Archaeofauna 9 (2000): 17-28

Hunting Reindeer to Support a Marine Economy. An example from Arctic Norway

LISA HODGETTS
University of Durham. Department of Archaeology. South Road. Durham DH1 3LE, U.K.

(Received *9 March 1999*; accepted *10 February 2000*)

ABSTRACT: Substantial semi-subterranean house features from the late Younger Stone Age of Arctic Norway have produced large faunal assemblages which indicate that marine species dominated the diet. Reindeer made up only a small percentage of the recovered bone, but their economic importance was much greater than their role in the diet might suggest. Reindeer bone and antler were extremely important in artifact production, and were used to make most of the fishing and marine mammal hunting equipment crucial in sustaining the primary (marine) economy. It is argued that selection for raw materials including bone, antler and sinew better explains the patterns of reindeer skeletal representation at the site than a dietary model based on maximizing meat returns.

KEYWORDS: NORWAY, STONE AGE, HUNTER-GATHERER, REINDEER, ARTIFACT PRODUCTION

RESUMEN: Ricos depósitos en habitáculos semi-subterráneos procedentes del Paleolítico tardío en la Noruega ártica han generado abundantes muestras faunísticas que evidencian el papel dominante de las especies marinas en la dieta. El reno constituyó una pequeña fracción de los restos recuperados pero la importancia económica de esta especie fue seguramente mucho mayor que lo que pudiera sugerir su papel en la dieta. El hueso y el asta de este cérvido eran extremadamente importantes en la producción de útiles y se utilizaron para fabricar la mayor parte de los equipos de caza y pesca, claves en el mantenimiento de la economía esencialmente marina. Se postula que la selección de materias primas, incluyendo el hueso, el asta y el tendón, ayuda a comprender mejor los patrones de representatividad esquelética del reno en el yacimiento, que lo modelos dietarios simples basados en la optimización del recurso cárnico.

PALABRAS CLAVE: NORUEGA, PALEOLÍTICO, CAZADORES RECOLECTORES, RENO, PRODUCCIÓN DE ÚTILES

INTRODUCTION

The most characteristic feature of the late Younger Stone Age (4200-3800 BP) along the north Norwegian coast are large house depressions or *hustufter*, which are particularly numerous in Varangerfjord (Figure 1). The substantial nature of the houses, known as "Gressbakken houses" after the type site of Gressbakken (Simonsen, 1961, 1963), has given rise to suggestions of permanent or semi-permanent occupation at these sites (Renouf, 1981, 1989; Engelstad, 1984; Schanche, 1994). Many archaeologists argue that these houses were not built by the type of egalitarian society traditionally associated with hunter-gatherers (cf. Lee & DeVore 1968), but rather by a socially stratified group with differences in status and wealth, and perhaps also strictly controlled territories with

