

Archaeofaunal signatures of specialized bowhead whaling in the Western Canadian Arctic: a regional study

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ABSTRACT

Zooarchaeologists continue to experience difficulty defining the importance of bowhead (*Balaena mysticetus*) whaling in Neoeskimo coastal deposits. The large size of bowhead bones, combined with their use as structural elements in Neoeskimo architecture, creates a suite of taphonomic issues that tend to obscure their usefulness as a measure of relative abundance, and thus as an overall economic indicator. Here we present a regional approach that focuses on contrasts in relative taxonomic abundance between sites with diverse economic signatures, supported by related differences in element frequencies, site locations, features, artefact frequencies, and manufacturing detritus. Using this approach, a generalized picture of the relative importance of bowhead whales in Neoeskimo subsistence economies can be assembled. Such an analysis, applied to the archaeological record of the Mackenzie Inuit, or Siglit, reveals the role that bowhead whaling played in subsistence economies from the 15th to 19th centuries AD. Specifically, the archaeological record indicates that the prehistoric *Qikiqtaryungmiut* and *Nuvugarmiut* practiced specialized bowhead whaling at coastal promontories, though the seasonal scheduling and success rate of these hunts contrasted considerably.

KEY WORDS

Mackenzie Inuit,
Siglit,
Meat weight,
Specialization,
Bowhead Whaling.

RÉSUMÉ

Répartitions typiques des restes archéofauniques de la chasse spécialisée à la baleine boréale dans l'Arctique de l'ouest du Canada : une étude régionale.

Les archéozoologues continuent d'éprouver de la difficulté à définir l'importance de la baleine boréale (*Balaena mysticetus*) dans les sites néoesquimaux. La grande taille des os de cette baleine, combinée avec leur utilisation comme éléments de construction dans l'architecture néoesquimaude, crée une série de questions taphonomiques qui tendent à obscurcir leur utilité comme mesure d'abondance relative, et donc comme indicateur économique. Des approches utilisant la biométrie, les isotopes, l'utilisation des éléments (à la fois architectural et social) et la boucherie sont utiles pour déterminer que la chasse à la baleine faisait partie des économies de subsistance néoesquimaudes. Nous présentons ici une approche régionale qui se penche sur les différences d'abondance taxinomique relative entre sites ayant diverses signatures économiques. Cette approche est appuyée par des différences corrélatives dans les fréquences d'éléments, les emplacements des sites, leurs caractéristiques, les fréquences d'objets témoins et les débris de fabrication. De cette manière, une image généralisée de l'importance relative des baleines boréales dans les économies de subsistance néoesquimaudes peut être avancée. Cette analyse, appliquée au dossier archéologique des Inuit du Mackenzie, ou Siglit, révèle le rôle que la chasse à la baleine boréale occupa dans les économies de subsistance du xv^e au xix^e siècle de notre ère. Plus précisément, les données archéologiques indiquent que les *Qikiqtaryungmiut* et les *Nuvugarmiut* préhistoriques pratiquaient la chasse spécialisée à la baleine boréale sur des promontoires côtiers, bien que le temps de l'année et le taux de réussite de ces chasses furent considérablement différents.

MOTS CLÉS

Inuit du Mackenzie,
Siglit,
poids de viande,
spécialisation,
chasse à la baleine
boréale.

INTRODUCTION

Developing an understanding of the role of bowhead (*Balaena mysticetus*) whaling in Neoeskimo economies has proven to be one of the most enduring issues in Arctic zooarchaeology. A host of cultural and natural taphonomic processes are known to distort the signature of mysticete remains in faunal assemblages, which has led to difficulties in assessing both the existence and intensity of bowhead whaling in Arctic contexts. In this paper, we discuss the issue of bowhead whaling among the pre-contact Mackenzie Inuit, or *Siglit*, the ancestors of the modern Inuvialuit, during the period between ca. 1400 AD and 1900 AD. We adopt a regional approach that focuses on contrasts in relative taxonomic abundance between sites with diverse economic signatures, and augment this analysis by considering related bowhead element frequencies,

site locations, site features, artefact frequencies, and manufacturing detritus. Using this broadly-based analytical framework, a generalized picture of the relative importance of bowhead whales in Mackenzie Inuit economies can be assembled.

THE BOWHEAD WHALING ENIGMA AND ITS WESTERN ARCTIC MANIFESTATION

In the Eastern Canadian Arctic, more than 30 years of intensive research has documented the central role of whaling in many prehistoric Neoeskimo economies. Zooarchaeologists have demonstrated the selective and intensive hunting of whales using: 1) artefactual data (McCartney 1980); 2) isotopic signatures of diet (e.g. Coltrain 2009; Coltrain *et al.* 2004); 3) biometrical analysis of bowhead skeletal

