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Article abstract

The Thule whale bone house is one of the most impressive features of the arctic landscape. Bowhead whale bone elements within 18 Thule winter houses along the southeastern coast of Somerset Island (Nunavut) were mapped and the patterning of these elements was investigated through the application of a bowhead architectural utility index and through principal components analysis. The results suggest that while whale bone was initially selected for dwelling construction on the basis of architectural value, socio-economic status may be reflected in the positioning of certain bone elements. Informed by historic North Alaskan Inupiat analogies, the positioning of various elements within the entrance tunnel in particular appears to have been related to whale symbolism.

The symbolic dimensions of whale bone use in Thule winter dwellings

A. Katherine Patton*
James M. Savelle**

Résumé: Les dimensions symboliques de l'utilisation d'os de baleine dans les habitations hivernales thuléennes

La maison d'os de baleine thuléenne est une des caractéristiques les plus impressionnantes du paysage arctique. Les éléments d'os de baleine boréale à l'intérieur de 18 maisons d'hiver thuléennes le long de la côte sud-est de l'île Somerset (Nunavut) ont été cartographiés et leur mode de distribution a été étudié par l'application d'un index d'utilité architecturale de la baleine boréale et par l'analyse des composants principaux. Les résultats suggèrent que même si l'os de baleine était initialement choisi pour la construction d'habitations sur la base de sa valeur architecturale, le statut socio-économique peut être reflété par le positionnement de certains éléments en os. En utilisant des analogies historiques provenant des Inupiat du Nord de l'Alaska, on apprend que le positionnement de divers éléments particulièrement dans le tunnel d'entrée semble avoir été lié au symbolisme de la baleine.

Abstract: The symbolic dimensions of whale bone use in Thule winter dwellings

The Thule whale bone house is one of the most impressive features of the arctic landscape. Bowhead whale bone elements within 18 Thule winter houses along the southeastern coast of Somerset Island (Nunavut) were mapped and the patterning of these elements was investigated through the application of a bowhead architectural utility index and through principal components analysis. The results suggest that while whale bone was initially selected for dwelling construction on the basis of architectural value, socio-economic status may be reflected in the positioning of certain bone elements. Informed by historic North Alaskan Inupiat analogies, the positioning of various elements within the entrance tunnel in particular appears to have been related to whale symbolism.

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Introduction

The Thule whale bone house (Figure 1) is one of the most striking archaeological features of the Arctic landscape. Whale bone houses are found in association with a number of prehistoric and historic cultures throughout much of the coastal regions of eastern Siberia, Alaska, Arctic Canada and Greenland. In the case of the Canadian Arctic, archaeologists have investigated the construction of these houses, as well as how social relations influence their design (*e.g.*, Dawson 2001; Habu and Savelle 1994; McCartney 1979a; McGhee 1984; Park 1997; Savelle 1997, 2002; Savelle and McCartney 2002; Whitridge 1999). While most of these studies recognize the potential symbolic aspects of Thule whale bone dwellings (e.g. Habu and Savelle 1994; Savelle 2002: Whitridge 1999), they have rarely been designed to specifically examine symbolism (but see Dawson [1995] for an innovative study on the symbolic aspects of the spatial patterning of traditional and modern Inuit dwellings). In this study we examine how ideology may have played an important role in the construction of these dwellings through an analysis of whale bone patterning at a series of sites on southeastern Somerset Island, Nunavut (Figure 2). This interpretation is informed by North Alaskan and Canadian Arctic Inuit ethnography, mythology and oral history.

Conceptual background

Houses can be constructed with cosmological principles that form daily interactions between inhabitants, and provide loci for informal household ritual. They can be constructed as a microcosm of the universe or of the human body, and also to organise intra-household relations (Blanton 1994; Bourdieu 1973; Pearson and Richards 1991). Wealthy households however, may be better able than poorer households to construct houses that are ingrained with this kind of social and ideological information (Blanton 1994). Recent work in the Arctic has shown that variability in Thule winter house construction techniques and materials may reflect differences in the socio-economic status of their builders. Dawson (2001) for example, argues that well-built, high-cost winter houses on Bathurst Island may have been constructed by wealthy Thule whaling households. Likewise, Whitridge (1999) contends that variation in whaling materials and whale bone elements between houses on Somerset Island reflects differences in household status and wealth that occurred through whaling. Savelle (1987, 2000) suggested this relationship between household wealth and whaling on a general level in the same region. In this study, we use supporting ethnographic and archaeological evidence to suggest that access to available raw materials was determined by household wealth and that this may have influenced symbolic attributes of whale bone use within Thule winter houses.

The historical context within which the Thule winter house was constructed is essential to an understanding of its ideological components. Regionally specific ethnographic and ethnohistorical data relating to ideology, ritual, and symbolism are commonly used to interpret Thule ideology because of the well documented cultural relationship between contemporary Inuit, Inupiat and Inuvialuit groups and prehistoric Thule (*e.g.*, Mathiassen 1927; McCartney 1977; McGhee 1984). The Thule arrived in

