PREHISTORIC USE OF BEAVER IN COASTAL MAINE (U.S.A.)

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Summary

In this paper the prehistoric use of beaver by native peoples along the coast of Maine is examined using archaeological faunal evidence. The focus of the paper is the fauna from the Richards site, a pre-contact Ceramic Period site located on the central coast of Maine. The faunal assemblage is dominated by beaver and is the largest, non-calcined sample of prehistoric beaver bone in the region ever to be recovered and analyzed, providing direct evidence for how beavers were used by native peoples before European contact.

Data on body part representation, minimum number of individuals and butchery marks reveal that whole carcasses were being processed at the site and that adults or large subadults were preferred. A comparison of the Richards beaver data with other prehistoric sites in the region shows that, through time, a shift toward increased utilization of beaver occurred prior to the European demand for pelts.

Résumé

Utilisation préhistorique du castor sur la côte du Maine (États-Unis).

En s'appuyant sur les données fauniques et archéologiques, cet article examine l'utilisation préhistorique du castor par les indigènes de la côte du Maine. Il est centré sur la faune de Richards, un site de la période céramique d'avant le contact avec les Européens, situé au centre de la côte du Maine. L'assemblage faunique est dominé par le castor et représente le plus important échantillon d'os de castor préhistoriques non calcinés jamais rassemblé et analysé. Cette collection nous fournit des indications directes sur l'utilisation que les indigènes faisaient du castor dans la période antérieure au contact avec les Européens.

Les données sur la représentation des différentes parties du corps, le nombre minimum d'animaux et les traces de découpe révèlent que des carcasses entières étaient traitées sur le site, et que les animaux adultes ou les animaux de grande taille n'ayant pas atteint l'âge adulte étaient sélectionnés. Une comparaison de l'étude des données sur les castors du site de Richards avec d'autres sites préhistoriques de la région montre un accroissement de l'utilisation du castor dès avant la demande de fourrures des Européens.

Zusammenfassung

Die prähistorische Nutzung des Bibers entlang der Küste von Maine (U.S.A.)

Der folgende Beitrag untersucht die prähistorische Nutzung von Bibern durch die einheimische Bevölkerung anhand archäologischer Materialien. Die aus dem vorkolumbianischen Keramikum stammende Ausgrabungsstätte "Richards", welche sich im zentralen Küstenabschnitt befindet, liefert die im Mittelpunkt stehenden tierischen Knochenfunde. Während die Faunenzusammensetzung deutlich von Biberknochen dominiert wird, bildet sie gleichzeitig die größte Ansammlung unverbrannter Überreste, die jemals in dieser Gegend entdeckt und analysiert worden ist. Sie ermöglicht eine direkte Schlussfolgerung in Bezug auf die Verwendung dieser Tiere vor der europäischen Atlantiküberquerung.

Die vorgefundene Anzahl bestimmter Körperteile, Spuren von menschlicher Handhabung und Bearbeitung der Knochen und die Mindestanzahl von benutzten Individuen, deuten nicht nur auf eine Verarbeitung an Ort und Stelle hin, sondern darüber hinaus auf die Verwendung ganzer Körper. Es wurden ausschließlich ausgewachsene oder ungewöhnlich große, junge Tiere verwendet. Ein Vergleich dieser Untersuchungsergebnisse mit denen anderer Fundorte der Region zeigt eine deutlich zunehmende Nutzung von Bibern vor der Landung der Europäer.

Key Words

Beaver, Ceramic Period, Maine, Prehistoric, Pre-Contact, Economy.

Mots clés

Castor, Période céramique, Maine, Préhistorique, Pré-contact, Économie.

Schlüsselworte

Biber, Keramikum, Maine, Prähistorisch, Vorkolumbianisch, Wirtschaft.

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Introduction

The pre-contact use of beaver by native peoples in the Gulf of Maine is not well known due to the scarcity of archaeological sites in the region preserving appropriate, well-reported faunal data. Coastal shell midden sites preserve the best faunal samples and provide the best potential for zooarchaeological data on beaver, whereas interior sites contain primarily small assemblages of calcined bone (Spiess, 1992). Some seventeeth century European ethnographic accounts exist which give anecdotal information about the way beaver were captured and used (e.g. Denys, 1672), and there is certainly a rich, post-contact ethnohistoric record of European fur trade in beaver with native peoples. However, except for data on the number of specimens or the relative proportion of beaver in a few archaeological faunal assemblages, details about the exact nature of the pre-contact use of beaver are scarce. Given the importance of beaver after contact, and the impact that Indian-European beaver trade had on both beaver and human populations, understanding the role these large rodents played in the indigenous economy before that time is crucial.

A rich, pre-contact Ceramic Period (Middle and Late Woodland) faunal assemblage, dominated by beaver, was preserved on the central Maine coast at the Richards Site, Blue Hill Bay (fig. 1). The assemblage, in fact, is the largest, non-calcined sample of prehistoric beaver bones in the region ever to be recovered and analyzed, and thus provides a unique opportunity to study, first-hand and with direct evidence, the nature of pre-contact beaver exploitation by native peoples. In this paper beaver data from the Richards site are presented and discussed; they are then compared with other Late Archaic and Ceramic Period sites in the region. Finally a discussion of pre-contact and post-contact adaptive patterns and use of beaver in Maine is presented. (It should be noted that in Maine the term "Ceramic Period" is used instead of "Woodland" because of the latter's association with agriculture, which did not occur prehistorically east of the Kennebec River; the terms are used interchangeably in this paper).