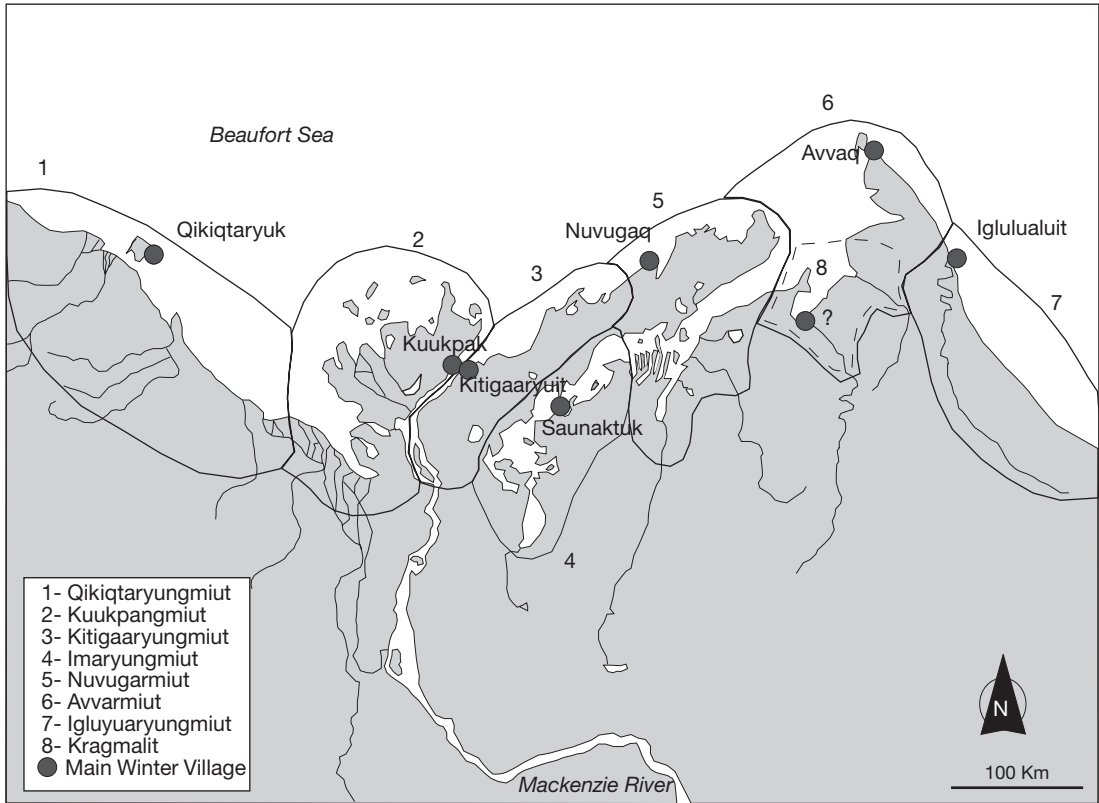


Fig. 1. — Mackenzie Inuit (Siglit) main winter villages and territories (after Betts 2009:Fig. 2).

elements (McCartney 1995; Savelle & McCartney 1994), 4) comparison of naturally stranded and archaeological whale bone assemblages (Savelle *et al.* 2000); and 5) broadly based approaches that incorporate site structure, faunal remains, and site location (McCartney & Savelle 1985; Savelle & McCartney 1988, 1990, 1991, 1999).

This research has largely been facilitated by the great cetacean bone yards of the Central Arctic Archipelago. In the Western Canadian Arctic, however, Neoeskimo sites contain little bowhead bone; therefore the nature of ancient bowhead whaling is poorly understood. In fact, there is a near complete absence of bowhead bone in the majority of archaeofaunal assemblages in the Western Canadian Arctic. In a recent regional survey, Betts (2008) documented 26 distinct faunal assemblages

totaling 162,388 identified faunal specimens, of which only 72 were identified as bowhead whale - less than five one hundredths of one percent of the entire faunal assemblage.

Four explanations are possible for this lack of bowhead remains. First, coastal erosion is significant in this area of the Arctic, and both coastal whaling sites and flensing/processing areas may now be completely destroyed. However, coastal erosion is a significant issue in Northern Alaska and whale bone is common on sites located at whaling promontories (Savelle & McCartney 2003). Second, unlike the Eastern Canadian Arctic, the abundance of driftwood in the Mackenzie Delta resulted in an architectural tradition that did not incorporate bowhead bone, meaning that these remains were probably mostly discarded in special



FIG. 2. — Bowhead whale mandible eroding from bank at McKinley Bay, Northwest Territories.

flensing and butchery areas (being too bulky to be returned to village or house sites). Third, bowhead bone, and its incorporation into architecture, was ritually significant to Eastern Arctic Thule peoples (Patton & Savelle 2006; Savelle & Vadnais 2011); perhaps different spiritual relationships existed between humans and bowhead whales in the Western Canadian Arctic that resulted in less bowhead bone incorporated into *Siglit* architecture. Finally, bowhead whaling in the Western Canadian Arctic simply may not have been as productive as it was in the great whaling corridors of the Central Arctic and Alaska, thus leaving less physical evidence of this practice.

This latter point is challenged by the early ethnohistoric record and Inuvialuit themselves, who describe intensive bowhead whaling by coastal Mackenzie Inuit groups (Fig. 1). Painted wooden plaques created by Mackenzie Inuit in the middle 19th century depict a bowhead whale hunt from an umiak (Morrison 2006:354), and oral histories describe specific rituals and taboos surrounding the traditional bowhead whale hunt (Metayer 1966:7-72). In fact, three distinct whale hunts are mentioned in the ethnohistoric record, each conducted by separate Mackenzie Inuit societies. For example, at Nuvugaq, in 1850, the Nuvugarmiut were documented to have taken three whales (M'Clure 1969:87) in a single season. The economic, social, and ritual importance of this hunt is underlined

by the observation that the Nuvugarmiut lived in houses surrounded by as many as 21 bowhead whale skulls (Richardson, in Franklin 1971: 217). Similarly, the Avvarmiut, whose main winter village was at Avvaq on Baillie Island, took three whales in 1848 (Richardson 1851:267). Both of these hunts were described as late summer or early fall open water hunts which would have coincided with the bowhead return migration in late August or early September (Martell *et al.* 1984:24).