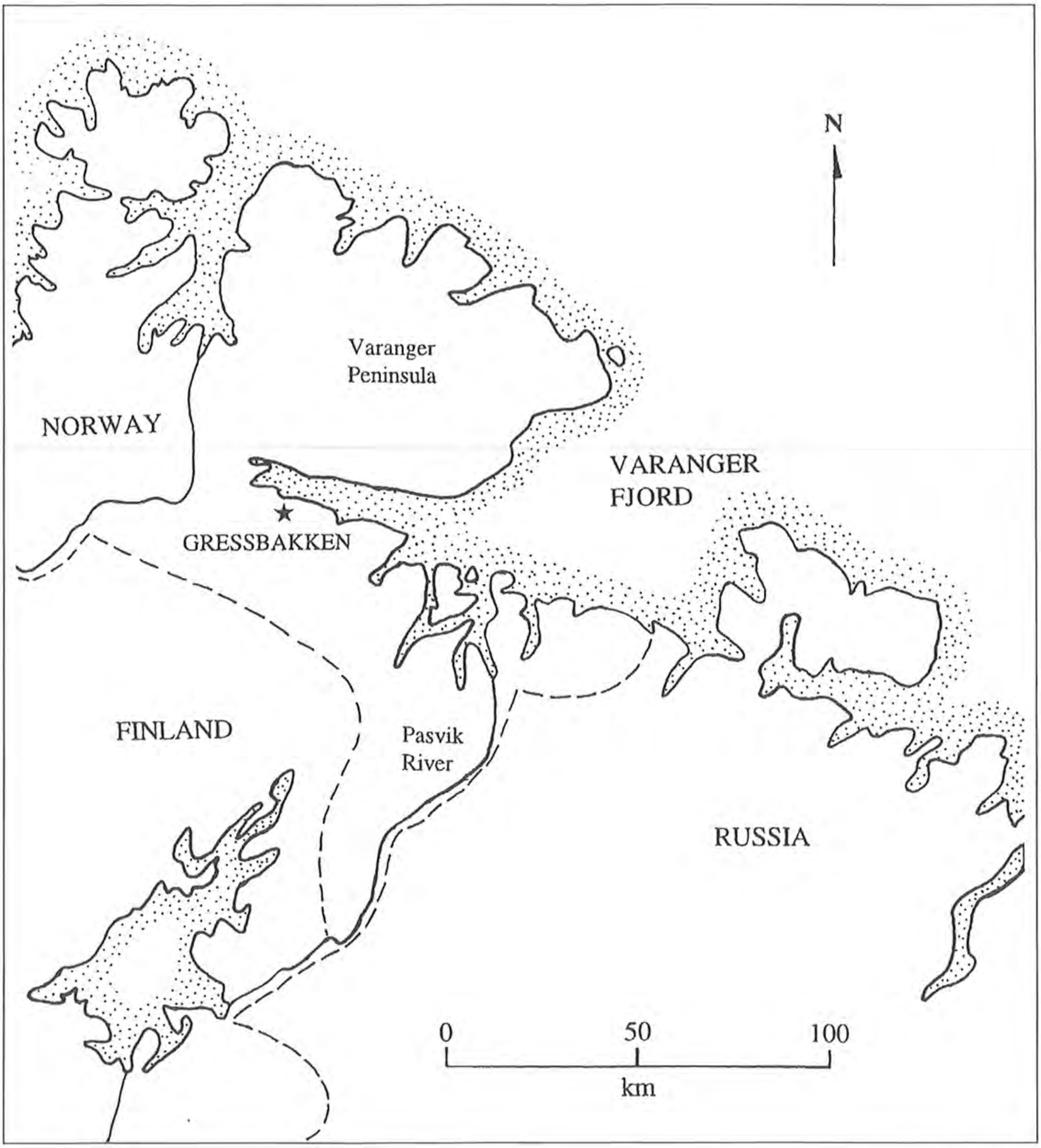

FIGURE 1

Distribution of late Younger Stone Age house depressions in north-eastern Norway and north-western Russia.

differential access to resources (Renouf, 1981, 1989; Myrvoll, 1992; Olsen, 1994; Schanche, 1994).

Gressbakken-type houses are symmetrical and strikingly uniform in construction. They are semi-subterranean with a rectangular floor plan and two rectangular stone-lined hearths along their long-axis (Figure 2). In almost all cases, they are oriented parallel to the contemporary shoreline, with a large midden mound along the side facing the water. This midden is bisected by an entrance passage, and there are often two other entrances, one along each of the short walls, and occasionally a fourth entrance at the rear (Simonsen, 1961; Schanche, 1994). The midden deposits consist of a continuous layer of bone and shell, and presumably represent a palimpsest of the activities carried out during the life-span of each house. The longevity of Gressbakken-type houses has been estimated at 30 to 50 years by Knut Helskog (1984) and at 150 years by Kjersti Schanche (1994: 172-177). Schanche wished to demonstrate a sharp increase in population pressure at the end of the Younger Stone Age in order to explain subsequent changes in settlement pattern. She may therefore have over-estimated the lifespan of individual houses.

The faunal assemblages from the site of Gressbakken are the largest among the excavated late Younger Stone Age (YSA) sites in the region. The site was excavated by Povl Simonsen of the Tromsø Museum in 1956 and 1957 (Simonsen, 1961). The deposits were not sieved, but the importance of faunal recovery was stressed to all excavators, and all visible faunal material was hand collected (Simonsen, pers. com.). Bone preservation in the middens was outstanding, and many of the recovered seal bones were intact. While hand collection must have seriously affected the recovery of fish and other small-boned taxa, the sample of larger mammalian taxa such as seal and reindeer is far more representative (Hodgetts, 1999). This article deals with Houses 3 and 4 at the site, where the middens were completely excavated rather than just sampled (Figure 3). House 3 produced a radiocarbon date of 3650 ± 150 BP, and House 4 of 3850 ± 100 BP (Helskog, 1980). The middens contain large amounts of well preserved bone indicating a strong marine focus in the economy (Table 1). All excavated bone material from the site was originally identified by Håkon Olsen, who published an analysis of the fish and bird bones (Olsen, 1967) and was working on the mammalian material when he died (Olsen n.d.). This paper is based on a re-examination of all the mammal bone from Houses 3 and 4 at Gressbakken. The NISP values for fish and birds presented in Table 1 come from Olsen's original notes on file at the Zoological Museum in Bergen, Norway.