The Richards site: excavation, setting and cultural associations

The Richards site is located on the central Maine coast, in the upper part of Blue Hill Bay (fig. 1). The site was excavated in 1938 by Douglas Byers, then Director of the R. S. Peabody Museum of Archaeology, Andover, Massachusetts, as part of a research program investigating what were then known as "Red Paint" sites. Access to the original field notes and archaeological materials (which have been meticulously studied by Dr. Nathan Hamilton, who generously shared his knowledge of the site with me) was provided by Dr. James Bradley, current Director of the Museum. Although the site suffers from some of the problems of sites excavated some time ago, the field notes and quality of archaeological materials recovered (such as charcoal and very small flakes) indicate that the excavators were decidedly systematic in recovering artifacts and ecofacts, even if they were constrained by the amount of archaeological materials that could be transported back to Massachusetts by train (Hamilton, pers. comm.). The site faces south-southeast and has good exposure to the sea, looking out directly onto Blue Hill Harbor and the nearby islands. It has direct access to nearby freshwater ponds, small streams and a mixed white pine, hemlock and hardwood forest. Stratigraphic profiles exist for every two meters which show a shallow plowzone underlain by homogeneous, intact Middle and Late Woodland deposits (Hamilton, pers. comm.). The depth of deposit is 50-60 cm, and there is continuity in activity areas from bottom to top, suggesting long-term, continuous occupation (even if on a seasonal basis). A series of 14 radiocarbon dates on shell, bone and charcoal yielded dates ranging from 1635 to 655 bp (AD 395-1310), suggesting occupation for about 900 years (Hamilton, pers. comm.). The deposits contained few shells, and those present were almost all softshell clam (*Mya arenaria*) with no oysters, suggesting at least a late fall or winter occupation, assuming that shellfish gathering took place when the tidal flats were not covered with ice.

Approximately 238 square meters of this large habitation site were excavated, revealing intact features such as hearths and oval concentrations of pebbles that seem to be house floors, 2-3 m in diameter. Artifactual remains include 320 projectile points (mostly side- and corner-notched), more than 200 scrapers, over 2500 pieces of pottery (mostly rocker dentate impressed, mixed with some linear dentate, cordage impressed and cord-wrapped stick), over 500 bone tools (including points, awls and harpoons) and about 60 copper artifacts (rare in the Northeast). Combined with this large artifactual assemblage (the site yielded more projectile points than any other excavated Ceramic Period site in Maine) is a well-preserved faunal assemblage that had not previously been analyzed.

The faunal assemblage

A total of 3343 bones were recovered and saved from the site. Of these, 90.7% (n = 3032) were identifiable to species or vertebrate class, while 9.3% (n = 311) were non-identifiable. The very high proportion of identifiable bone is unusual in modern excavations and is clearly due to excavator biases of the past, including the absence of screening. Still, the sample is extremely rich in the diversity of species and habitats represented. Thirty-six vertebrate species (7 fish, 2 reptiles, 12 birds and 15 mammals) are present, indicating the broad-based nature of the subsistence base. Despite its coastal location, there is no apparent focus on marine resources at the Richards site, contrary to the earlier Late Archaic populations who "flourished on the resources of the seacoast with their backs to the forest" (Tuck, 1991: 41).

The assemblage is overwhelmingly dominated by mammalian remains, which comprise 77.9% of the fauna by number of identifiable specimens (NISP = 2362), and represent a minimum of 94 individuals (tab. 1). Bird bones comprise only 16.1% of the sample (NISP = 488; MNI = 51),