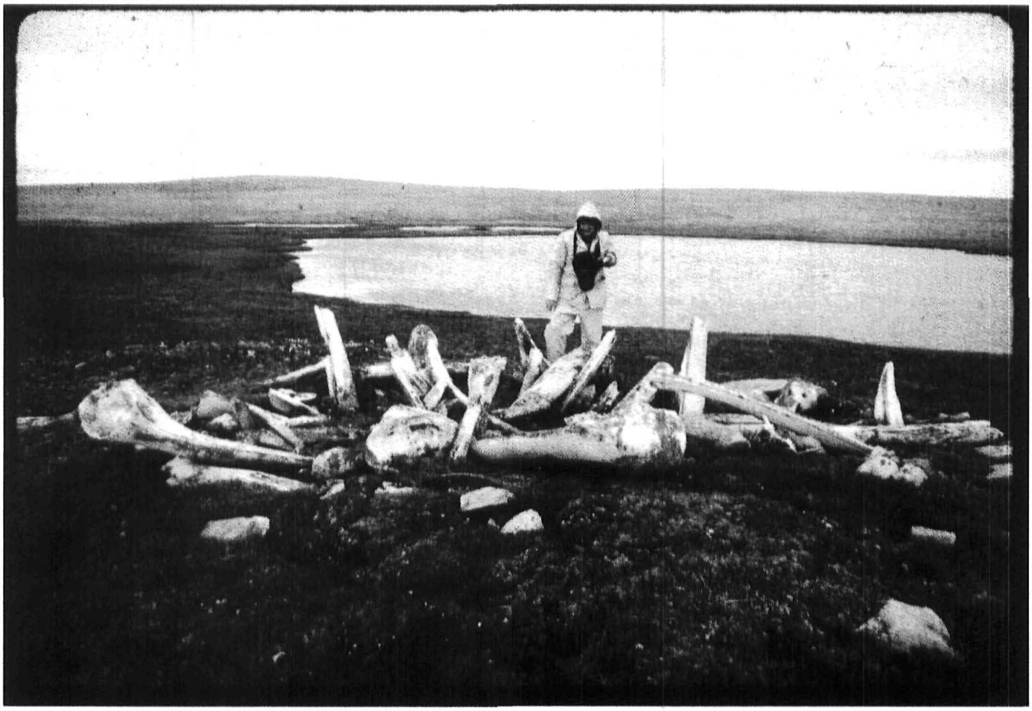


Figure 1. Thule whale bone dwelling in the eastern Canadian Arctic, Deblicquy site, Bathurst Island, Nunavut, 1988 (with Allen P. McCartney providing scale). Photo: James M. Savelle.

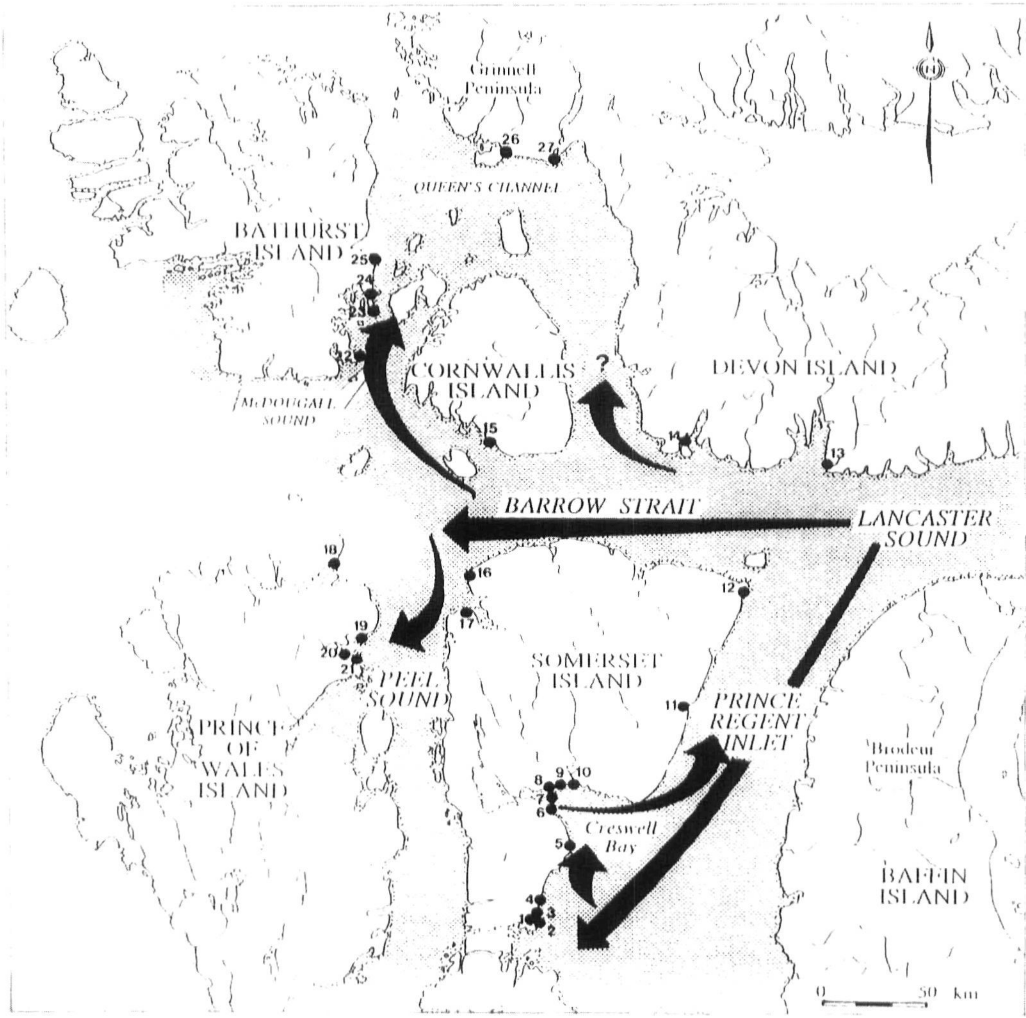


Figure 2. Location of thule whale bone winter dwelling sites and site clusters in the eastern Canadian Arctic. Stippled area represents historic bowhead whale range and arrows indicate probable summer migration routes. Dwellings analysed in this study are located at site 1 (PaJs-2); site 2 (PaJs-3); and site 4 (PaJs-13). The Pond and Camp Stream sites are 2-3 km south of PaJs-13.

the central and eastern Arctic from Alaska approximately A.D. 1100-1200, and are the immediate ancestors of all Inuit groups occupying these regions. In the central and eastern Arctic, Thule house architecture reflects Alaskan traditions modified to suit new environments and raw material availability. Meanwhile, Alaskan Thule and their Inupiat descendants continued to construct dwellings in traditional forms into the historic period. Ethnographic information and oral history relating to Alaskan winter houses appear to be an appropriate means of interpreting the ideological components of central and eastern Arctic Thule winter houses because of this historical relationship. Furthermore, the validity of this approach is strengthened by the striking number of common elements in Inuit and Inupiat ideology (*e.g.*, Clark 1996; Lantis 1938; Mary-Rousselière 1984: 441-442; Rasmussen 1929; Søby 1969-1970).