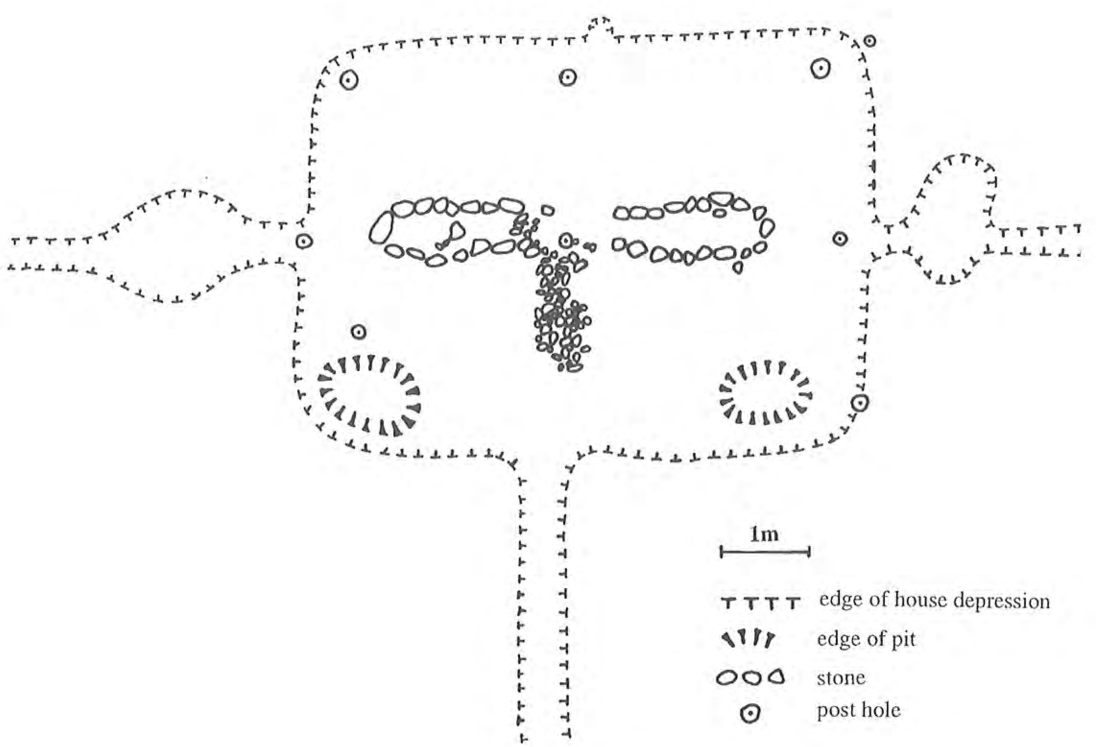

FIGURE 2

Plan of a Gressbakken-type house (after Schanche, 1994: Figure 14).

Taxon	Common Name	House 3 NISP	House 3 %	House 4 NISP	House 4 %
Gadus morhua	Cod	1275	31.1	11514	61.4
Pollachius virens	Coalfish or Pollack	158	3.9	1100	5.9
Melanogrammus aeglefinus	Haddock	186	4.5	1118	6.0
Molva molva	Ling	34	0.8	148	0.8
Other fish		6	0.1	87	0.5
TOTAL FISH		**1659**	**40.5**	**13967**	**74.5**
Uria aalge/Uria lomvia	Guillemot/Brunnich's murre	336	8.2	2021	10.8
Fratercula arctica	Puffin	17	0.4	72	0.4
Plautus alle	Little auk	17	0.4	59	0.3
Larus marinus	Greater black back gull	38	0.9	16	0.09
Fulmaris glacialis	Fulmar	20	0.5	27	0.1
Somateria mollissima/S. spectabilis	Common eider/King eider	53	1.3	35	0.2
Lagopus lagopus	Willow grouse	158	3.9	75	0.4
Other bird		35	0.8	54	0.3
Unidentified bird		49	0.9	580	3.1
TOTAL BIRD		**674**	**16.4**	**2359**	**12.6**

Taxon	Common Name	House 3 NISP	House 3 %	House 4 NISP	House 4 %
Phocidae	Seal family	823	20.1	1450	7.7
Phoca groenlandica	Harp seal	279	6.8	287	1.5
Phoca hispida	Ringed seal	55	1.3	109	0.6
Phoca vitulina	Harbor or Common seal	30	0.7	22	0.1
Erignathus barbatus	Bearded seal	23	0.6	42	0.2
Other seal		4	0.1	7	0.04
Cetacea	Whale family	18	0.4	58	0.3
Phocaena phocaena	Harbor porpoise	5	0.1	16	0.09
Lagenorhynchus sp.	Dolphin	112	2.7	73	0.4
Globicephalus melaena	Pilot whale	7	0.2	5	0.03
Other whale		7	0.2	2	0.01
TOTAL SEA MAMMAL		**1363**	**33.3**	**2071**	**11.0**
Rangifer tarandus	Reindeer	190	4.6	231	1.2
Canis familiaris	Dog	74	1.8	18	0.1
Canis lupus	Wolf	43	1.0	3	0.02
Vulpes vulpes	Fox	52	1.3	23	0.1
Martes martes	Pine martin	5	0.1	18	0.1
Ursus arctos	Brown bear	9	0.2	1	0.01
Castor fiber	Beaver	20	0.5	43	0.2
Other land mammal		10	0.2	4	0.02
TOTAL LAND MAMMAL		**403**	**9.8**	**341**	**1.8**
SUM TOTAL		**4099**		**18747**	

note: NISP values do not include ribs, vertebrae or antler because of the likelihood of counting multiple fragments from a single specimen.

TABLE I

Representation of animal taxa in the middens at Gressbakken Houses 3 and 4 (bird and fish values after Olsen, n.d.).