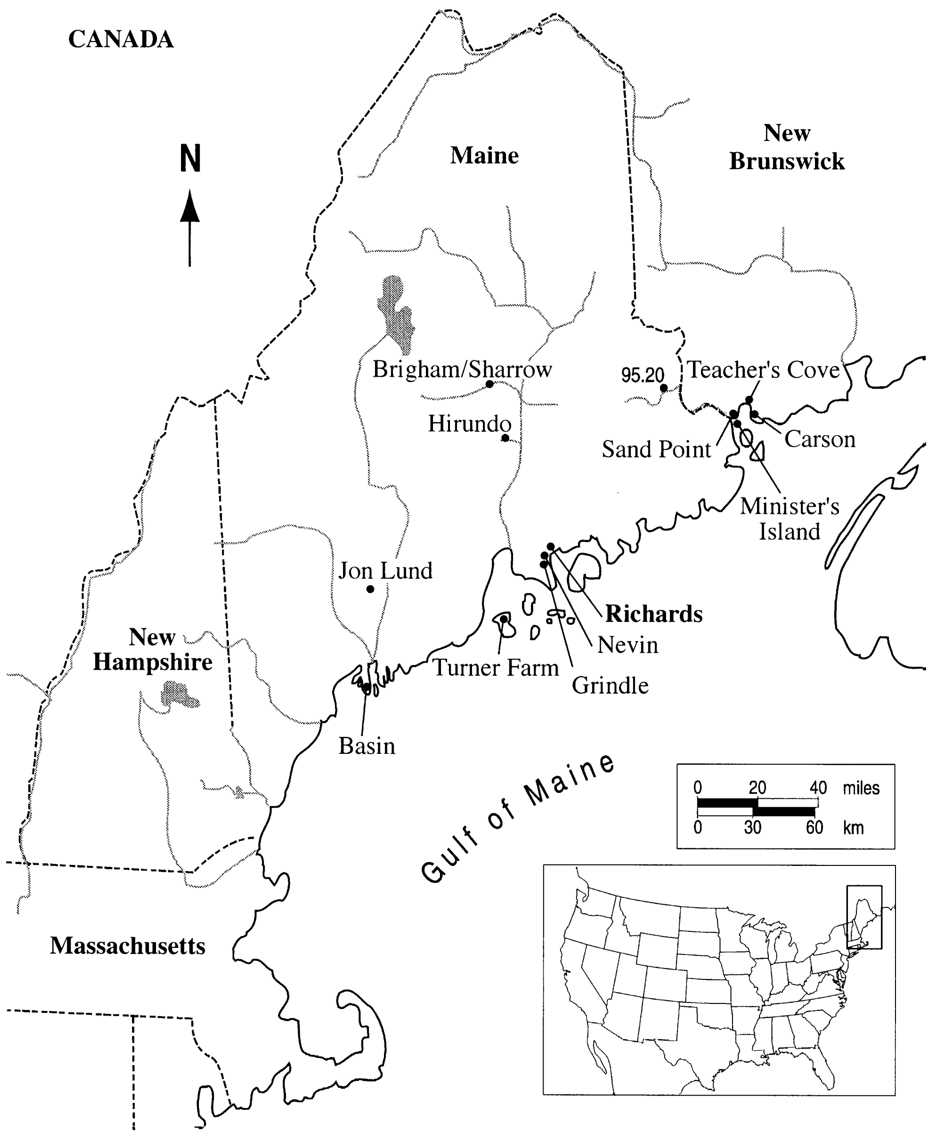

Fig. 1: Map of Maine showing the location of selected prehistoric sites with large beaver assemblages.

Table 1: Composition of identifiable vertebrate fauna from the Richards site by class, with mammalian remains by species. (Note: the assemblage also includes 311 non-identifiable specimens not shown in this table).

	NISP	%	MNI
FISH	122	4.0	17
REPTILE	60	2.0	2
BIRD	488	16.1	51
MAMMAL	2362	77.9	94
TOTAL (see note in caption)	3032	100.0	164
MAMMALIAN SPECIES			
Snowshoe hare, *Lepus americanus*	7	0.3	1
Beaver, *Castor canadensis*	869	36.8	46
Muskrat, *Ondatra zibethicus*	1	.04	1
Porcupine, *Erethizon dorsatum*	37	1.6	8
Sea mink, *Mustela macrodon*	6	0.3	2
River otter, *Lutra canadensis*	31	1.3	4
Raccoon, *Procyon lotor*	14	0.6	1
Lynx or bobcat, *Lynx* sp.	2	.08	1
Dog, *Canis* sp.	31	1.2	2
Black bear, *Ursus americanus*	96	4.1	4
White-tailed deer, *Odocoileus virginianus*	227	9.6	8
Moose, *Alces alces*	573	24.3	9
Harbor seal, *Phoca vitulina*	86	3.6	4
Gray seal, *Halichoerus grypus*	9	0.4	2
Harbor porpoise, *Phocoena phocoena*	5	0.2	1
Mammal 1, very small	6	0.3	–
Mammal 2, small	209	8.8	–
Mammal 3, medium	130	5.5	–
Mammal 4, large	23	1.0	–
TOTAL MAMMAL	2362	100.0	94

followed by 4.0% fish (NISP = 122; MNI = 17) and 2.0% reptiles (NISP = 60; MNI = 2). Because of taphonomic factors and the lack of screening, it is difficult to know the importance of some small species in the overall economy, such as some fish and birds, but there is reason to believe that the relative importance of the various vertebrate classes has integrity. Nothing in the field notes suggests there were large quantities of fish or bird remains at the site that were not be saved, and other sites excavated by Byers using the same methodology, such as Pond Island, did yield large quantities of fish (Hamilton, pers. comm.). Thus, the great preponderance of mammals probably reflects their relative importance in the overall diet and economy. Due to the presence of some winter-only species, the fauna demonstrates a winter season occupation on the coast, but a multi-season occupation cannot be ruled out based on deer teeth indicating kills spanning from fall to early spring.

The composition of the mammalian fauna by species shows the clear dominance of beaver in the assemblage, both by NISP and MNI (tab. 1). Next in importance are moose and deer, followed by bear and seal, indicating a focus on terrestrial species, with a less important marine component, here at this coastal site. This type of pattern, with its emphasis on terrestrial species, especially beaver, moose, deer and bear, parallels the historic winter (late fall to early spring) subsistence pattern of the Micmac, Maliseet, Passamaquoddy and Penobscot (Bock, 1978; Erickson, 1978; Snow, 1978). It is also found at other archaeological sites in the region such as those in Passamaquoddy Bay, New Brunswick (fig. 1; Sanger, 1985, 1987). What is unique about the Richards site is the overwhelming preponderance of beaver in a non-calcined, well-preserved faunal assemblage and the opportunity to study, in detail, how this very important resource was used before contact. This assemblage, in fact, comprises the largest prehistoric non-calcined sample of beaver bones from habitation context in northern New England.

Body part representation and Minimum Number of Individuals

An examination of the beaver skeletal parts represented shows very good recovery of almost all elements except ribs, vertebrae and foot bones (tab. 2, fig. 2). Given the excellent preservation, good recovery rate and high MNIs on most body parts, the missing elements can be attributed to excavator bias or chewing and consumption by dogs. Seventy-two beaver specimens bear distinctive canid gnaw marks, presumably made by dogs on-site. The most extreme examples are 19 femora and 14 tibiae with epiphyseal ends completely chewed off. This attests to some non-human disturbance of the faunal remains.