Traditional North Alaska Inupiat winter dwellings

Alaskan Inupiat utilized primarily two types of dwellings: domestic dwellings and *qargit* (ceremonial houses; sing. *qargi*). Both these dwelling types were typically semi-subterranean structures with the living space, or main room, constructed primarily from wood, and accessed by a long, semi-subterranean passage, incorporating bowhead whale mandibles, ribs, vertebrae, scapulae and crania (Figure 3) (Dumond 1987: 132-135; Kilmarx 1990a: 113; Lowenstein 1993: 32-33; Murdoch 1892: 72; Rainey 1947: 244; Spencer 1959: 51-52). At Utqiagvik, the entrances of the oldest houses were constructed from a series of upright mandibles, embedded in holes 20-30 cm deep and roofed with timbers (Smith 1990: 85). Entrance tunnels provided extra storage and work space, and served as additional protection from the external environment. The success of its design was enhanced by a cold trap entrance tunnel below the *katak*, the entrance hole in the floor of the main room.

In domestic dwellings, a raised platform at the rear of the main room, and sometimes along the sides of the house interior, provided warmer working and sleeping areas. Cooking was designated often to an adjunct off the main room or the entrance tunnel (Lowenstein 1993: 33; Spencer 1959: 53-54). *Qargit* were built in a similar fashion to domestic structures, but were generally much larger and lacked sleeping platforms. Instead, *qargit* were constructed with seating benches along most inside walls. Rainey (1947) and Lowenstein (1993: 32-33), among others, emphasize the use of whale bone in dwelling and *qargit* entrances. Sheehan (1990: 185, 1997: 155-157) however, identified a *qargi* at Utqiagvik that had been constructed with a surface entrance and incorporated whale bone in its entire superstructure.

Qargit are known to have served as ceremonial houses, particularly leading up to and during the whaling season. Equally important, whaling rituals also occurred within the domestic house. Inupiat constructed dwellings with potent symbols relating these spaces to whales and, in the case of the domestic house, to women. The logic of this association is made explicit in Inupiat mythology and ritual as discussed below.

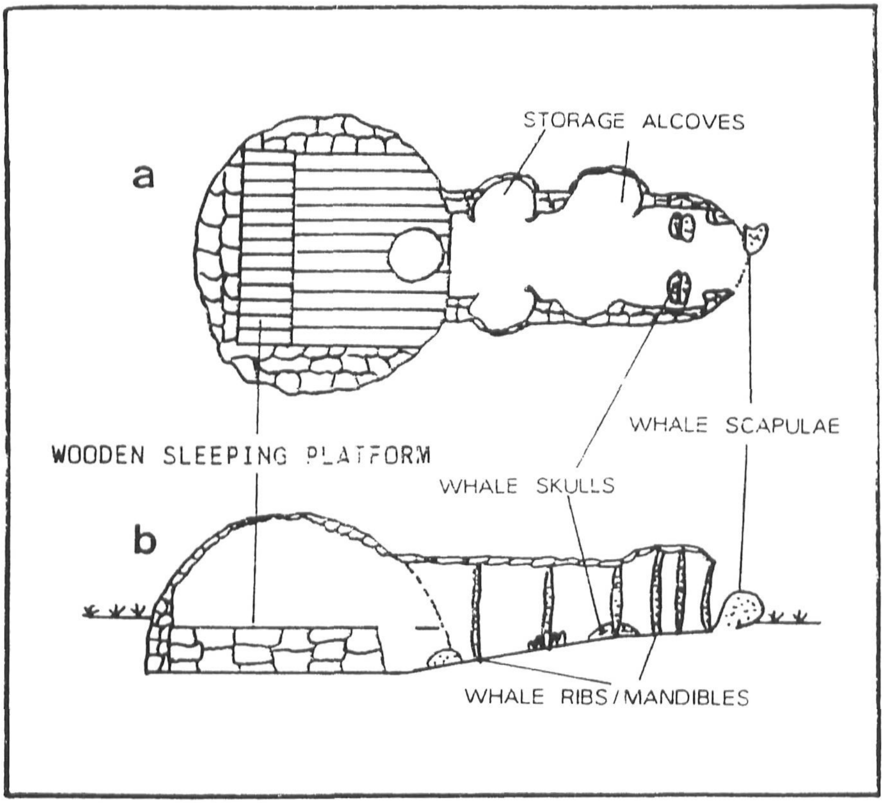


Figure 3. Cross-section of northwest Alaskan Eskimo whale bone and sod dwelling (from Savelle 1987: 57 after Spencer 1959: 49).

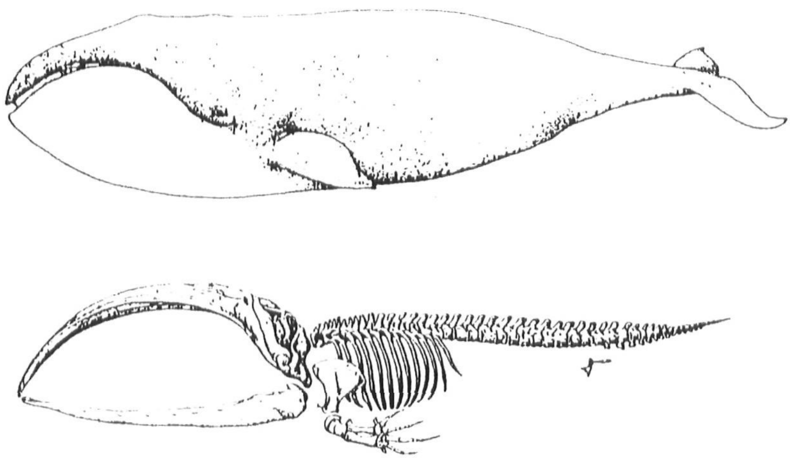


Figure 4. Bowhead whale and skeleton (from Savelle and McCartney 1999: 438).