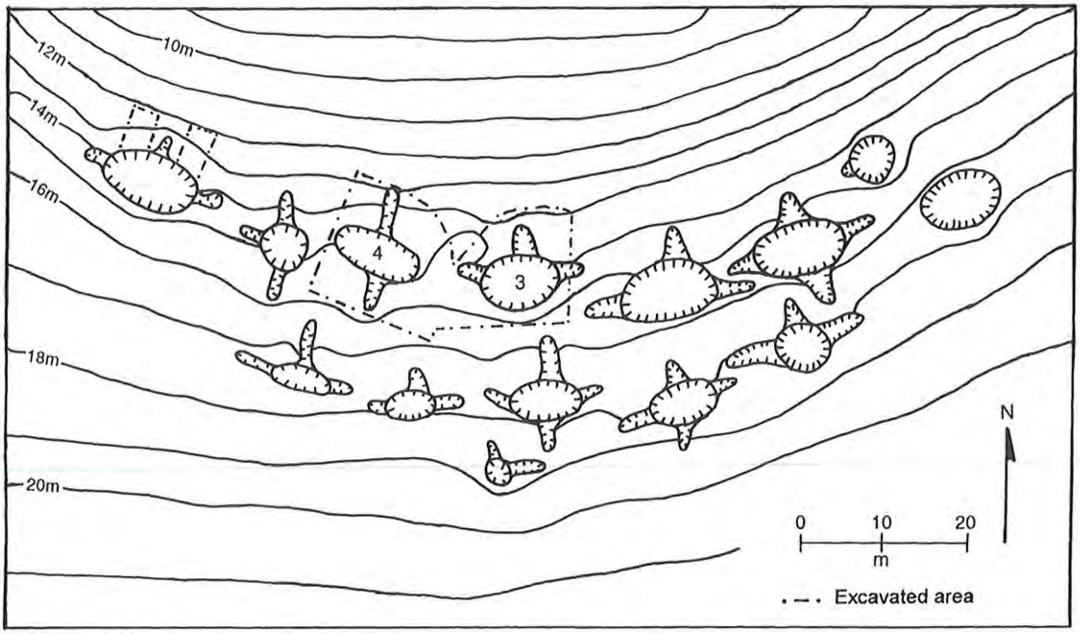

FIGURE 3
Late Younger Stone Age house features at Gressbakken, Varangerfjord (after Simonsen, 1961: Figure 111).

Fish, particularly cod, are very well represented at both Houses 3 and 4, as are sea birds and sea mammals such as harp seal and ringed seal, and to a lesser extent small whales. The large numbers of fish at House 4 overwhelm all other taxa. Fish form a smaller proportion of the assemblage at House 3, but the relative importance of various fish, bird and mammal species is much the same as at both houses. The only terrestrial mammal present in any quantity is reindeer, which accounts for 10.8% of all identified mammal remains at House 3 and 9.6% at House 4. However, the small amounts of excavated reindeer bone do not reflect the real importance of the animal at the site given the large number of artifacts constructed using reindeer bone and antler.

REINDEER AS A FOOD SOURCE

Reindeer, though the most important terrestrial mammal at most of the Varanger sites, does not occur in large numbers. This suggests that unlike fish and sea mammals, reindeer did not make a major contribution to the diet. There is a strong correlation (r_s=0.76, P<0.001) between the reindeer element distributions at Houses 3 and 4 at Gressbakken. However, the results from House 4 must be viewed with some caution since the reindeer sample is small (MAU=58), and may not be as representative as the larger one from House 3 (MAU=100). The two houses have very different values for distal humerus and proximal radius, but the remainder of the distribution plots are strikingly similar (Figure 4). Axial elements are scarce, as are proximal humerus, distal metacarpus, pelvis and both proximal and distal femur.

This trend appears to be partly attributable to density-mediated destructive processes. There are currently no bone mineral density measurements available for reindeer, but the values recorded by Lyman (1984) for the deer skeleton[1] will give a good approximation, given the similar anatomical structure of the two animals. The bone mineral density values used in this analysis are for the part of each element which occurred in the largest

[1] Lyman (1984) derived his deer bone mineral density values using photon absorptiometry measurements on black-tailed deer (*Odocoileus hemionus columbianus*), mule deer (*Odocoileus hemionus hemionus*) and white-tailed deer (*Odocoileus virginianus leucurus*).