Table 2 also gives MNE figures (minimum number of elements represented) which, when compared to NISP, are a good measure of whether body part data are inflated: the closer MNE and NISP are, the more each specimen tends to represent a different, individual bone. As can be seen, there is good agreement between NISP and MNE figures for most elements. Exceptions are incisors and mandibles, both of which are broken into smaller fragments than most other elements. The fragmentation of the mandible may be due to attempts to obtain the lower incisors for tools, whereas the fragmentary incisors could be due to this process or to their long, narrow, easily-broken shape. Among the artifactual remains at the Richards sites are 102 worked beaver incisors, which occur in fabrication, use and discard forms. (The worked incisors are not included with the faunal remains analyzed here, although two lower incisors did have polished ends, one on the proximal end of the tooth and one on the distal end). Beaver half-mandibles with the worked incisor intact were also used as tools and are known archaeologically from sites in the Passamaquoddy Bay region (Sanger, 1987).

Forty-six beaver individuals are represented, the largest reported beaver MNI for any archaeological site in the Gulf of Maine (tab. 3). As part of the analysis, a considerable amount of time was spent doing "jigsaw-puzzlery", that is, attempting to articulate or fit pieces back together, thereby finding specimens that belong to the same individual. This

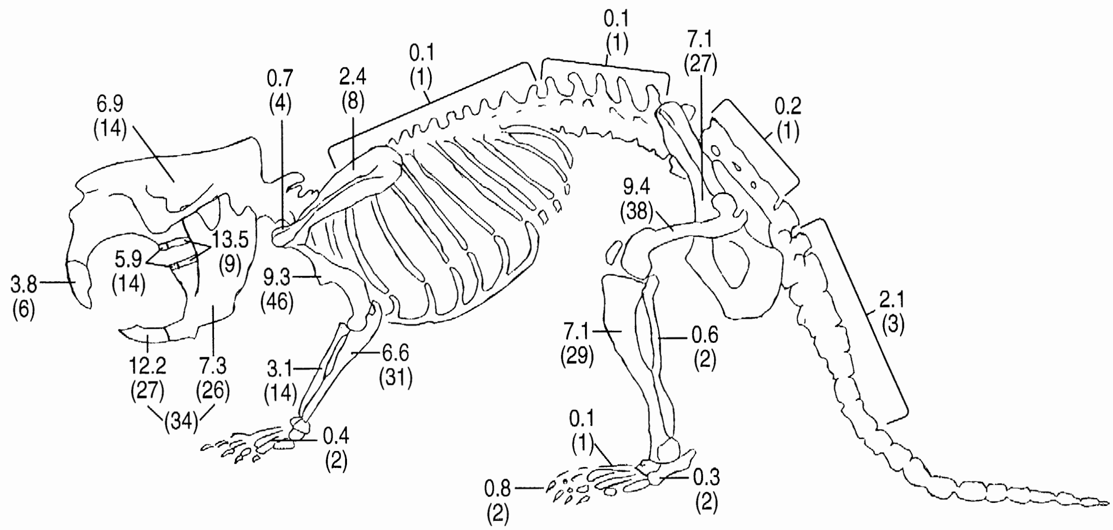

Fig. 2: Body part representation for the Richards beaver bones, showing number of identifiable specimens (NISP) calculated as a percentage. Minimum number of individuals is given in parentheses.

Table 2: Body part representation of the Richards beaver specimens, with number butchered and burned. (MNE = minimum number of elements represented; for butchery, % refers to the proportion of that element with butchery marks).

BODY PART	NISP	%	MNE	MNI	BUTCHERED		BURNED
					n	%	
Cranial fragments	40	4.6	34	7	0	–	0
Maxillae/teeth	20	2.3	14	14	0	5.0	0
Mandibles/teeth	63	7.3	22	22	8	12.7	0
Isolated teeth							
incisors	139	16.0	79	27	0	–	0
premolars	52	5.9	52	9	0	–	1
molars	116	13.5	116	9	0	–	0
Vertebrae	22	2.5	22	3	3	13.6	1
Clavicle	6	0.7	6	4	1	16.7	0
Scapula	21	2.4	15	8	2	9.5	1
Pelvis	62	7.1	50	27	24	38.7	3
Humerus	81	9.3	72	46	50	61.7	0
Radius	27	3.1	26	14	7	25.9	1
Ulna	57	6.6	46	31	15	26.3	2
Femur	82	9.4	65	38	37	45.1	6
Tibia	62	7.1	48	29	36	58.1	3
Fibula	5	0.6	4	2	0	–	1
Tarsals	3	0.3	3	2	1	33.3	1
Metapodials	4	0.5	4	2	0	–	1
Phalanges	7	0.8	7	2	0	–	0
TOTAL	869	100.0	685	46	184	–	21

resulted in the discovery of several "sets" of bones including teeth that fit into mandibles, broken pieces of the same pelvis, unfused femur epiphyses that fit onto shafts, and so on. This was especially valuable for the analysis of edentulous mandibles which originally could not be assigned to an age category, but that could be aged when isolated teeth were fit back into the alveoli. This type of analysis leads to a more accurate determination of MNI figures when it is known that separate specimens of the same element actually fit together and belong to the same individual.

Overall, the MNI data conform with the NISP data in indicating a large number of individuals for many body parts. Elements with low MNI figures are those that are also poorly represented by NISP (vertebrae, clavicles, scapulae and foot bones), and which, when fragmentary, are non-identifiable and naturally yield low MNIs. On the basis of the body part data, it is reasonable to postulate that whole carcasses were being processed and discarded on site.