Symbolism and Alaskan Inupiat dwellings

Inupiat winter houses were constructed with wooden main rooms, representing the body of the bowhead whale, and whale bone entrance tunnels which represented the whale's mouth (Lowenstein 1993; Rainey 1947). In Inupiat mythology, Tikigaq, the original Point Hope settlement, was created from a harpooned whale and all subsequent whales have emerged from the land to the sea through the whale bone entrance tunnels of Inupiat houses (Lowenstein 1993: 33, 42-50). *Katak* acted as transitional points between entrance tunnels and main rooms, and by extension, between the outside world and the mythical world within the whale's body. In Inupiat legends, women could create and hunt whales from the *katak* or take whaling gear from the sea through this hole. Entrance tunnels were reputed also to have supernatural qualities that were evoked in whaling rituals. With each new moon in the fall, married women in Tikigaq stood on top or in the entryway of the whale bone entrance tunnels and asked the moon man, Alinnaq, to drop a whale into her *immiun,* the sacred wooden bowl used to give water to harvested animals. The whales caught by their husbands during the spring hunt were believed to be the same whales given to the women during this ritual (Lowenstein 1993: 129; Pulu *et al.* 1980: 15-16; Rainey 1947: 253).

The association between women and the whale's soul is illustrated succinctly in the Inupiat myth of the whale and the raven. A raven flies through the mouth of a bowhead whale, and finds within the chest cavity a young woman tending her lamp. She must leave the room through the entrance every few minutes and in her absence, the raven tastes the lamp oil. The woman then falls into the house dead as the whale itself begins to die. The lamp goes out, and in the darkness, the raven begins to suffocate. This mythic account illustrates well how the whale bone house represents the whale, the woman the whale's soul, and the lamp its heart (Lowenstein 1993: 40-45; Nelson 1899: 464-465; Rasmussen 1952: 24-25).

Although married couples acted as partners for most hunting activities, the relationship between the umialik ('owner of a whaling boat')'s wife and the bowhead whale was much stronger than with any other animal (Bodenhorn 1990: 64). This is because, as Larsen (1995: 207) states, "[t]he activity of whaling penetrated nearly every aspect of coastal Inupiat life around the turn of this [19th] century. Economics, social organization and regulation, and ceremonialism were all intertwined with these 'largest animals'." Women's actions within bowhead whaling ceremony were intended to negotiate the relationship between the hunters and the bowhead whale. Through rituals performed in houses, women sought to influence the outcome of the whale hunt, reiterating the symbolic associations of the domestic house. Prior to the *umiaq* ('whaling boat') launch, the harpooner enacted a ritual "harpooning" of the *umialik*'s wife at the floe edge. The woman then returned to her house and was subjected to a series of restrictions, which impeded the whale's escape and augmented the whalers' success (Lantis 1938: 445-459; Lowenstein 1993: 38-50, 144-145; Rainey 1947: 259; Rasmussen 1952: 25-26; Søby 1969-1970: 47-54; Spencer 1959:338). At Tikigaq, women behaved as if they were ill, refrained from any movement and removed one *kamik* ('boot') as the first step in preparation for bed. These acts were carried out to confuse the whale's soul into believing it was tired and weak. At Utqiagvik, women could not use knives or the harpooner's line would break, nor could they sew or make any noise. Moreover, if a woman stooped upon entering her house, the whale might be lost under the pack ice (Spencer 1959: 338). A woman was permitted to move, but only very slowly, through the house. She had to think peaceful thoughts and be generous (Bodenhorn 1990) so that the whale she represented might be generous with the hunters.

Historic period *qargit* were ceremonial, social and political centres and the focal point around which whaling crews were formed and operated (Lowenstein 1993: 33; Rainey 1947; Sheehan 1990, 1995). Although driftwood was generally readily available in this area, bowhead mandibles and ribs were the primary entrance building material (Murdoch 1892: 72-73; Lowenstein 1993: 32-33; Spencer 1959: 51-52) and as such, carried overt symbolic associations with whaling activity. *Qargit* ideological properties were enacted during a pre-hunt ceremony where a shaman, representing a bowhead whale, stood beneath the *katak* and poked his head through the hole repeatedly to receive water from the women inside (Lowenstein 1993: 110; Rainey 1947; Victor 1987). The wives of successful *umialgit* ('owners of whaling boats') greeted harvested whales at the flensing site in this same manner using the same water container. Whale bone was also used selectively within the main room, drawing attention to the critical role of the whole *qargit* within whaling ceremonialism. Lowenstein (1993: xxxi, 33), for example, notes that two whale mandibles were mounted in the wooden walls of each *qargi*, to insure that all celebrations took place in the presence of the bowhead whale, the community's provider.

In Alaska, *qargit* functioned much of the time as work and social houses for men (Lantis 1947: 104-107; Spencer 1959: 186-188), while women's day-to-day activities and their mythic roles were situated within the winter house. Rainey (1947: 247) and Lowenstein (1993: 114-115) however, record women as full participants in some pre-whaling ceremonies that took place within north Alaskan *qargit*. Prior to "the sitting," for example, the *umialgit* painted pictures of whales being harpooned or trapped on the whale mandible arch within the *qargi*. Food brought into the *qargi* by *umialgit*'s wives was first presented to these images (Lowenstein 1993: 116; Rainey 1947: 247-249). Inupiat elders at Utqiagvik are still familiar with this practice, although whale bone is no longer employed in house construction (Kilmarx 1990b: 4).

Symbolism and Canadian Arctic Inuit dwellings

By the time European explorers, and later ethnographers, entered the eastern and central Arctic, extensive bowhead whaling was no longer a facet of Inuit societies. Nevertheless, Inuit societies in this region share many elements of their ideology, ritual and architecture with Alaskan Inupiat. For example, *qargit* were constructed by most groups in the central and eastern Arctic despite the absence of the *umialgit-qargit* whaling complex. Most important, Inuit women in the Foxe Basin and Labrador played critical roles during the limited whaling that took place; roles that highlight the common Thule ancestry of both Inupiat and Inuit groups. Iglulik women had to loosen their clothing and lie still in their tents with relaxed limbs, to keep the struck whale from driving the *umiat* out to sea (Lantis 1938: 460; Rasmussen 1929: 187; Søby 1969-1970: 53-54). In Labrador, women sat motionless so that their coat tails would not move on the sleeping platform. They were forbidden also to eat whale meat or sew. If the women left their houses during the hunt, the whale would fight its pursuers, making the catch difficult and dangerous (Taylor 1985: 127).

