shafts are also extremely diagnostic. Moreover, their epiphyses are highly distinguishable from those of other long bones. The distal epiphysis is compact and often preserves well, and the flat proximal articulation is also easily recognized (Marean and Frey 1997). Therefore, the relative abundance of metapodials in the samples listed in Table 2 may reflect biases not only in preservation but also in identification (cf. Ryder 1969). This issue has received attention from faunal analysts. For example, Marean and Spencer (1991) found that in experimental assemblages ravaged by carnivores, long bone shafts, rather than bone ends, actually provided the best measure of element abundance. The

chosen method of measuring element abundance and, more specifically, of identifying long bone shafts may seriously affect overall counts in faunal assemblages.

Conclusions

The meat diet of Middle Period and early Plateau Pithouse Tradition peoples is relatively well documented (see summary by Stryd and Rousseau [1996]). The faunal analysis of EdRh-31, however, suggests that, until more assemblages are studied, inferences about site usage based on faunal remains may be premature. This article cautions against interpretations of bone element representation without a consideration of post-depositional processes and methods of analyses. High levels of bone fragmentation, the result of both cultural and natural processes, can obscure skeletal part frequencies and even the number of taxa identified from archaeological deposits.

The predominance of artiodactyl metapodials at Middle Period and early Plateau Pithouse Tradition sites on the Canadian Plateau is probably the result of a combination of factors including site usage, human decisions about carcass transport, butchering activities, the low proportion of identified specimens and post-depositional fracturing. Moreover, elements such as metapodials are not only dense but are more easily recognized in heavily fragmented assemblages. Future faunal studies in this region should note the degree of fragmentation of an assemblage and establish a standardized method of analysis to permit more reliable comparisons between different assemblages (see Driver 1982, 1991, 1992).

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References Cited

Arcas Associates
1985 Excavations at the Rattlesnake Hill Site (EeRh 61), Ashcroft, BC. Manuscript on File. Victoria, BC: Heritage Conservation Branch.

Bartram, L. E.
1993 Perspectives on Skeletal Part Profiles and Utility Curves from Eastern Kalahari Ethnoarchaeology. In *From Bones to Behavior: Ethnoarchaeological and Experimental Contributions to the Interpretations of Faunal Remains*, edited by J. Hudson, pp. 115-137. Center for Archaeological Investigations, Occasional Paper No. 21. Carbondale: Southern Illinois University.

Binford, L. R.
1978 *Nunamiut Ethnoarchaeology*. London: Academic Press.

Brain, C. K.
1967 Hottentot food remains and their bearing on the interpretation of fossil bone assemblages. *Scientific*

Papers of the Namib Desert Research Station 32:1-7.

Brain, C. K.
1969 The contribution of Namib Desert Hottentots to an understanding of australopithecine bone accumulations. *Scientific Papers of the Namib Desert Research Station* 39:13-22.

Brain, C. K.
1981 *The Hunters or the Hunted? An Introduction to African Cave Taphonomy*. Chicago: University of Chicago Press.

Bussey, J.
1995 Systematic data recovery at EeRf-1, Savona, BC. Volume I. Report prepared for the British Columbia Heritage Trust, Victoria, BC.

Clarke, A. H.
1981 *The Freshwater Molluscs of Canada.* National Museums of Canada, Ottawa.

Driver, J. C.
1982 Minimum standards for reporting of animal bones in salvage archaeology: Southern Alberta as a case study. In *Directions in Archaeology: A Question of Goals*, edited by P. D. Francis and E. C. Poplin, pp. 199-209. Calgary: Department of Archaeology, University of Calgary.

Driver, J. C.
1990 Bison assemblages from the Sierra Blanca region, southeastern New Mexico. *Kiva* 55(3):245-263.

Driver, J. C.
1991 *Crow Canyon Archaeological Center Manual for Description of Vertebrate Remains*. Cortez: Crow Canyon Archaeological Center.

Driver, J. C.
1992 Identification, classification and zooarchaeology. *Circaea* 9(1):35-47.

Driver, J. C.
1993 Zooarchaeology in British Columbia. *BC Studies* 99:77-105.