By many elements it is clear that there are several very large and muscular (probably older) individuals represented in the sample. Because there is virtually no sexual dimorphism in beavers (Godin, 1977; Hilfiker, 1991), these probably belong to older individuals rather than simply to males, and judging by comparison with modern specimens, they probably weighed approximately 20-25 kg. These individuals (MNI = 12 based on humerus specimens) are most easily recognized by the rugose muscle attachment areas on the long bones, such as the super-enlarged deltoid tuberosity and wide, flared distal end on the humerus, and by the enlarged shaft of the femur. Several pelvis specimens had an enlarged acetabulum, heavy muscle markings and bony knobs for attachment of muscles. Finally, several mandibles had large, sweeping rami, and there are some extremely large teeth in the assemblage. Among the 46 individuals represented, there is also evidence for a few smaller and younger animals based on dentition and long bones.

The questions that present themselves are why were so many beavers being processed at the Richards site, and how pressing a commodity were beaver? A close examination of body part representation and butchery marks reveal how beaver were being processed and helps answer these questions. Crania were represented by only 60 specimens, including 40 belonging to various parts of the skull, and 20 maxilla specimens, with and without teeth. Besides maxilla fragments, portions of the zygomatic arch and bulla were the most commonly preserved cranial elements, conforming with Knight's (1985) crushing load data as two of the top three most durable cranial elements. Mandibles, with and without teeth, were fairly well represented, while isolated teeth were the most common body part, probably because of their durability, interest to the excavators and anatomical commoness.

Among isolated tooth specimens, it appears that incisors are more common than cheekteeth (tab. 2). However, as noted above, the MNE data reveal fewer incisors than molars because the incisor specimens are fragmented while molars are not, illustrating the importance of the MNE calculation when considering body part representation. Thus, incisors are not over-represented relative to the cheekteeth even though the NISP data alone might suggest this.

The MNI data on isolated teeth also shed some light on this problem. An MNI of 27 for incisors is commensurate with MNI figures for many other body parts, such as the pelvis, ulna and tibia. So, although it appears from looking at the tooth data alone that incisors are over-represented compared to premolars and molars (which might suggest selectivity of incisors), it is actually the cheekteeth that are under-represented relative to most other body parts. For premolars, the discrepancy is partially accounted for by the presence of premolars in maxilla and mandible specimens, so that the MNI figure for isolated teeth alone is misleading. For molars, the low MNI figure has to do not only with that, but also because anatomically it is almost impossible to separate uppers from lowers (upper rights look like lower lefts). The MNI figure is low for molars because it was calculated simply by dividing MNE by 12 (the number of molars in one individual). Finally, the MNI figure for molars does not take into account mandibles and maxillae with teeth. In fact, when the mandible data are combined with the lower incisor data, an MNI of 34 is calculated (fig. 2). This is based on the fact that many of the mandibles have incisors already, so some lower incisors had to belong to additional individuals not accounted for by the mandibles with incisors. This lengthy discussion of tooth representation is warranted because beaver incisors were a very important resource for tools. It is of interest if there is

Table 3: Beaver data from selected sites in the Gulf of Maine. (LA = Late Archaic, TA = Terminal Archaic, CP = Ceramic Period, n.a. = not available).

Site	Beaver NISP	% of Mammal NISP	Beaver MNI	Total Mammal NISP	Cultural Association
RICHARDS	869	36.8	46	2362	Ceramic Period
Turner Farm					
Plowzone	15	1.8	n.a.	817	Late Ceramic Period
Ceramic Period	361	8.7	n.a.	4142	Ceramic Period
Occupation III	104	7.2	n.a.	1447	Susquehanna Trad. (TA)
Occupation II	37	3.0	n.a.	1225	Moorehead Phase (LA)
Grindle	540	22.4	27	2410	Middle Woodland (CP)
Minister's Island	351	13.8	12	2552	Quoddy Tradition (CP)
Sand Point	457	21.9	6	2091	Quoddy Tradition (CP)
Teacher's Cove	454	16.0	5	2784	Quoddy Tradition (CP)
Carson	204	14.8	12	1382	Quoddy Tradition (CP)
Hirundo	1344	92.7	28	1450	Ceramic Period
Brigham					
Ceramic Period	274	95.5	n.a.	287	Ceramic Period
Late Archaic	19	90.5	n.a.	21	Moorehead Phase & Laurentian Trad. (LA)
Middle Archaic	37	40.2	n.a.	92	Middle Archaic
Sharrow					
Woodland	7	38.9	n.a.	18	Woodland (CP)
Late Archaic	300	60.5	n.a.	496	Late Archaic
95.20	548	77.2	29	710	Vergennes (LA)
Jon Lund	171	60.6	n.a.	282	Early & Middle Archaic

evidence for obtaining or collecting beaver incisors, without other parts of the body being represented. This is apparently not the case at the Richards site. Even if the 102 worked beaver incisors are added to the 79 represented among the faunal remains (tab. 2), simple arithmetic (dividing 181 by 4, the number of incisors per individual) yields an MNI of 46, exactly the number of individuals represented by the humerus specimens.

Cheekteeth, including those in maxillae and mandibles, were examined for the degree of basal root closure, a reliable age indicator in beaver (Van Nostrand and Stephenson, 1964) which has also been used by Spiess and Lewis (in press) in analyzing the Turner Farm beaver material. Three age classes are easily discernible based on whether the roots are open, closing or closed, corresponding, respectively, to ages of less than 2 years, between 2.5-4 years, and older than 4 years. Using eruption and root closure, the age of 21 of the thirty four individuals represented by all maxillae, mandibles and isolated teeth combined could be determined as follows: one 6-month-old, two 6-12 months, four 1.5-2 years, six 2.5-4 years, and eight over 4 years old. An additional thirteen adult individuals of unknown age are also present. Based on this data, there are seven individuals under two years of age and twenty seven individuals over two years of age, indicating selectivity for more mature (subadult and adult) animals over yearlings or kits. As noted below, long bone data on age and size of individuals represented sheds more light on preferred sizes and ages of beaver killed.