In addition, Inupiat ideas about gendered division of labour and space permeate much of Inuit ideology. As amongst North Alaskan Inupiat societies, women's positions were traditionally defined by their control over the storage, preparation and distribution of food to their families (Bodenhorn 1990: 65; Oosten 1986: 127). Kitchen and food storage areas were often physically restricted and confined to adjuncts off the living area or entrance tunnel, to alcoves or to carefully constructed lamp stands and work areas (Dawson 1995: 77). Inuit women also were associated through ceremony to Sedna (the sea goddess), whales and the domestic house (Oosten 1983: 150, 1986: 127; Sabo and Sabo 1985: 81; Saladin d'Anglure 1978). In Cumberland Sound, for example, Sedna was said to live at the bottom of the sea in a house made of stone and whale ribs (Boas 1901: 119).

Material correlates of architectural symbolism

As noted above, in their domestic architecture, Alaskan Inupiat symbolised the mouth of the bowhead whale by using abundant whale bone in the entrance tunnel. The main rooms were considered to represent the whale's body, even though these were typically constructed with a wooden frame (Lowenstein 1993: 41-44). For the Thule inhabiting the whaling regions of the central and eastern Canadian Arctic, wood and other building materials were typically very rare, thus entire dwellings tended to be constructed primarily of whale bone (McCartney 1979b; Maxwell 1985) (see Figure 4 for bowhead whale skeleton). Under these circumstances, did the central and eastern Arctic Thule build their houses to represent the bowhead whale? We suggest that the material correlates of bowhead whale symbolism might be recognised in the relative proportions and placement of whale bones within individual structures, in particular any whale bone combination that may emphasise the whale's mouth *vis-à-vis* the entrance tunnel.

Application to eastern Canadian Arctic Thule dwellings

Study sites

The southeast coast of Somerset Island is particularly well suited for a study of the symbolic dimensions of Thule architecture because Prince Regent Inlet is one of the earliest central Arctic waterways accessible to bowheads in midsummer and a large number of Thule winter village sites are found along the adjacent coastline. Research by McCartney and Savelle (McCartney 1979b; McCartney and Savelle 1985, 1993; Savelle 2000; Savelle and McCartney 1994, 1999) has demonstrated that these sites contain a large number of bowhead whale remains relative to other areas in the central and eastern Arctic.

For her M.A. thesis on the ideological dimensions of whale bone use in Thule winter houses, Patton (1996) examined 31 dwellings at Thule village sites from the southeast coast of Somerset Island: PaJs-13, PaJs-2, and PaJs-3 (Figure 2). PaJs-3 is located on a narrow peninsula extending north of Hazard Inlet into Prince Regent Inlet. There are 13 houses at this site clustered along a beach ridge. Artifacts from PaJs-3 suggest it was inhabited A.D. 1200-1500 (Savelle 2000). PaJs-2 (Qariaraqyuk) is a very large village site situated at the base of a scree slope directly across Hazard Inlet from PaJs-3. Whitridge (1999: 1) states that 350 people may have been living at PaJs-2 during its peak occupation circa A.D. 1200-1400 (see Whitridge [1999] for a detailed discussion and analysis of this site). PaJs-13 is located approximately 6 km north of Mount Oliver along a series of raised beach ridges. An upper ridge of smaller houses, containing very little whale bone, may represent an early Thule occupation of the area. Twenty houses were constructed along lower beach ridges, a sample of which is included in this study. Six houses were excavated by Savelle, one of which is documented by Habu and Savelle (1994) and Savelle and Habu (2004) and dates from approximately A.D. 1300-1500. Three houses located between PaJs-13 and PaJs-2 were also included in this study. These houses have not received individual Borden designations, and thus are named Pond House North (PHN), Pond House South (PHS) and the Camp Stream Site house (CSS) for the purposes of this study.

Methods

Sketch maps of all houses included in this study were made in 1994 and the location of each whale bone element, and internal and external dimensions of main rooms and entrances were recorded (*e.g.*, Figure 5). Post-abandonment mining of archaeological sites to collect mandibles for sled runners by later prehistoric or historic occupants and the removal of bone by modern carvers have been well documented (McCartney 1979a, 1979b), and the study houses have undoubtedly been affected by such activities. For this reason, only those dwellings with a total whale bone Minimum Animal Units (MAU) value of 5 or greater (a total of 18 houses) were included in this analysis. The removal of complete bones is impossible to quantify, although removed crania often leave recognisable depressions. Few complete mandibles were observed in the houses selected for this study, yet the high number of cut or fractured mandibles suggests that most original mandibles are represented in these houses, as embedded or loose proximal ends (Habu and Savelle 1994: 13-14; McCartney 1979a: 307-308, 1979b: 25).

Surface evaluations of this sort have been undertaken by a number of scholars working in the high Arctic and they appear to provide good indications of the complete above and below ground assemblage. For example, Dawson's (2001) and Whitridge's (1999) recent examinations of whale bone distribution across Thule village sites were based on surface evaluations. Savelle and McCartney (2002) have demonstrated also that there is a positive correlation between surface visibility and total buried

Figure 5. Map of PaJs-13, house 7.

assemblage, even with smaller structural elements such as ribs, scapulae and cervical vertebrae[1]. Following Patton (1996) however, vertebrae (other than cervical vertebrae) are excluded from the present study because they have the least surface visibility of any bone. Hyoid and flipper elements, are excluded also because they most likely represent food portions (see Savelle 1997; Whitridge 1999: 217-218). Bone fragments and any bones entirely exposed on the surface were mapped, but are not considered in this analysis, because it was not possible to determine their original placement.

The ethnographic data summarised previously suggests that if whale bone is used in houses to symbolise the bowhead whale, as well as for architectural purposes, relative frequencies of certain elements may vary between the entrance tunnel and main room. Accordingly, bones were assigned to either "main room" or "entrance." Any element within 1 m of the entrance tunnel or main room was ascribed to its respective area. Individual bone element counts were converted to Minimum Animal Units (MAU). MAU is determined by dividing element counts within the study assemblage by the element frequency in the anatomy of the living animal. This is a useful means of examining variability in the deposition of animal parts; or in this case, the procurement, processing and transportation of bowhead whale body parts (Banning 2000: 102-103; Binford 1984: 50-51).