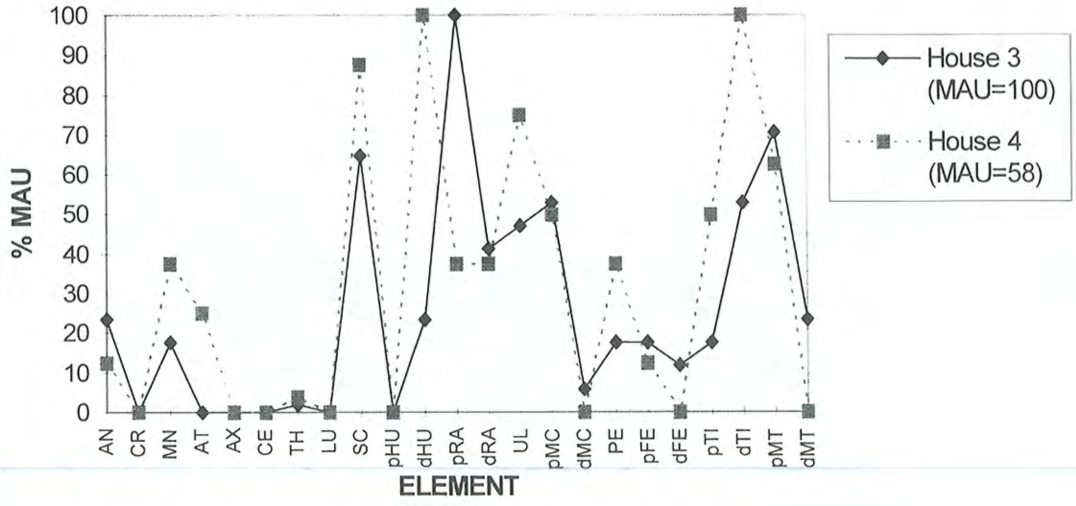

FIGURE 4

Reindeer body part representation at Gressbakken Houses 3 and 4.
abbreviations: p=proximal, d=distal, AT=atlas, AX=axis, CE=cervical, TH=thoracic, LU=lumbar, SC=scapula, HU=humerus, RA=radius, UL=ulna, MC=metacarpus, PE=pelvis, FE=femur, TI=tibia, MT=metatarsus.

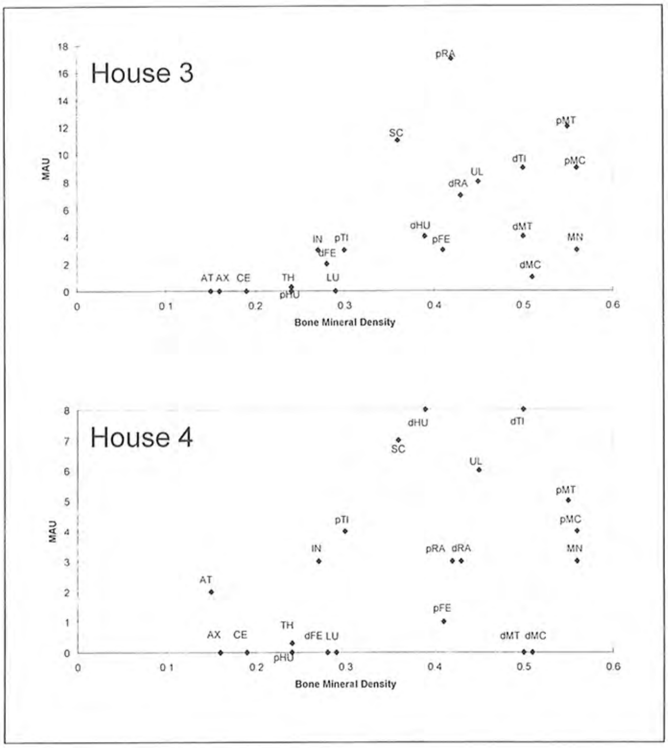

FIGURE 5

Reindeer element frequency vs. deer bone mineral density at Gressbakken Houses 3 and 4 (House 3: r_s=0.64, P=0.004; House 4: r_s=0.44, P=0.04).

numbers and was thus used to derive MAU (e.g. the glenoid region of the scapula).

Dense parts of the skeleton tend to be well represented in the middens. Proximal metapodia and distal tibiae, some of the densest bones in the artiodactyl skeleton, are among the best represented at both houses (Figure 5). At House 3, there is a fairly strong positive correlation (r_s=0.64, P=0.004) between bone mineral density and reindeer element representation, with a weaker positive correlation at House 4 (r_s=0.44, P=0.04). Both dogs and wolves are present in the identified material from Gressbakken, and there is some evidence of carnivore gnawing on the reindeer bones in the assemblage. Their impact along with natural decomposition probably accounts for the correlations between bone mineral density and MAU for reindeer elements. However, there are features of the body part distributions which cannot be satisfactorily explained by differential preservation, such as the high numbers of scapulae and low numbers of proximal femora, two elements with similar bone mineral densities.

Meat utility indices are traditionally used to asses the impact of human transport of carcass parts on a bone assemblage (Binford, 1978; Speth, 1983; Legge & Rowley-Conwy, 1988; Lyman *et al.*, 1992). Binford (1978) developed a meat utility index (MUI) for caribou based on the quantity of meat associated with each part of the skeleton[2]. There is no clear linear association between this index and reindeer MAU at Gressbakken Houses 3 and 4 (Figure 6), but the plots resemble the L-shaped curve typical of a "reverse utility strategy". Such scatterplots generally indicate kill sites, where the higher utility elements have been removed to a residential camp elsewhere (Binford, 1978).