Vertebrae, scapulae and clavicles are not well-represented in the assemblage. This is unusual for vertebrae, given how many one individual has, but is understandable in terms of bone size and durabilty. Alternatively, beaver tail is an important source of fat, and it is possible these were cut off and used elsewhere. Most of the vertebral specimens (n = 18) are basal caudal vertebrae, from the portion of the tail where it attaches to the body; these included three different "sets" of two or three articulating or associated specimens which belonged to the same individual. Most of the vertebrae had unfused epiphyses, although there was clear evidence of two older individuals. Clavicles were complete or broken off, while the scapulae are represented almost entirely by the glenoid fossa (n = 15), which is more dense and durable than the spine or blade.

Pelvis specimens are well-represented. This durable bone is represented mostly by fragments of the acetabulum with either the ilium or the ischium attached. The pubis is typically broken away and not present. Some specimens are very large and rugose, indicating the presence of big, muscular individuals.

The various limb bones are very well-represented in the sample. In fact, the highest MNI figure (46) is derived from the humerus. Differential representation of the three bones that make up the front limb (humerus, ulna, radius) mirrors the differential representation of the analogous three bones that make up the hind limb (femur, tibia, fibula). That is, the humerus and femur are equally common and best represented, followed by the ulna and the tibia, which are also equally represented but somewhat less common than the humerus or femur; last are the radius and the fibula which are not very well represented at all compared to the other limb bones. The discrepancy in representation of the lower limb of both the front and hind leg probably relates to anatomy, taphonomy and excavator bias: both the radius and the fibula are small, thin bones that are easily snapped off and broken. Distal humeri are very common, as are proximal ulna specimens. This again conforms with Knight's (1985) crushing load data which showed the distal humerus and the proximal ulna as two of the top six most crush-resistant beaver bones. All of the 46 individuals represented by humerus specimens could be assigned to one of four different size/age groups as follows: five individuals are small and young, with unfused distal ends; five are small, but older than the previous group by epiphyseal fusion; 24 individuals are large subadults or medium-sized adults; and 12 individuals are very large and muscular adults. Unfortunately, details about age of epiphyseal fusion are limited, and those available in the literature (Robertson and Shadle, 1954; Larson and Van Nostrand, 1968), are not applicable to the archaelogical specimens from the Richards site, so thus far it has been impossible to link the fusion states of the long bones with the age groups represented in the teeth.

For the femur specimens, there is remarkable uniformity of patterning in the portion of bone, size and age represented. Most specimens are complete shaft fragments minus one or both epiphyses, many with the distal epiphysis unfused. With only three exceptions, all femur specimens belong to individuals about the same size, regardless of the state of epiphyseal fusion. This suggests that even those bones with unfused epiphyses belonged to individuals who were adult in size, even though subadult in age. The remaining three specimens belonged to two very small, immature individuals. Like the dental and humerus data, the femur data suggest there was some selectivity on the part of the hunters for mature or large subadults, as opposed to smaller, immature individuals, which makes sense in terms of a preference for animals that would provide more meat and larger, better quality pelts. This kind of selectivity could have taken place even if the primary method of capture was trapping, as suggested by modern ethnographic parallels (Richardsson and Ianzelo, 1974). Selected individuals could have also been taken by bow and arrow hunting from canoes, by spears after breaking open the dam, or by other means as described in Denys (1672) which involved reaching into the lodge. Interestingly enough, Denys' (1672: 432) account suggests there was no selectivity in beaver hunting: "Few in a house are saved; they would take all. The disposition of the Indians is not to spare the little ones any more than the big ones." This is contrary to the evidence at the Richards site, and it may be that the practice of killing all size and age groups arose later, as a result of contact, which put increased pressure on beaver populations.

Tibiae are well-represented by 62 specimens. Most of the specimens are large shaft pieces, with the proximal end of the bone occasionally present, but the distal end missing in all but five specimens. In 12 cases the distal end had been chewed off by canids. There were also five unremarkable, fragmentary fibula specimens representing two individuals.

Foot bones are poorly represented, probably due to excavator bias against small specimens or chewing by dogs. The near-absence of foot bones is in stark contrast to the interior sites that preserve calcined assemblages dominated by beaver bones. There, beavers are well-represented by foot elements due to their greater durability when burned (Knight, 1985; Spiess, 1992). In fact, some of the calcined assemblages are comprised of 80-90% foot elements (Spiess, pers. comm.). It is unfortunate that foot bones are so sparsely represented at the Richards site because this results in non-comparable data sets for coastal vs. interior sites.

Butchery and other human modifications

Butchery marks were most common on long bones, especially the humerus and tibia (tab. 2), most of which are related to skinning and meat removal based on ethnographic comparisons (Hara, 1980; Richardsson and Ianzelo, 1974). Differences in patterning of butchery marks on the humerus, femur and tibia indicate that the front limb and hind limb were treated somewhat differently (fig. 3). Both the humerus and the femur have some butchery marks on their proximal ends which must be related to dismemberment. However, in beaver the hind limbs are disproportionately large compared to the front limbs due to the large, strong muscles adapted for swimming. The hind limbs are thus an important source of meat, while the front limbs are smaller and less important for food. In addition, more pelage occurs on the hind limb because of its larger size, so cuts relating to pelt removal ought to appear farther down the leg on the hind limb. Consequently, most of the butchery marks on the humerus should reflect pelt removal