In 1826, the Qikiqtaryungmiut bowhead hunt was described as taking place soon after the ice fractured in July (Franklin 1971:126), and probably occurred along a major lead system that still forms 5 km northeast of the island today (Wadhams 1975:3). In 1837, Simpson (1843:116) mentioned seeing bowhead whale bones at what was probably Avadlek Spit, the location of a prehistoric Qikiqtaryungmiut settlement (see Friesen 1991). Recent aerial surveys indicate that the area to the northeast of Herschel Island is also an aggregation location for modern migrating bowheads in August and September (Hardwood & Smith 2002), and the possibility of an open water early fall hunt at Herschel Island should not be excluded. However, the aerial surveys indicate that the largest aggregation of bowheads during the fall migration occurs north of the Tuktoyaktuk Peninsula (Hardwood & Smith 2002: figure 3).

The fact that bowhead whaling villages and flensing areas have been destroyed by coastal erosion is incontrovertible. Nuvugaq, with its whale skull encircled house, is now completely destroyed by erosion, as is Avvaq at Baillie Island. These processes are ongoing, and Betts witnessed a bowhead mandible actively eroding into the Beaufort at McKinley Bay, a large Mackenzie Inuit site just across the bay from the historic whaling village of Nuvugak (Fig. 2). The destruction of these villages is certainly a contributing factor in our inability to identify coastal whaling in the Western Canadian Arctic.

Nevertheless, many coastal village sites still survive, and are located at promontories where bowhead whales would have been accessible. Figure 3 displays the location of extant coastal archaeological sites compared to bowhead aggregations (following Mar-



Fig. 3. — Locations of bowhead whale aggregation areas (after Martell *et al.* 1984; Fraker *et al.* 1978, and Harwood & Smith 2002).

tell *et al.* 1984, Fraker *et al.* 1978, and Harwood & Smith 2002). If the nature of bowhead whaling is to be properly defined in the Western Canadian Arctic, and by extension in other regions, these sites, and the faunal assemblages derived from them, should provide the best evidence. It is this core group of sites that we focus on for the remainder of the paper; all are best described as winter village sites (Betts 2008) and all faunal assemblages are derived from semi-subterranean winter house structures (for detailed descriptions of the contexts see Betts 2008). Sample sizes for these faunal assemblages range between 838 and 1867 NISP (number of identified specimens), which should be sufficient volume for the scale of analysis conducted in the following pages (Table 1). As a procedural note, we assume that Mackenzie Inuit house contexts represent palimpsests of procurement activity during multiple seasons, an assumption supported by

the significant quantities of warm and cold season resources in all of the assemblages considered here (e.g. Betts 2005). This does not, however, mean that all houses were occupied year round with no seasonal gaps, since the archaeological and ethnographic records indicate variability in the seasonal occupation of semisubterranean dwellings in this region (e.g. Morrison 1997; Nagy 1990; Stefansson 1913).

REGIONAL COMPARISONS: VERTEBRATE FREQUENCIES

How are we to determine the role of a species in a procurement system if its osseous remains are subject to such severe taphonomic processes that they are virtually absent in faunal assemblages? Our following analysis is based on premises derived from

TABLE 1. — Faunal Frequencies (NISP) for coastal house contexts in the Western Canadian Arctic. Note many taxa have been aggregated for comparative purposes.

	Washout H 3		Pauline Cove H1		Pauline Cove H5		Pauline Cove H7		Avadiek Spit H1		McKinley Bay H1		McKinley Bay H2		Iglualuit H11		Iglualuit H20	
		%		%		%		%		%		%		%		%		%
Lagomorpha	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Rodentia	17	2.0	6	0.4	1	0.1	18	1.1	13	0.8	76	5.3	18	2.1	20.0	1.1	17.0	1.0
Carnivora	84	10.0	279	20.2	154	18.4	187	11.7	77	4.6	247	17.2	251	29.2	78.0	4.2	61.0	3.6
<i>Delphinapterus leucas</i>	0	0.0	2	0.1	1	0.1	16	1.0	17	1.0	9	0.6	10	1.2	1	0.1	0	0.0
<i>Balaena mysticetus</i>	1	0.1	1	0.1	0	0.0	17	1.1	2	0.1	0	0.0	3	0.3	6	0.3	11	0.0
Phocidae	622	73.8	901	65.2	507	60.5	320	20.0	8	0.5	137	9.5	116	13.5	1515.0	80.9	1523.0	89.4
Cervidae	5	0.6	45	3.3	34	4.1	84	5.3	53	3.2	135	9.4	31	3.6	163	8.7	37	2.2
Bovidae	2	0.2	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	2.0	0.1	1.0	0.1
<i>Gavia</i> sp.	2	0.2	9	0.7	4	0.5	4	0.3	8	0.5	18	1.3	2	0.2	1	0.1	0	0.0
<i>Podiceps</i> sp.	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Anatidae	6	0.7	42	3.0	26	3.1	9	0.6	343	20.5	63	4.4	33	3.8	42.0	2.2	11.0	0.6
Acciptridae	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	3	0.2	0	0.0
Falconidae	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Tetraoninae	0	0.0	24	1.7	94	11.2	7	0.4	16	1.0	17	1.2	16	1.9	34	1.8	50	2.9
Gruidae	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Charadriidae	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Scolopacidae	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.1	1	0.1
Stercorariinae	0	0.0	0	0.0	0	0.0	2	0.1	0	0.0	0	0.0	0	0.0	2	0.1	0	0.0
Laridae	1	0.1	19	1.4	0	0.0	1	0.1	16	1.0	1	0.1	1	0.1	4.0	0.2	2.0	0.1
Strigidae	0	0.0	0	0.0	1	0.1	2	0.1	3	0.2	0	0.0	0	0.0	1	0.1	0	0.0
Passeriformes	0	0.0	0	0.0	0	0.0	0	0.0	9	0.5	1	0.1	0	0.0	0	0.0	0	0.0
Clupeidae	0	0.0	0	0.0	0	0.0	0	0.0	29	1.7	0	0.0	0	0.0	0	0.0	0	0.0
Salmonidae	101	12.0	53	3.8	16	1.9	920	57.5	1080	64.5	714	49.7	332	38.6	0.0	0.0	0.0	0.0
Cypriinidae	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Esocidae	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Catostomidae	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Gadidae	2	0.2	0	0.0	0	0.0	12	0.8	1	0.1	18	1.3	40	4.7	0	0.0	0	0.0
Percidae	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Cottidae	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	7	0.8	0	0.0	0	0.0
Total	843	100.0	1381	100.0	838	100.0	1599	100.0	1675	100.0	1436	100.0	860	100.0	1873	100.0	1714	100.0