The substantial house remains and thick midden deposits at Gressbakken speak of an intensely occupied base camp, not a short term hunting camp, so the presence of a reverse utility strategy of carcass transport does not agree with Binford's

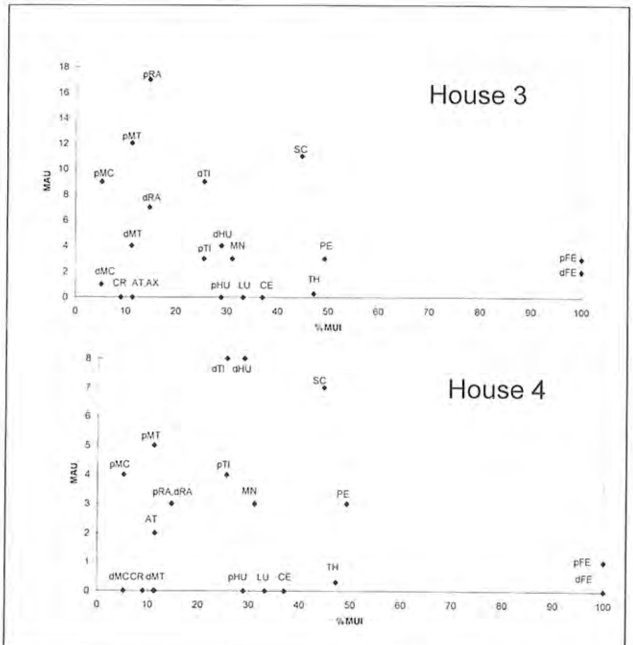

FIGURE 6

Reindeer element frequency vs. MUI at Gressbakken Houses 3 and 4 (House 3: r_s=-0.35, P=0.06; House 4: r_s=-0.07, P=0.38).

[2] "Caribou" and "reindeer" are the common names for regional populations of the species *Rangifer tarandus*. "Caribou" refers to the population in northern North America and Greenland, "reindeer" to that in northern Scandinavia and Russia (Burch, 1972). Binford's caribou indices are therefore fully applicable to reindeer.

	Taxon and Element	HOUSE 3	HOUSE 4
SEA	WHALE (*Cetacea*)		
	vertebra	0	1
	rib	0	1
	TOTAL WHALE	**0**	**2**
	DOLPHIN (*Lagenorhynchus sp.*)		
	rib	**1**	**0**
	SEAL (*Phocidae*)		
	canine tooth	1	1
	baculum	1	0
	TOTAL SEAL	**2**	**1**
AIR	BIRD		
	longbone	**35**	**26**

	Taxon and Element	HOUSE 3	HOUSE 4
LAND	BEAVER (*Castor fiber*)		
	incisor	**3**	**1**
	CARNIVORE		
	canine tooth	**2**	**1**
	REINDEER (*Rangifer tarandus*)		
	antler	110	79
	tooth	0	1
	thoracic	0	1
	scapula	3	8
	humerus	0	1
	radius	3	0
	ulna	7	4
	calcaneus	1	0
	metapodial	0	2
	TOTAL REINDEER	**124**	**96**
	REINDEER (*R. tarandus*) or ELK (*Alces alces*)		
	antler	**82**	**65**
	LARGE TERRESTRIAL MAMMAL (probably reindeer)		
	rib	2	2
	scapula	2	4
	longbone	75	56
	TOTAL LTM	**79**	**62**
	UNKNOWN		
	bone or antler	22	31
	TOTAL	**312**	**255**

TABLE 2

Raw material selection for bone and antler artifacts at Gressbakken Houses 3 and 4 (counts of numbers of artifacts and artifact fragments).

(1978) model. This lack of fit may relate to the major underlying assumption of meat and other utility curves; that animals were hunted primarily as a source of food (but see Savelle, 1997). The small numbers of reindeer bones in the Varanger assemblages indicate that reindeer did not play a major role in the diet. Yet reindeer bone and antler dominate among the artifact assemblages, suggesting an importance for reindeer not indicated by the species lists. The inhabitants of Gressbakken may have consumed much of the reindeer meat at the kill site, returning to the base camp with bones and antler valued as raw material.

ARTIFACTS OF BONE AND ANTLER

One of the characteristic features of the terminal Younger Stone Age assemblages from Varanger is the large number and wide variety of bone and antler artifacts (Simonsen, 1961; Renouf, 1989; Olsen, 1994; Schanche, 1994). Antler is particularly prominent in the artifact assemblage, as are reindeer longbones (Table 2). Some of the unworked antler burrs found on the site had been shed naturally, suggesting that antler was collected specifically as a raw material as well as coming to the site attached to carcasses.

Table 2 lists the raw materials used to produce the bone and antler artifacts at Houses 3 and 4. It reveals a striking difference in the use of land and sea mammal bone, completely reversing the relative importance of the two classes indicated by the unworked bone assemblage. The top part of the table shows sea mammals which are represented by only very small numbers of artifacts, mainly harp and ringed seal canine tooth beads. Birds are better represented among the artifacts, primarily in the form of long bone segments which were scored and snapped at both ends to make beads or tubes.