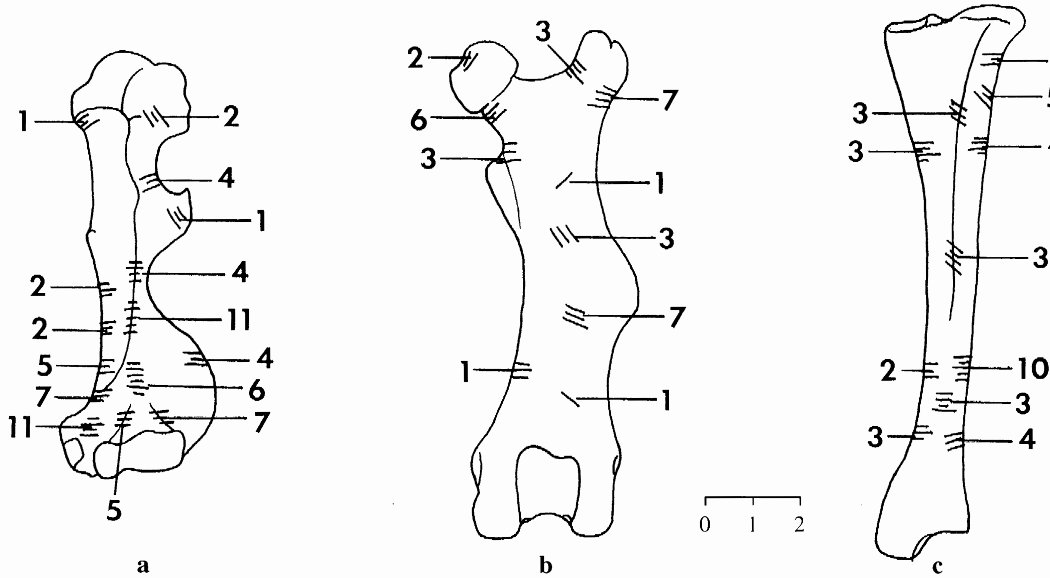

Fig. 3: Incidence of butchery marks on beaver long bones from the Richards site. Numbers refer to number of specimens with cut marks in the location indicated. (a) humerus, (b) femur, (c) tibia.

rather than meat removal, and their location and orientation on the medial, lateral and anterior surfaces of the distal end of the shaft reflect this (fig. 3a). On the femur, butchery marks are less common, more randomly distributed along the shaft and are rare on the distal end where they might be expected if pelts were cut here (fig. 3b). Instead, it is the distal end of the tibia, a less meaty bone, which is ringed with cut marks which must have been made during pelt removal (fig. 3c). One unusual pattern for the femur is the presence of seven shaft specimens that have been sheared off transversely with some kind of cleaver or ax-like tool. Five are sheared near the distal end and two near the proximal end. For some reason the hind leg in these individuals was chopped through the central part of the femur shaft.

Fewer radius and ulna specimens have cut marks, and those that occur are mostly transverse, sometimes ringing the shaft of the bone. These are probably related to skinning rather than meat removal because the muscles are thin in this part of the forearm.

On the pelvis most butchery marks occur above, below and on the rim of the acetabulum. These appear to be typical dismemberment marks inflicted when removing the large, meaty hind limb from the body, a process also reflected on the proximal end of the femur (fig. 3b). A few specimens appear to be sheared off just below the acetabulum, suggesting a heavier implement was sometimes used. There are also nine specimens that appear to be either sheared off or snapped off just below the acetabulum. This kind of damage could occur if a heavier implement was being used to separate the hind leg from the body.

Butchery marks are very rare on other body parts. On the cranium, only one maxilla and eight mandibles bear cut marks. On the mandible these occur around the articular condyle and on the corpus and must relate to removing the mandible from the skull, perhaps to use as a tool with the incisor intact. Three basal caudal vertebrae have butchery marks, one of which is sheared through the centrum obliquely, as though to cut off the tail with a heavy blow. As noted earlier, beaver tails are an important source of fat, so they must have been cut off and processed. One clavicle, one scapula and a calcaneum also had cut marks.

Only 21 specimens are burned. Whatever methods were used to cook beaver meat or to dispose of the bones, they did not result in the bones being burned in the process. Other human modifications to the beaver bones include a distal humerus with a hole bored in it, an ulnar shaft that is polished to form a bevelled edge and another ulna that has small black and red lines and swirls painted on the shaft. In addition, several specimens preserve a reddish stain on the surface which could be red ochre.

Discussion

Ethnohistorically in North America beaver was a significant source of food, fur and incisors for tools. Cub beaver was considered a delicacy by many Indians in central Canada (Ray 1974), and Snow (1978) reports that for the Eastern Abenaki beaver pelts were popular for both robes and smaller garments such as breechcloths. Prehistorically, at least during the Ceramic Period this pattern of beaver exploitation and use was already in existence in the Gulf of Maine as evidenced by the Richards site data. As noted by Spiess and Lewis (in press), due to their large size, fat content, predictable habits and widespread distribution, beavers could be easily caught and were an important resource.

To understand the significance and importance of the Richards beaver assemblage, it is compared with other prehistoric sites in the region that contain the largest samples of beaver bones (tab. 3, fig. 1). Only sites from Archaic and Ceramic Period contexts with more than 100 beaver specimens are included. (Data were compiled from Spiess and Lewis, in press; Snow, 1970; Sanger, 1985, 1987; Knight, 1985; Spiess, 1992 and Cox, 1993). Several other sites with scant beaver bones have been reported (see Spiess, 1992), but they do not reveal much because the sample sizes are so small. The Richards site, with 869 specimens, stands out as the largest sample of non-calcined, well-preserved prehistoric beaver in northern New England, yielding the largest MNI (46) and a wealth of superb, direct information about beaver exploitation and demographics. It is second only to the Hirundo site in NISP (Knight, 1985), but that assemblage is calcined and fragmentary, with only 28 individuals represented (tab. 3).