optimal foraging theory (Charnov & Orians 1973; McArthur & Pianka 1966), and in particularly the work of Glasser (1984). According to Glasser's modified optimal foraging model, if a highly ranked target species is available in abundance, a predator may specialize in the consumption of that species, with the effect of reducing the amount of predation on other highly ranked taxa in the optimal diet breadth. In short, if bowhead whales were abundant and hunts were successful, the immense amount of caloric input that those species represented would have reduced the incentive to pursue other highly ranked taxa already in the diet breadth (e.g. Glasser

1984:900, 903), such as beluga whales, small seals, and caribou. Zooarchaeologically, such a specialized strategy would normally result in an archaeofaunal profile that is biased towards the focal taxon (e.g. Lyman 1989, 1991). However, in the present case, with the focal taxon effectively removed, this may manifest as a false archaeofaunal profile, indicative of a generalist strategy with relatively balanced frequencies of multiple high-ranked taxa (Lyman 1989, 1991).

To summarize, we suggest that intensive whaling would have had a major impact on the procurement of non-cetacean species, such that it should cause a

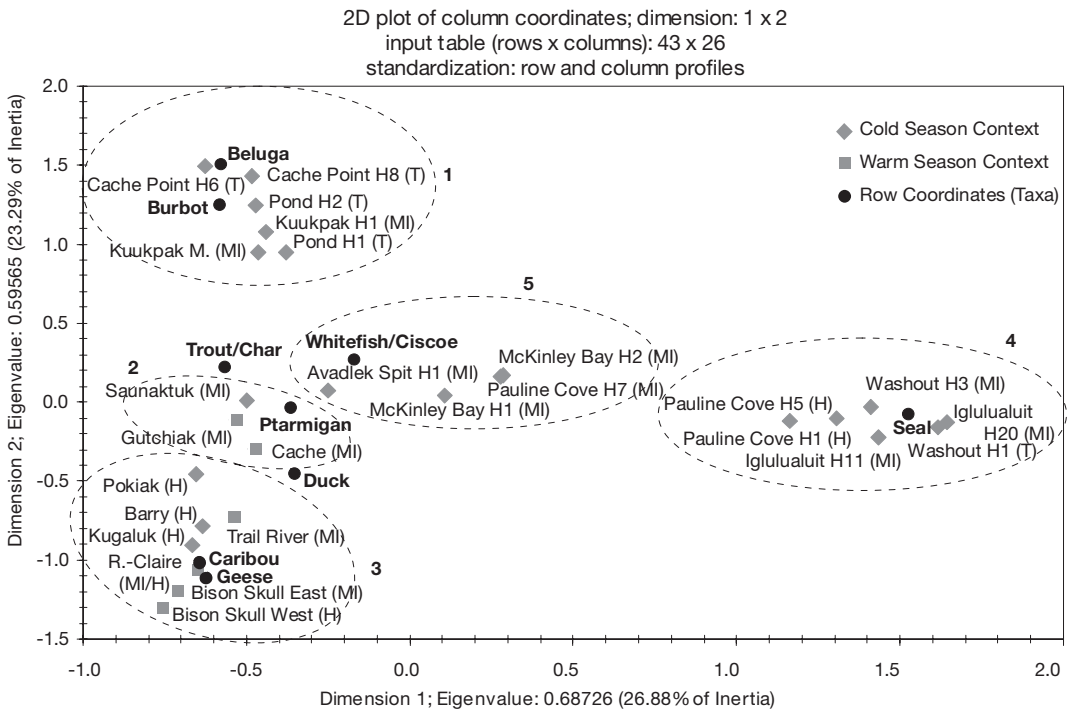


Fig. 4. — Correspondence analysis (% NISP) on faunal assemblages from the Mackenzie Delta region (modified from Betts 2009: Fig 4). Archaeological contexts have been coded with an associated time period where T = Thule, MI = Mackenzie Inuit, H = Historic (Betts 2009). The dashed circles enclose archaeological contexts with similar faunal assemblages. All archaeological contexts (columns) have been plotted; however, only row variables (taxa) with relative inertias greater than 0.05 (5%) have been displayed. Relative inertia can be interpreted as the proportion (out of 1) of the variability in the plot accounted for by a particular taxon.

distinct pattern in the remaining faunal assemblage. Thus, even in the same coastal environments, sites where bowhead whaling was not practiced or was not successful should have a very different procurement signature from bowhead whaling sites. According to Glasser's model of specialization, they should exhibit increased frequencies of one or few highly ranked taxa in the diet breadth (e.g. seals, caribou, etc.), which would have been intensively exploited to fill the caloric deficit caused by the absence of the bowhead hunt. Again, in a productive environment like the Mackenzie Delta, this should take the form of a specialized archaeofaunal assemblage.