Land mammals make up the lower portion of the table, and the bulk of the assemblage. A single bear tooth pendant, several fragments of unidentifiable carnivore (wolf?) tooth pendants, and several beaver incisors worked to form cutting edges were found, as was a single piece of elk antler which had been scored and snapped as part of the early stages of artifact manufacture. The remainder of the artifacts, most of them functional tools such as fish hooks, harpoons and scrapers, are constructed using reindeer antler (or antler which

Bird Bone	Sea Mammal Bone	Land Mammal Bone	Land Mammal Antler
30 beads	5 canine tooth beads	61 polished/abraded	159 scored & snapped
29 needles	3 incised decoration	48 points	27 fish hooks
10 points	1 scored & snapped	36 chisels	25 barbs
6 polished/abraded	1 abraded	22 incised decoration	22 harpoons
5 tubes	1 object of unknown function	9 scrapers	22 combs
3 buttons?		6 awls	19 leister prongs
		6 daggers	19 points
		4 leister prongs	8 daggers
		4 incisor tooth knives	8 abraded
		3 harpoons	7 chisels
		2 canine tooth beads	5 awls
		1 net weight	3 decorated
		1 fish hook	2 U-shaped objects
		1 barb	1 T-shaped object
		1 comb	1 animal figure
		1 cylinder	
		1 animal figure	

TABLE 3

Artifact types made of bird, sea mammal, and land mammal bone at Gressbakken Houses 3 and 4 combined.

could not be positively identified but is probably reindeer) and reindeer (or reindeer-sized land mammal which is almost certainly reindeer) bone.

The representation of various species among the unworked bone indicates that the main economic activities taking place on the site were fishing and sealing, and the artifact inventory (Simonsen, 1961) supports this conclusion. Among the bone and antler artifact types (Table 3), fish hooks, leister prongs, net sinkers, loose barbs and harpoons can be reliably attributed to fishing and sea mammal hunting. Scrapers and needles would have been used for working hides, chisels for woodworking. Combs and beads would presumably have been used for personal ornamentation. Bone points, daggers and "t-shaped artifacts" are more difficult to assign to specific functions. Thus, the vast majority of the fishing and marine mammal hunting equipment found at the site is produced using reindeer bone and antler. Marine mammal bone, on the other hand, is rarely worked and tends to be used for decorative rather than functional items.

DISCUSSION

The two elements of the reindeer skeleton which are best represented in the artifact assemblage, scapula and ulna, are also over-represented among the unworked reindeer elements at Houses 3 and 4 at Gressbakken. The moderate positive correlation that exists between bone mineral density and reindeer skeletal element representation suggests that post-depositional destructive factors have shaped the unworked reindeer assemblage. However, neither scapula or ulna is among the elements with highest bone mineral densities. Of the twenty-one elements compared in Figures 4 through 6, scapula ranks tenth and ulna ranks fifteenth. The correlation between the best represented elements among the artifacts and among the unworked material holds at both houses and suggests, if somewhat tentatively, that reindeer bones favored in artifact manufacture were preferentially selected for return to the base camp. Whether or not this selection occurred, the importance of land mammal bone in supporting the marine economy cannot be denied. This importance could not have been detected by considering the faunal material in isolation and only became apparent when the worked bone material was also included in the analysis.

The selection of reindeer antler and bone for artifact production probably occurred for practical reasons. Antler is strong and easy to work, and several artifacts could be produced using a single antler. Reindeer longbones are longer, straighter, and have a thicker cortex than those of seals, making them better suited to tool manufacture. Reindeer would also have been valued for their long sinews and their hides, which were doubtless important for clothing and bedding and perhaps also for temporary shelters and skin boats. The seal bones on the site represent large quantities of meat and fat, given that an adult harp seal averages 150 kg, and an adult ringed seal averages 87 kg. Fish were also widely available and were obviously intensively exploited. There was thus no shortage of food at the site, a suggestion borne out by the very limited degree to which both land and sea mammal bones were processed for marrow[3]. Given the abundance of marine food, it seems both reasonable and probable that non-food uses dictated which parts of the reindeer carcass were returned to the site.

While reindeer meat may have been an important part of the diet at certain times of the year during hunting trips away from the base camp, it was not consumed in large quantities at the site of Gressbakken itself. Meat value was apparently of little concern in determining which elements of the reindeer carcass were transported to the site, as evidenced by the paucity of such important meat bearing elements such as femur. Instead, elements favored for artifact manufacture, such as scapula and ulna, may have been selected for return to the site.

It perhaps reflects an essential balance between land and sea that the late Younger Stone Age inha-

[3] The seal bones were probably not processed for marrow due to their structure. Seals lack the distinct marrow cavity found in terrestrial mammal bones. Their medulary cavities are filled instead with trabeculated bone, and any digestible organic matter is dispersed throughout the entire bone (Cruz-Uribe & Klein, 1994: 40; Lyman *et al.*, 1992: 537). Occasionally, reindeer longbones at the site had their epiphyses removed so that the marrow could be removed from the diaphysis (which was then left as a hollow tube), but there was no indication of intensive processing for marrow and grease which would be expected if the community was under dietary stress (cf. Outram 1988).

bitants of Varanger had to look inland for raw materials in order to maintain the marine focus of their economy. Reindeer antler was obviously the preferred material for making fish hooks and harpoons. Antler was traditionally prized for its strength and was used almost to the exclusion of bone in tool production among many northern hunter-gatherers (Grønnow *et al.*, 1983). Activities such as collecting shed reindeer antlers from the ground and hunting reindeer were an essential part of fishing and sea mammal hunting. The latter activities were dependent on the raw materials provided by the former. Reindeer must have had a special place in the lives and thoughts of the people who lived at Gressbakken, and an importance belied by the small numbers of reindeer bones deposited in the middens.