It is obvious that sites with large beaver assemblages involve both interior and coastal settings (fig. 1). One of the difficulties of comparing the Richards assemblage with others in Maine is the fact that the inland sites contain only calcined assemblages and fragmentary bones. Thus, when an interior assemblage shows an extremely high percentage of beaver, this does not necessarily indicate a focus on beaver hunting, but rather the greater differential survivability of beaver bones over most other species when bones are severely burned (Knight, 1985). By contrast, the abundance of beaver at the Richards site is not an artifact of the preservation process, but instead truly represents a focus on hunting beaver over other species.

In examining the relative importance of beaver in the economy, one question focuses on whether there are changes in beaver exploitation through time. Spiess (1992: 178) notes that in the interior of central Maine, both Archaic and Ceramic Period sites are often dominated by beaver bone, but that "it is not yet possible to determine whether this pattern reflects a subsistence focus, a nonsubsistence activity or disposal pattern, or one of the vagaries of calcined faunal samples". With the Richards data from the coast, this question can be answered definitively. During the Ceramic Period there is clearly a focus on beaver hunting, at least at some coastal sites, that is not seen earlier during the Archaic Period at sites such as Nevin (Crader and Hamilton, 1990), Great Diamond Island and the Basin (Hamilton, pers. comm.), where beaver begin to appear only in substantial numbers during the Ceramic Period (Middle and Late Woodland). This shift is also documented at the Turner Farm site where, although deer is the dominant species represented in all levels, the relative proportion of beaver increases during the Ceramic Period (Spiess and Lewis, in press).

Two interior sites, Brigham and Sharrow, also provide temporal sequences that help elucidate the changing role of beaver through time. At Brigham, Spiess (1992) argues that there is a shift from more species diversity in the Late Archaic to a focus on beaver during the Ceramic Period, suggesting this is due either to a disposal pattern specific to the species, a narrow seasonal adaptation or a true focus on beaver trapping and hunting in the site catchment area. By contrast, at Sharrow, Spiess (1992) argues that a clear decrease in faunal diversity between Archaic and Ceramic Periods is not shown, and that a focus on beaver (and muskrat) goes back at least into the Middle Archaic, contrasting with most other Middle Archaic faunal samples. However, the Ceramic Period sample at the Sharrow site is extremely small (18 specimens) and it is doubtful whether such a conclusion is warranted by the data. It seems possible that a widespread shift toward increased beaver exploitation occurred during the Ceramic Period, which pre-dated the European demand for pelts.

Explaining whether, where and why this shift occurred involves understanding the nature of the faunal assemblages, the biogeography of the region and the changing settlement patterns of the prehistoric groups who lived there. Are these patterns and changes due to cultural shifts and preferences, or to seasonal patterns, or do they represent the natural environment evolving more toward the typical pattern of the last 2000 years? This is difficult to evaluate based on the faunal data available. Spiess and Lewis (in press) suggest that the shift toward increased beaver exploitation and use may indicate that beaver pelts became more important as an item of clothing, and may even have been formalized as an Indian-to-Indian trade item. At Turner Farm, they also report a parallel increase in other fur-bearing species, which they suggest reinforces the idea that pelts became economically important before European contact (Spiess and Lewis, in press). Certainly indigenous trade and exchange networks for other items, such as exotic raw materials and copper, were clearly established.

The pattern revealed by the Richards faunal data suggests a Middle to Late Woodland population camping on the coast of Maine, subsisting primarily on terrestrial fauna such as beaver, moose, deer and bear, with some marine resources. The abundance of beaver supports the notion of a winter occupation. Despite their smaller size, beavers have a high fat content (they store fat in their tails during the winter) and their pelts are at their prime during late winter (Hilfiker, 1991), making them an important winter-season source of food and clothing. This overall pattern is reminiscent of the historic Micmac, Passamaquoddy, Maliseet and Penobscot winter subsistence base, and raises questions about the prehistoric relationships of these groups in the region. During the 500 years following the occupation of the Richards site, the Micmac pushed east and became strong trade partners with the Penobscot and Passamaquoddy peoples. The Richards site may represent either the Passamaquoddy or Penobscot groups, and analysis of the cultural materials from the site may help us to understand pre-contact social and cultural boundaries. These are interesting research questions. Not much is known about the past movement and relationships of existing Penobscot, Passamaquoddy, Maliseet and Micmac groups, and there are few archaeological samples that provide as much artifactual and subsistence data as the Richards site. A careful study of the cultural materials, especially the flaked stone artifacts, bone tools and pottery, will help to reveal the nature of these past relationships. The faunal data are very important in this effort, since they provide the link between the cultural materials and historically-known subsistence patterns.

The Richards faunal data clearly document the intense use of beaver before European contact. Once the European demand for beaver intersected and overlapped with the needs and uses of this large rodent by indigenous peoples, grave changes were to follow. As noted by Hilfiker (1991: 51):

> *"Nothing about the beaver's appearance, habits, or way of life give the slightest hint of its impact on the course of history or the degree to which it was responsible for the exploration, settlement, and development of a continent... [beavers were] the unwitting and unwilling cause of over two centuries of prolonged competition, intrigue, and conflict that involved individuals, organizations, colonists, Native Americans, and foreign governments".*

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