At this initial stage, we adopt a regional perspective which focuses on comparing and contrasting potential whaling sites versus non-whaling sites, placed in context within the constellation of regional faunal patterns. Our first step is to conduct exploratory

analysis on faunal frequencies from sites throughout the Mackenzie Delta (Figure 4) to determine if coastal locations exhibit any unique faunal patterning. Figure 4 displays a correspondence analysis, a multivariate exploratory technique that outputs a map of faunal variability in two dimensions. Here the analysis is conducted on the % NISP, following a previous analysis by Betts (2008, 2009).

Betts (2005, 2008, 2009) has previously determined that the dispersion and clustering in the graph indicates five separate specialized procurement signatures, with each cluster focused on one or two major resources, consistent with Lyman's definition of specialized signatures in faunal assemblages (Lyman 1989, 1991). This should not be an unexpected result; predators should typically turn to specialist strategies in productive environments such as the Western Canadian Arctic (e.g.

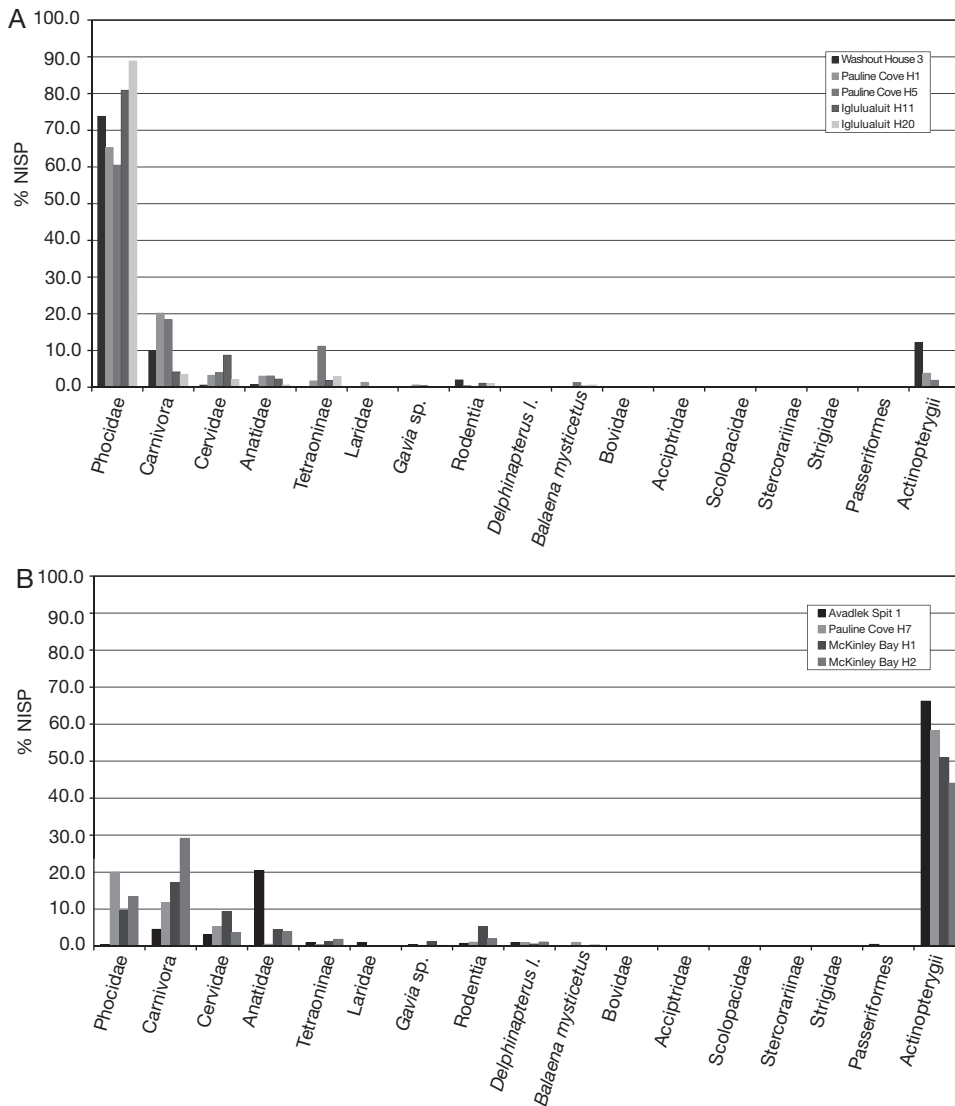


FIG. 5. — **A**, Faunal frequencies (%NISP) for coastal contexts with seal dominated faunal assemblages which cluster in the correspondence analysis (Fig. 4); **B**, Faunal frequencies (%NISP) for coastal contexts with non-seal dominated faunal assemblages which cluster in the correspondence analysis (Fig. 4).