Enloe, J. G.
1993 Ethnoarchaeology of marrow cracking: Implications for the recognition of prehistoric subsistence organization. In *From Bones to Behavior: Ethnoarchaeological and Experimental Contributions to the Interpretations of Faunal Remains*, edited by J. Hudson, pp. 82-97. Center for Archaeological Investigations, Occasional Paper No. 21. Carbondale: Southern Illinois University.

Fladmark, K. R.
1982 An introduction to the prehistory of British Columbia. *Canadian Journal of Archaeology* 6:95-156.

Grayson, D. K.
1984 *Quantitative Zooarchaeology. Topics in the Analysis of Archaeological Faunas*. London: Academic Press.

Haynes, G.
1983 Frequencies of spiral and greenbone fractures on ungulate limb bones in modern surface assemblages. *American Antiquity* 48(1):102-114.

Huculak, S. A. G.
2004 *Middle Period Hunter-Gatherers of the Thompson River Drainage, British Columbia: a Critical Review*. MA Thesis. Simon Fraser University, Burnaby, BC.

Ioannidou, E.
2003 Taphonomy of animal bones: species, sex, age and breed variability of sheep, cattle and pig bone

density. *Journal of Archaeological Science* 30:355-365.

Jones, K. T.
1993 The Archaeological Structure of a Short-Term Camp. In *From Bones to Behavior: Ethnoarchaeological and Experimental Contributions to the Interpretations of Faunal Remains*, edited by J. Hudson, pp. 101-114. Center for Archaeological Investigations, Occasional Paper No. 21. Carbondale: Southern Illinois University.

Klein, R. G. and K. Cruz-Uribe
1984 *The Analysis of Animal Bones from Archaeological Sites.* Chicago: University of Chicago Press.

Kuijt, I.
1989 Subsistence resource variability and culture change during the Middle-Late Prehistoric cultural transition on the Canadian Plateau. *Canadian Journal of Archaeology* 13:97-118.

Lam, Y. M., O. M. Pearson, C. W. Marean and X. Chen
2003 Bone density studies in zooarchaeology. *Journal of Archaeological Science* 30:1701-1708.

Lam, Y. M. and O. M. Pearson
2005 Bone density studies and the interpretation of the faunal record. *Evolutionary Anthropology* 14:99-108.

Langemann, E. G.
1987 *Zooarchaeology of the Lillooet Region, British Columbia*. MA Thesis. Simon Fraser University, Burnaby, BC.

Lindsay, C.
2003 *Investigations into the Ethnographic and Prehistoric Importance of Freshwater Molluscs on the Interior Plateau of British Columbia*. MA Thesis. Simon Fraser University, Burnaby, BC.

Lyman, R. L.
1984 A model of large freshwater clam exploitation in the prehistoric southern Columbia Plateau area. *Northwest Anthropological Research Notes* 18(1):97-107.

Lyman, R. L.
1994 *Vertebrate Taphonomy*. Cambridge: Cambridge University Press.

Lyman, R. L. and M. J. O'Brien
1987 Plow-zone zooarchaeology: Fragmentation and identifiability. *Journal of Field Archaeology* 14(4):493-498.

Marean, C. W. and L. M. Spencer
1991 Impact of carnivore ravaging on zooarchaeological measures of element abundance. *American Antiquity* 56(4):645-658.

Marean, C. W. and C. J. Frey
1997 Animal bones from caves to cities: reverse utility curves as methodological artifacts. *American Antiquity* 62(4):698-711.

Marshall, F. and T. Pilgram
1993 NISP vs. MNI in quantification of body-part representation. *American Antiquity* 58(2):261-269.

Meadow, R. H.
1978 Effects of context on the interpretation of faunal remains: a case study. In *Approaches to Faunal Analysis in the Middle East*, edited by R. H. Meadow and M. A. Zeder, pp. 15-21. Peabody Museum Bulletin 2, Peabody Museum of Archaeology and Ethnology. Cambridge, MA: Harvard University.

Muir, R. J., M. J. La Salle, and D. Kirsch
2006 Report on Archaeological Excavations at Snapa: Sites EdRh 7, 8

and 31. Report for Madrone Environmental Services Ltd, Duncan, BC.

Parsons, I. and S. Badenhorst
2004 Analysis of lesions generated by replicated Middle Stone Age lithic points on selected skeletal elements. *South African Journal of Science* 100:384-387.