In order to explore variability in whale bone patterning, we used the Spearman's Rho test to examine the relationship between ranked data sets. MAU values were ranked for each main room and entrance tunnel and correlated with a modified version of Savelle's Architecture Utility Index (1997; Savelle and McCartney 2002). The Architectural Utility Index for bowhead whale bone (Table 1) ranks whale bone according to its potential utility in constructing roofing material ("frame") and supporting material ("bulk"). High ranking "frame" elements include maxillae, mandibles and premaxillae, while high ranking "bulk" elements include crania. MAU values were also subjected to an exploratory principal components analysis.

Table 1. Architectural utility index (after Savelle and McCartney 2002) showing values for elements used in this study.

Bone	Frame Utility	Bulk Utility	Combined Frame and Bulk Utility	Meat Utility
cranium	.	9	9	3.8
maxilla/premaxilla	3	.	8	7.55
mandible	4	.	9	7.55
cervical vertebrae	.	8	8	4.3
vertebra	.	6	5	82.2
rib	2	.	7	39.7
scapula	1	.	6	4.8

1 Excavated houses produced a Spearman's Correlation Coefficient between the Architectural Utility Index (Savelle 1997; Savelle and McCartney 2002) and Minimal Animal Units (MAU) of .800 or higher. At unexcavated sites, 15/20 showed positive correlations between the Architectural Utility Index and MAUs between .618 and .946.

Results

Architectural utility and whale bone selection

Bone element MAUs for individual dwellings, entrances and main rooms are listed in Figures 6 and 7. The MAU values for the total combined assemblage of all 18 dwellings (Table 2) show a very strong positive correlation with the architectural utility index (r_s[2] = .837, p[3] = .019). These relationships hold for both overall main room (r_s = .765, p = .076) and entrance (r_s = .736, p = .096) assemblages. These values are consistent with the selection of bone with high architectural values for overall dwelling construction purposes. There is some variation at the individual dwelling level, but with the exception of dwelling PHN, the strong correlation pattern is generally consistent throughout the assemblages. This same pattern, again with some variation, and again with the exception of dwelling PHN, is followed when individual main rooms are considered separately. However, within individual entrances, two (PaJs-13 H9 and PHN) show moderate negative correlations and four (PaJs-13 H8, PaJs-3 H4, H6, and CSS) show no correlation. These particular entrances contain little whale bone relative to their associated main rooms, which may be the result of extensive "mining" for whale bone or other post-occupational processes; factors contributing to these results cannot be determined without excavation. Overall these results suggest that initial whale bone selection was dependent primarily on architectural utility.

Principal components analysis

In order to explore variability in the internal arrangement of selected whale bone elements, principal components analyses (PAC) were performed on the individual data sets (main rooms and entrances). Principal components analysis is a statistical method that examines how a large number of quantitative variables are related to each other through the reduction of the variables to a small number of "components." The components identified by the analysis represent an average of the initial variables that correlate very strongly (Dawson 2001; Shennan 1997: 269-287; SPSS 1999; Williams 1992: 176-194). Each component is independent of all others, with the first identified component accounting for the largest amount of variation in the sample, the second component the second largest, and so on. Although principal components analyses produce as many components as there are variables, we examine only those with eiganvalues[4] higher than 1.0. These are the most important components as values below 1.0 explain less variation than a single independent variable. Furthermore, for

2 r_s value shows the strength of the correlation.

3 p value represents the probability that the correlation is statistically significant.

4 An eiganvalue is the sum of the squared loadings (*i.e.* correlations) of individual variables for each component. In essence, it measures the variation accounted for by each component and reflects the relationship, or correlation, between the original variables (Shennan 1997: 278-279).

Table 2. Spearman's correlations of whole house, main room and entrance tunnel MAUs with architectural utility index.

House	House totals	Entrance tunnels	Main room
PaJs-13 house 7	r_S=.909 p=.005	r_S=.599 p=.249	r_S=.985 p=.000
PaJs-13 house 8	r_S=.807 p=.028	r_S=.000 p=1.000	r_S=.687 p=.132
PaJs-13 house 9	r_S=.727 p=.064	r_S= -.348 p=.499	r_S=.765 p=.076
PaJs-13 house 10	r_S=.991 p=.000	r_S=.609 p=.199	r_S=.985 p=.000
PaJs-13 house 16a	r_S=.944 p=.001	r_S=.907 p=.013	r_S=.907 p=.013
PaJs-13 house 17	r_S=.972 p=.000	r_S=.896 p=.016	r_S=.907 p=.013
PaJs-3 house 1	r_S=.844 p=.017	r_S=.687 p=.132	r_S=.657 p=.156
PaJs-3 house 4	r_S=.727 p=.064	r_S=.000 p= 1.000	r_S=.618 p=.191
PaJs-3 house 5	r_S=.991 p=.000	r_S= .896 p=.016	r_S=.985 p=.000
PaJs-3 house 6	r_S=.936 p=.002	r_S=.000 p= 1.000	r_S=.896 p=.016
PaJs-3 house 9	r_S=.862 p=.013	r_S=.375 p=.464	r_S=.864 p=.027
PaJs-3 house 10	r_S=.954 p=.001	r_S=.844 p=.035	r_S=.925 p=.008
PaJs-2 house 1	r_S=.837 p=.019	r_S=.806 p=.053	r_S=.500 p=.312
PaJs-2 house 2	r_S=.807 p=.028	r_S=.591 p=.217	r_S=.870 p=.024
PaJs-2 house 3	r_S=.837 p=.019	r_S=.687 p=.132	r_S=.853 p=.031
PaJs-2 house 4	r_S=.807 p=.028	r_S=.687 p=.132	r_S=.687 p=.132
Camp stream site	r_S=.844 p=.017	r_S=.000 p= 1.000	r_S=.745 p=.088
Pond house north	r_S=.367 p=.418	r_S= -.455 p=.365	r_S=.090 p=.866
Totals	r_S=.837 p=.019	r_S=.736 p=.096	r_S=.765 p=.076

each analysis varimax rotation[5] is employed, and matrix values less than 0.20 are suppressed. The results of the principal components analysis for main room and entrance assemblages are presented in Tables 3 and 4 respectively.