Glasser 1984:902). The first cluster represents a group of winter sites on the East Channel of the Mackenzie River and is focused primarily on beluga whales and burbot. Cluster 2 is composed of a group of interior winter and summer sites specialized towards birding and fishing. The third group consists of winter and summer sites focused

primarily on caribou hunting and trapping of fur bearers. The fourth cluster consists of coastal sites dominated by phocid seals. Finally, the fifth cluster represents significant input from fish, combined with substantial contributions from multiple other taxa (typically greater than 10% each for caribou, birds, and phocids).

When viewed from a regional perspective, this fifth cluster presents a rather unique faunal profile. As noted, the dispersion of the clusters at the periphery of the graph indicates the overwhelming contribution of one or a few taxa to the assemblages – in effect, their extreme specialization. The fact that these four contexts exist in the centre of the graph suggests a somewhat less specialized economy, one in which a focal taxon is offset by more balanced contributions from other taxa. Thus, while fish remains, particularly coregonids, still occur in dominating frequencies in these assemblages, the more even distribution of caribou, phocids, and birds (*c.* 10 % NISP and greater) are a distinct oddity amongst the other highly specialized economies in the Western Canadian Arctic. Particularly puzzling is the fact that the coastal sites occur in two clusters; in fact, the site of Pauline Cove has members in both clusters.

Despite its inclusion in Figure 4, we have not included the Thule era context of Washout House 1 in our following analysis of coastal economies. Significant differences in technology and procurement strategies have been documented between Mackenzie Inuit and Thule era populations in the Western Canadian Arctic (Betts & Friesen 2004; Betts 2008; Friesen 2009), which may impact faunal assemblages from these contexts. This observation is supported by the extreme position of Washout House 1 in the correspondence analysis cluster; which is primarily due to its complete lack of fish remains. Importantly, one of the defining economic differences between the Thule and Mackenzie Inuit periods is the development of intensive net fishing in the latter (Betts 2005). This procurement adaptation is believed to have fundamentally altered the nature and scheduling of all procurement systems in the region (Betts & Friesen 2004; Betts 2008), suggesting that including Washout House 1 in the analysis would be inappropriate.

Thus, we are left with nine coastal assemblages, all occurring near bowhead migration or aggregation areas, yet they cluster neatly into two groups, with a significant gap between them. Bar graphs of the % NISP for aggregated taxa reveal the general faunal profile of these coastal assemblages (see Table 1). The contexts on the extreme right of the correspondence analysis (Fig. 4) are clearly seal dominated sites based on relative abundance

(Fig. 5A), with lesser contributions (typically less than 10 percent) from furbearers, caribou, and birds. The sites in the centre of the correspondence analysis (Fig. 4) however, are very different (Fig. 5B). Their assemblages are dominated by fish, with more even contributions from seals, fur bearing animals, and birds in the family Anatidae (often greater than 10 percent).

While some of the variability must result from differences in micro-environments around the sites, this does not explain the distinct clustering of the correspondence analysis, particularly in light of the fact that one of the sites, Pauline Cove, yielded separate faunal assemblages which occur in both clusters. Thus, we interpret this pattern as indicating that the fifth cluster represents contexts in which bowhead hunting was important, while the fourth (phocid seal dominated) cluster represents coastal contexts in which bowhead hunting did not occur or was less important.

The latter faunal profile (Fig. 5A) for these four assemblages is indeed a distinct regional oddity – in none of the remaining 22 assemblages are fish a standalone dominant taxon and in all at least one other highly ranked mammal taxon is a significant prey item (see Betts 2005). In short, fish are never the only focal taxon at any other Mackenzie Inuit site, and in no other sites do more generalist foraging strategies occur, as indicated by even representation across all taxa (e.g. Betts 2005, 2008). We believe this frequency distribution, in which fish dominate, but other high ranked taxa occur in relatively high frequencies, is consistent with a specialized strategy *if* the focal taxon were removed from the assemblage. In this case, bowhead whale remains are effectively hidden by severe taphonomic processes we have described above.

To provide support for this interpretation, we present the faunal profiles for specialized beluga whaling sites on the East Channel of the Mackenzie River (Fig. 6A), but with the beluga whale remains removed from the assemblages (Fig. 6B). There are some differences between this profile and the bowhead whaling contexts, such as the increased importance of ptarmigan, rodents, and hares, but these differences are likely related to the microenvironment surrounding these beluga whaling sites, which is effectively a near-coastal