ACKNOWLEDGEMENTS

I would like to thank Anne Karin Hufthammer of the Zoological Museum in Bergen who gave me access to both the faunal collections housed there and to Håkon Olsen's unpublished lab notes and manuscripts. I am also indebted to Knut Helskog who allowed me to examine the bone and antler artifacts in the collections of the Tromsø Museum. Thanks also to Peter Rowley-Conwy, Pam Graves, Farid Rahemtulla, Priscilla Renouf and two anonymous reviewers for their helpful comments on an earlier version of this paper. This article is based on Ph.D. research funded at various stages by a doctoral scholarship from the Commonwealth Scholarship Commission, a doctoral fellowship from the Social Sciences and Humanities Research Council of Canada, and a Sir James Lougheed Award of Distinction from the Alberta Heritage Scholarship Commission.

REFERENCES

BINFORD, L. R. 1978: *Nunamiut Ethnoarchaeology*. Academic Press, New York.

BURCH, E. S. 1972: The caribou/wild reindeer as a human resource. *American Antiquity* 37: 339-368.

CRUZ-URIBE, K. & KLEIN, R. G. 1994: Chew marks and cut marks on animal bones from the Kasteelberg B and Dune Field Midden Later Stone Age sites, Western Cape Province, South Africa. *Journal of Archaeological Science* 21: 35-49.

ENGELSTAD, E. 1984: Diversity in Arctic maritime adaptations. An example from the Late Stone Age of Arctic Norway. *Acta Borealia* 2: 3-24.

GRØNNOW, B.; MELDGAARD, M. & NIELSEN, J. B. 1983: Aasivissuit - The Great summer Camp. Archaeological, ethnographical and zoo-archaeological studies of a caribou-hunting site in West Greenland. Copenhagen: Meddelelser om Grønland, Man & Society 5.

HELSKOG, K. 1984: The Chronology of the Younger Stone Age in Varanger, North Norway. Revisited. *Norwegian Archaeological Review* 13: 47-60.

HODGETTS, L. M. 1999: Animal Bones and Human Societies in the late Younger Stone Age of Arctic Norway. Unpublished Ph.D. thesis, Department of Archaeology, University of Durham.

LEE, R. B. & DEVORE, I. 1968: *Man the Hunter*. Aldine Publishing Co., Chicago.

LEGGE, A. J. & ROWLEY-CONWY, P. A. 1988: Star Carr Revisited. A Re-Analysis of the Large Mammals. University of London, Centre for Extra-Mural Studies, London.

LYMAN, R. L. 1984: Bone density and differential survivorship of fossil classes. *Journal of Anthropological Archaeology* 3: 259-299.

LYMAN, R. L.; SAVELLE, J. M. & WITRIDGE, P. 1992: Derivation and application of a meat utility index for phocid seals. *Journal of Archaeological Science* 19: 531-555.

MYRVOLL, E. R. 1992: Stil og samfunn. En analyse av materiell symbolisme og sosiale relasjoner i Varanger 2200 f.Kr. - Kr.f. Unpublished M.A. thesis, Department of Archaeology, University of Tromsø.

OLSEN, B. 1994: Bosetning og Samfunn i Finnmarks Forhistorie. Universitetsforlaget, Oslo.

OLSEN, H. 1967: Varangerfunnene IV. Osteologisk materiale: Inledning - fisk - fugl. Tromsø Museums Skrifter, 7(4).

OLSEN, H. (n.d.): Sjø og Land. Unpublished manuscript on file at the Zoological Museum, University of Bergen, Norway.

OUTRAM, A. K. 1998: The Identification and Palaeoeconomic Context of Prehistoric Bone Marrow and Grease Extraction. Unpublished Ph.D. thesis, Department of Archaeology, University of Durham.

RENOUF, M. A. P. 1981: Prehistoric Coastal Economy in Varangerfjord, North Norway. Unpublished Ph.D. thesis, Department of Archaeology, Cambridge University.

RENOUF, M. A. P. 1989: Prehistoric Hunter-Fishers of Varangerfjord, Northeastern Norway. B.A.R. (International Series) 487. Oxford.

SAVELLE, J. M. 1997: The role of architectural utility in the formation of zooarchaeological whale bone assemblages. *Journal of Archaeological Science* 24: 869-885.

SCHANCHE, K. 1994: Gressbakkentuftene i Varanger. Boliger og sosial struktur rundt 2000 f.Kr. Unpublished Ph.D. thesis, Department of Archaeology, University of Tromsø, Norway.

SIMONSEN, P. 1961: Varanger-Funnene II. Tromsø Museums Skrifter, 7(2).

SIMONSEN, P. 1963: Varanger-Funnene III. Tromsø Museums Skrifter, 7(3).

SPETH, J. D. 1983: Bison Kills and Bone Counts. University Press, Chicago.