Although principal components analysis is a powerful statistical tool that illuminates underlying patterns within data, it can also produce patterned results from random data and thereby contribute to false interpretations (Dawson 2001; Shennan 1997: 262; Vierra and Carlson 1981). We use principal components analysis in this study however, in an exploratory manner only to see if patterns emerge from the data which might explain whale bone placement as a symbol of the bowhead whale.

Given the small MAUs for scapulae, ribs and cervical vertebrae, we comment on the results in general terms only. In the main room, three components had eiganvalues greater than 1.0 and these accounted for 78% of the total variance within the data set. In the entrance tunnel, three components also had eiganvalues greater than 1.0 and these explained 74% of the total variance. The results reveal a most interesting pattern with regards to crania. These elements tend to be negatively associated with other elements in the main rooms as reflected in components 1 and 2 (Table 3). In the entrance tunnel however, crania are grouped with maxillae and cervical vertebrae. This association is reflected in component 2 and accounts for 21% of the variance within the data (Table 4). The results indicate that crania are well associated with these other elements in entrance tunnels, but not in main rooms.

Table 3. Principal components analysis results for main rooms.

	Component		
	1	2	3
Crania	-0.732	-0.297	0.242
Maxillae		0.932	
Mandible	0.514	0.676	0.409
Cervical v.	0.571	-0.298	0.591
Ribs		0.205	0.908
Scapulae	0.764		

Extraction method: Principal component analysis.
Rotation method: Varimax with Kaiser normalisation.
Rotation converged in 7 iterations.

5 Varimax rotation produces maximal loadings of individual variables within specific components such that components are more readily differentiated (*e.g.*, Wiliams 1992: 184-187). Varimax rotation is often used in principal components analysis to maximise differentiation between components (Dawson 2001: 461).

Table 4. Principal components analysis results for entrance tunnels.

	Component		
	1	2	3
Crania		0.884	-0.308
Maxiallae	0.592	0.583	
Mandible	0.824		
Cervical v.	0.299	0.705	
Ribs	0.729		-0.341
Scapulae			0.963

Extraction method: Principal component analysis.
Rotation method: Varimax with Kaiser normalisation.
Rotation converged in 6 iterations.

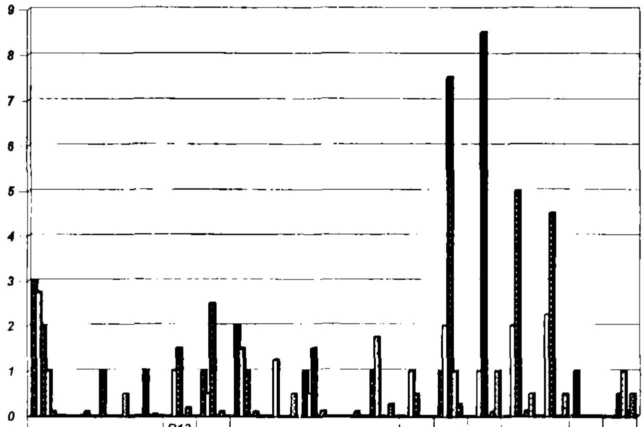
Discussion

There are a number of possible explanations for the distributions of whale bone within the study houses. First, much of the variability discussed above could be explained from purely materialistic perspectives. For example, the paucity of crania at the PaJs-2 houses may indicate that the inhabitants of this site were further from the major bowhead processing site, probably located at least 5 km to the east on the open coast (see Savelle 1987). Second, some of the variability between houses could be explained chronologically. Dawson (2001: 467-468) for example, has argued that cooling temperatures and the resulting changes to sea ice cover around Bathurst Island would have affected the availability of bowhead whales and later-period occupants' access to high-cost raw materials. Changing access to raw materials could explain some of the variability observed among the houses on southeastern Somerset Island, but over half of the crania at the study sites are found in just four houses. This uneven distribution of crania throughout the sample may imply that when they do occur, crania represent an aspect of Thule architecture that is consciously non-utilitarian. The association of maxillae with crania and cervical vertebrae as a separate component in the factor analysis for the entrance tunnel assemblages may reflect their use as complete fused units. No such association occurs in the main rooms, where crania and maxillae are weakly negatively correlated. Use of whale bone in this manner suggests that some Thule may have constructed houses to represent the bowhead whale by emphasising the whale's mouth in the entrance tunnel. As MacDonald observes (1979: ix) "[t]he large whale skulls perched over the entryway and the imposing rafters of the whale jaws leave an impression on entering one of them that you are actually entering into the whale itself, a potent image that I am sure did not escape the ancient Thule people who built them."

In addition to the houses within this study, two further structures at PaJs-13, house 2 and house 5, exhibit large numbers of *in situ* crania relative to other bone elements in the entrance tunnel (*e.g.*, Habu and Savelle 1994; Savelle 1997; Savelle and Habu 2004). The ideological aspects of house 5 can be explained by its service as a *qargi*. The second structure (house 2; Savelle 1991) is a residential dwelling, and its bowhead crania entrance tunnel may also reflect Thule social and ideological principles. This interpretation is supported by the historical association between women and the bowhead whale in various Inuit and Inupiat societies.