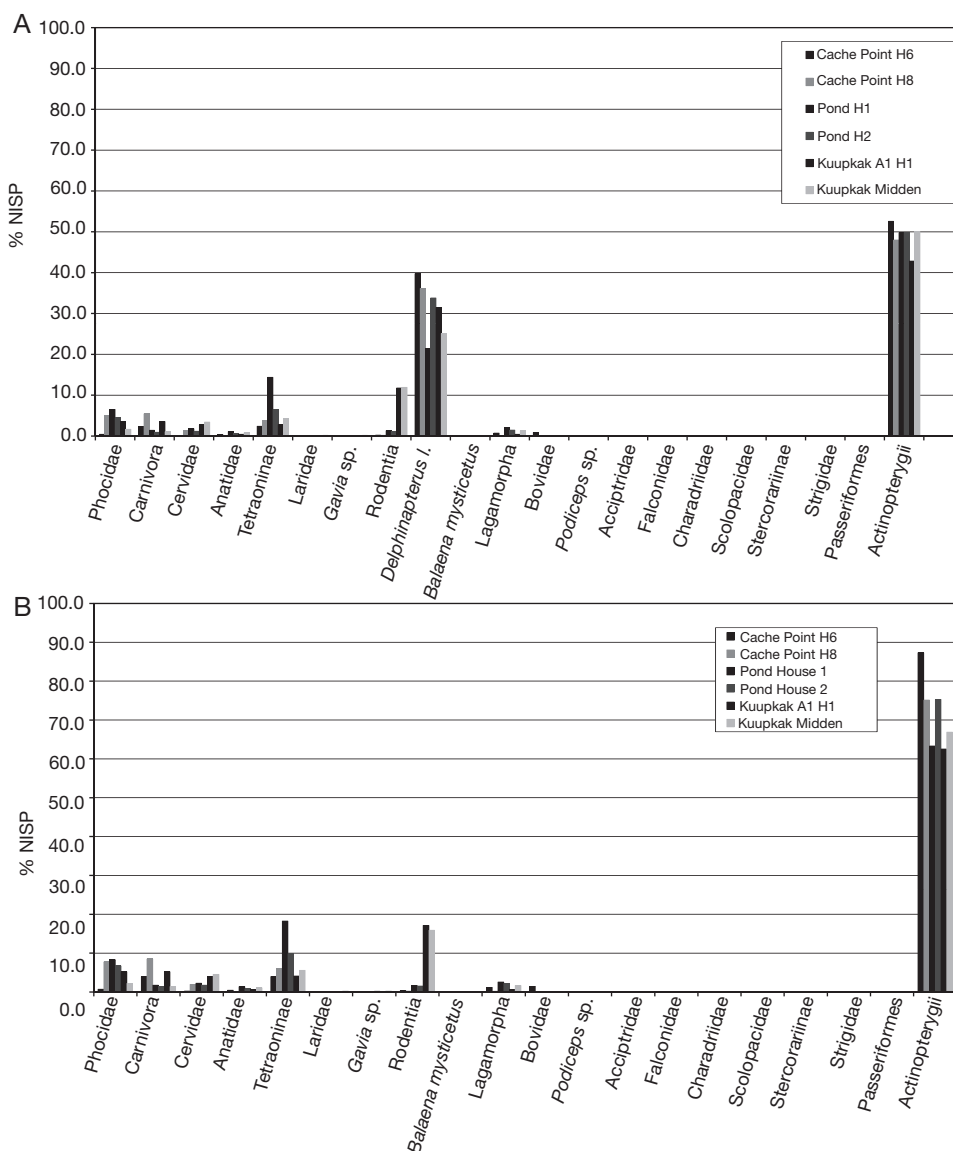


FIG. 6. — **A**, Faunal frequencies (%NISP) for sites on the East Channel of the Mackenzie River; **B**, faunal frequencies (%NISP) for sites on the East Channel of the Mackenzie River with beluga whales removed (%NISP has been recalculated).

estuary. However, in general, with the focal taxon removed from the assemblages, the faunal profile is very similar to the presumptive bowhead whaling contexts (Fig. 5b), with fish dominating the assemblages, and with more even inputs from other major high ranked taxa.

This is a potentially important result, not only because it provides a faunal signature for bowhead whale hunting, but also because it clearly indicates that the faunal assemblages at bowhead hunting sites are not simply coastal assemblages with bowhead whale added on top of an otherwise pinniped-based fauna.

Instead, these assemblages suggest that procurement activities at these sites were fundamentally different from other coastal sites in the region, particularly in the attention paid to phocid seals. We believe that this unique faunal signature reflects a reorientation of the procurement strategy caused by intensive bowhead whaling in these contexts. In effect, the lower frequencies of pinniped remains, and more even distribution of other taxa, are an indicator of specialized bowhead whaling. This interpretation places specialized bowhead whaling within a regional continuum of specialized economies which defines Mackenzie Inuit procurement systems (Betts 2005).

Since all of the coastal sealing contexts come from locations near bowhead migration routes, how do we explain the significant differences in faunal signatures between coastal contexts, and especially contexts at the same site? Foraging theory may provide an answer. In specialist subsistence strategies, the failure of a prey taxon sometimes forces a “switch” to the specialized exploitation of other high ranked taxa in the diet breadth. This ecological model is sometimes known as “prey switching” (Begon *et al.* 1986:312), where a predator will focus on the most efficient high ranked taxon until it declines in abundance, after which it will “switch” prey, in effect specializing in the procurement of another readily available high ranked taxon. In this case, perhaps coastal groups dealt with the failure of the bowhead hunt by “switching” to the intensive hunting of seals during the following winter and spring. Because we assume that most of these deposits are time averaged over the use-life of their associated dwellings, this process may have occurred over longer time scales than simply one season. In fact, the prey switching documented here may have occurred over several seasons or even decades of progressive environmental changes that affected the timing of the bowhead whale migration.