Pavao, B. and P. W. Stahl
1999 Structural density assays of leporid skeletal elements with implications for taphonomic, actualistic and archaeological research. *Journal of Archaeological Science* 26:53-66.

Perkins, D. and P. Daly
1968 A hunters' village in Neolithic Turkey. *Scientific American* 219:96-106.

Plug, C. and I. Plug
1990 MNI counts as estimates of species abundance. *South African Archaeological Bulletin* 45:53-57.

Prager, G.
1995 Faunal analysis. In *Systematic Data Recovery at EeRf-1, Savona, B.C. Volume II*, edited by J. Bussey, pp. 1-3. Report prepared for the British Columbia Heritage Trust, Victoria, BC.

Reitz, E. and E. S. Wing
1999 *Zooarchaeology*. Cambridge: Cambridge University Press.

Richards, T. H. and M. K. Rousseau
1987 *Late Prehistoric Cultural Horizons on the Canadian Plateau*. Department of Archaeology Publication 16. Burnaby, BC: Simon Fraser University.

Robinson, K. and M. Eldridge
1998 Excavations at EdRa-14. Report on File. Resource Management Branch, Victoria, BC.

Rousseau, M. K.
2004 A culture historic synthesis and changes in human mobility, Sedentism, subsistence, settlement, and population on the Canadian Plateau, 7000-200 BP. In *Complex Hunter-Gatherers: Evolution and Organization of Prehistoric Communities on the Plateau of Northwestern North America*, edited by W. C. Prentiss and I. Kuijt, pp. 3-22. Salt Lake City: University of Utah Press.

Rousseau, M. K.
1991 Landels. An 8500 year-old deer hunting camp. *The Midden* 23(4):6-9.

Rousseau, M. K. and T. Richards
1988 Excavations at the Oregon Jack Creek site (EdRi 6) in the Thompson River Valley of British Columbia. *Canadian Journal of Archaeology* 12:39-63.

Rousseau, M., R. Muir, D. Alexander, J. Breffitt, S. Woods, K. Berry, and T. Van Gaalen
1991 Results of the 1989 Archaeological Investigations Conducted in the Oregon Jack Creek Locality, Thompson River Region, South-Central British Columbia. Report prepared for the British Columbia Heritage Trust, Victoria, BC.

Ryder, M. L.
1969 *Animal Bones in Archaeology*. Oxford: Blackwell Scientific Publications.

Sanger, D.
1970 The archaeology of the Lochnore-Nesikep Locality, British Columbia. *Syesis* 3 (Supplement 1).

Shipman, P.
1981 *Life History of a Fossil. An Introduction to Taphonomy and Paleo-*

ecology. Cambridge, MA: Harvard University Press.

Speth, J. D.
1983 *Bison Kills and Bone Counts. Decision Making by Ancient Hunters*. Chicago: University of Chicago Press.

Stryd, A. R. and M. K. Rousseau
1996 The early prehistory of the Mid Fraser-Thompson River area. In *Early Human Occupation in British Columbia*, edited by R. L. Carlson and L. Dalla Bona, pp. 177-204. Vancouver: UBC Press.

Symmons, R.
2002 Bone density variation between similar animals and bone density variation in early life: Implications for future taphonomic analysis. In *Biosphere to Lithosphere. New Studies in Vertebrate Taphonomy*, edited by T. O'Connor, pp. 86-93. Oxford: Oxbow Books.

Todd, L. C. and D. J. Rapson
1988 Long bone fragmentation and interpretation of faunal assemblages: approaches to comparative analysis. *Journal of Archaeological Science* 15:307-325.

Trolle-Lassen, T.
1990 Butchering of red deer (*Cervus elaphus* L.)- a case study from the Late Mesolithic settlement of Tybrind Vig, Denmark. *Journal of Danish Archaeology* 9:7-37.

Villa, P. and E. Mahieu
1991 Breakage patterns of human long bones. *Journal of Human Evolution* 21:27-48.

Watson, J. P. N.
1972 Fragmentation analysis of animal bone samples from archaeological sites. *Archaeometry* 14:221-228.

Wilson, I. R.
1992 Summary of excavations at the Baker site EdQx-43, Monte Creek. Report on file., Resource Management Branch, Victoria, BC.