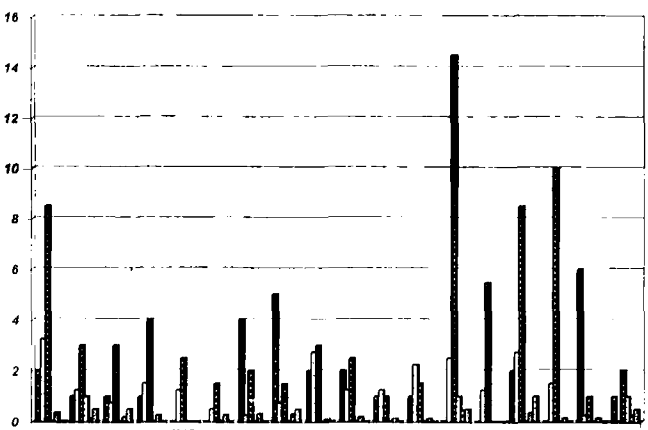
It is readily apparent however, that not all entrance tunnels of Thule winter dwellings in the study sample were constructed with the same association between crania, maxillae and cervical vertebrae (Figures 6 and 7). Differences in whale bone quantity and kind between houses could reflect differential access to whale bone both within and across the sites examined. Before the commercial whaling period in North Alaska, successful Inupiat *umialgit* took the choicest whale bone elements, namely the whale's jawbones, after the hunt. These *umialgit* were then able to construct long and elaborate whale bone entrance tunnels that reflected their success in whaling and their status within the community (Lowenstein 1993: 33, 161-166; Pulu *et al.* 1980: 25). Whitridge (1999: 209-212) and Savelle and Wenzel (2002) have suggested that settlement patterns exhibited at Thule winter village sites were formed partly by the same kin-based social structure implicit in historic Alaskan villages. Large bi-lobate and tri-lobate houses clustered around *qargit* and provided the labour required to hunt, butcher and prepare whale products. At PaJs-2, Whitridge (1999) provided evidence that greater whaling participation was associated with these large, well-built houses, which also contained higher proportions of wealth and ritual paraphernalia than smaller, ephemeral houses. Whale crania within the kitchen wall and over the exterior tunnel mouth of many dwellings at PaJs-3 and PaJs-13 also suggest that certain households, namely successful whaling households, had the resources to invest in the ritual aspects of domestic architecture (Whitridge 1999: 248-250, 275). Dawson (2001) also interprets variability in whale bone element use between Thule winter houses on Bathurst Island as a reflection of household status. He argues that houses replete with high-cost whale bone elements, such as maxillae and mandibles may represent higher status households directly involved in whaling. Such households also may have restricted access to these elements, so that other households were limited to constructing houses from predominately low cost elements, such as ribs.

Similarly, the results of this study suggest that differential use of whale bone between houses may have been determined by access to raw materials through household involvement in whaling activities. Entrance tunnels exhibiting correlations between crania, maxillae and cervical vertebrae represent the whale's mouth and these dwellings in turn were constructed by wealthier whaling households. Assuming that whale bone was divided amongst Thule *umialgit* in a manner not unlike the Inupiat, the most successful *umialgit* would have had the resources to use whale bone in a non-utilitarian fashion. These households could construct entrance tunnels representing the bowhead whale's mouth, an integral part of Thule cosmology, and at the same time, transmit important social status information to other households and communities. Less successful *umialgit*, or crew members, might only have had enough to use this resource in a purely utilitarian manner.



	P13 H7	P13 H8	P13 H9	P13 H10	P13 H16 a	P13 H17	P3H 1	P3H 4	P3H 5	P3H 6	P3H 9	P3H 10	P2H 1	P2H 2	P2H 3	P2H 4	CS S	PH N
Crania	3	0	1	0	0	1	2	0	1	0	1	0	1	0	0	0	1	0
Maxillae	2.75	0	0	0	1	0.5	1.5	1.25	0.5	0	1.75	1	2	1	2	2.25	0	0
Mandibles	2	0	0	1	1.5	2.5	1	0	1.5	0	0	0.5	7.5	8.5	5	4.5	0	0.5
Cervical Vertebrae	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Ribs	0.1	0.1	0	0.04	0.19	0.1	0.1	0	0.12	0.1	0.27	0	0.27	0.1	0.12	0	0	0.12
Scapulae	0	0	0.5	0	0	0	0	0.5	0	0	0	0	0	1	0.5	0.5	0	0.5

Figure 6. Minimum animal units (MAU) for entrance tunnels. MAU were determined using standard zooarchaeological procedures (Lyman 1994: 104-113). See also Savelle (1997).



	P13 H7	P13 H8	P13 H9	P13 H10	P13 H16 a	P13 H17	P3H 1	P3H 4	P3H 5	P3H 6	P3H 9	P3H 10	P2H 1	P2H 2	P2H 3	P2H 4	CS S	PH N
Crania	2	1	1	1	0	0	4	5	2	2	1	1	0	0	2	0	6	1
Maxillae	3.25	1.25	0.75	1.5	1.25	0.5	0.25	0.75	2.75	1.25	1.25	2.25	2.5	1.25	2.75	1.5	0.25	0
Mandibles	8.5	3	3	4	2.5	1.5	2	1.5	3	2.5	1	1.5	14.5	5.5	8.5	10	1	2
Cervical Vertebrae	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Ribs	0.35	0.12	0.19	0.26	0	0.27	0.31	0.31	0.1	0.19	0.12	0.12	0.46	0	0.35	0.15	0.15	0.27
Scapulae	0	0.5	0.5	0	0	0	0	0.5	0	0	0	0	0.5	0	1	0	0	0.5

Figure 7. Minimum animal units (MAU) for main rooms.

Preferential use of whale bone also appears to have been associated with the construction of *qargit*. Although the Alaskan Inupiat *qargit* have been interpreted as communal houses, they were typically owned by wealthier *umialgit* (Burch 1981: 45; Sheehan 1995). Assuming again that whale bone distribution among Thule *umialgit* occurred in a manner similar to the Inupiat, successful *umialgit* could have provided large quantities of the prized bowhead elements to construct their *qargit*, regardless of whether they were actually "owned" or not (Savelle 2000 has examined this in detail on a regional scale).

Conclusion

This study suggests how ideological and social factors may have been embedded within Thule whale bone dwelling architecture. Archaeologists can begin to understand these factors through a prudent interpretation of archaeological material that is illuminated by ethnographic and oral history records. As Thule moved into the central Arctic, they were confronted with an environment similar to the north Alaskan coast, but which lacked a lumber source and locally differed in the seasonal availability of bowhead whales. In order to incorporate the same ideological components into their winter houses and *qargit*, the people living on Somerset Island had to make some adjustments. The distinction between the main room and entrance tunnel could be made by manipulating the placement of particular whale bone elements, in particular the use of crania, maxillae and cervical vertebrae in entrance tunnels. The exploratory principal components analysis shows that these elements correlate relatively well in entrance tunnels overall. On an individual basis, some houses conform to this pattern more strongly than others, which may be partially due to the fact that crania are widely unevenly distributed between dwellings. In sum however, the results suggest that some Thule, perhaps wealthier whaling-related households, constructed their houses to symbolise the complex relationship between bowhead whales and Thule society. This interpretation is supported by recent work by Habu and Savelle (1994), Dawson (2001) and Whitridge (1999) concerning the ideological and social facets of Thule winter dwellings in the central Arctic.

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