ELEMENT FREQUENCIES

Although bowhead whale bones are rare in Mackenzie Inuit faunal assemblages, several sites’ faunal assemblages have yielded enough bowhead material to allow an initial assessment of element frequen-

cies. In this connection, it is important to note that several aspects of bowhead bones can impact their frequency in faunal assemblages. The first aspect relates to the amount of edible tissue (meat, fat, and *maqtaq*) associated with a particular bone. Savelle (1997:873) has calculated a meat utility index for bowhead whales, which indicates that hyoids, ribs, thoracic, lumbar, and caudal vertebrae are highest ranked elements in terms of meat yield. Of course, given the enormous size and weight of most bowhead bones, in many instances we assume that meat would be cut from the bone at the butchery site, and bones would not be brought back to dwellings. As revealed by butchery experiments (Savelle & Friesen 1996), much of the blubber, skin, and meat in cetaceans is easily removed without “riders”, or bones left attached to meat and animal products for convenience of butchery and transport. The second factor relates to the architectural utility of bowhead bones. In regions without driftwood, bowhead maxillae, mandibles, and ribs are valued for their ability to span significant distances as wall and roof supports. Furthermore, crania and larger vertebrae are often used in dwelling construction due to their weight and density where stability is needed (Savelle 1997:872). In a recent overview of whaling in the Arctic, Whitridge (1999a:110) suggested that due to these two factors (size and weight of bones plus differential use in architecture) smaller elements, such as forelimb bones, are a better indicator of whaling in Thule sites. Additional factors which likely impacted bowhead element frequencies include the fact that certain body parts, including tails and flippers, were associated with high social status (e.g., Rainey 1947; Spencer 1959; Whitridge 1999b; Whitridge 2002: 67, 72, 73); and that whales and whaling were associated with complex ritual and symbolic meaning (Patton & Savelle 2006).

Table 2 presents bowhead whale element frequencies for three of the samples in the coastal bowhead hunting cluster of sites. Note that for these element distributions finished artifacts and other bones with clear evidence of having been worked are excluded. It should also be mentioned that these frequencies are likely low estimates, since all sites yielded a number of small cetacean fragments which could not be identified to species. At McKinley Bay, two houses

TABLE 2. — Bowhead whale element frequencies from three house assemblages. Worked bones and artefacts are excluded.

Element	McKinley Bay House 2	Pauline Cove House 7	Avadlek Spit House 1 - interior	Avadlek Spit House 1 - exterior
cranium				
mandible				
mandible/maxilla				1
hyoid				
vertebra cervical				
vertebra thoracic				
vertebra lumbar				
vertebra caudal	2		1	
vertebra misc.		3		24
rib				
sternum				
scapula				
humerus	1	1		
radius				
ulna		1		
carpal				
phalanx		11	2	11
miscellaneous		1		
Total	3	17	3	36

were excavated; no bowhead elements were identified in McKinley Bay House 1, but at McKinley Bay House 2, three bowhead elements were recovered. These included two caudal vertebrae and a complete right humerus from a juvenile individual. Of these elements, only the humerus exhibited cut marks. At Pauline Cove House 7, 17 bowhead bones were recovered. Eleven of these were phalanges, with the sample also containing three miscellaneous vertebral fragments, one humerus, one ulna, and one unidentified fragment. Fully 15 of the 17 bowhead specimens displayed cut marks.

Avadlek Spit House 1 represents a special case since an extensive area (41 m²) was excavated in front of the house (all other excavated house features include materials from adjacent middens, but from far smaller areas). This exterior area included a sheet midden, as well as two driftwood-lined meat caches and what is interpreted as a collapsed driftwood drying or storage rack. Within the house were only three bowhead bones: two phalanges on the floor, and one complete caudal vertebra in the entrance tunnel, of which one phalanx and the vertebra displayed

cut marks. In the exterior area, however, a much greater number of bowhead bones were recovered: 24 vertebral fragments, 11 phalanges, and one very weathered fragment of a maxilla or mandible (it is possible that this last specimen represents the remains of a structural member in the adjacent collapsed rack). One of the vertebral fragments is cut, and 8 of the 11 phalanges have cut marks. This assemblage is noteworthy for the fact that the house itself contains very few bowhead bone specimens, yet the midden and associated features have a much higher frequency, and the element categories in both contexts are similar. This may indicate that bowhead hunting and consumption generally are more visible outside of houses than in their interiors. This situation may result from the fact that the bones are so large that they are often processed and discarded outside, before meat is brought into the house, or because their size leads to a high probability that they will be cleaned away and discarded outside of the house.

Viewing these element distributions as a whole, it is interesting to note that vertebrae and forelimb bones, especially phalanges, are the most common element classes (Table 2). Within vertebrae, most specimens could not be identified to a particular element category, but three were identified as caudal. Thus, as expected in a region supplied with abundant driftwood, none of the element classes with high architectural utility are present in anything but trace frequencies. Likewise, the element selection does not appear to be based on meat utility – this is also expected, given the fact that bowhead bones are so large that it does not make sense for them to be regularly transported along with their attached meat. Instead, elements in these assemblages appear to be selected based more on known patterns of high status consumption, with flippers and tails repeatedly appearing in the ethnographic literature as preferred carcass portions. Perhaps this association with status led to these carcass portions being introduced into contexts where they were consumed as larger and more visible butchery units, rather than with meat removed. This pattern, combined with the high frequency of cut marks in all samples, is consistent with our argument that bowhead whaling did occur at these sites, and bowhead meat was consumed in these houses.

TABLE 3. — Frequencies of bowhead whale-derived artefacts in coastal house contexts. Slate has been removed from totals due to the overemphasis of slate in the Avadlek Spit House 1 assemblage.

Category	McKinley Bay H2	Pauline Cove H7	McKinley Bay H1	Iglulualuit	Pauline Cove H1	Washout H3	Avadlek Spit H1	Pauline Cove H5
Whale bone debitage	71	34	19	0	5	3	8	0
Whale bone artefacts	9	0	0	19	0	3	1	0
Baleen fragments	4	47	0		5	6	0	3
Total artefacts in assemblage (excluding slate)	244	307	117	182	1001	247	781	1029
Total organic artefacts in assemblage	182	241	62	167	107	131	191	77
Percentage of all whale-derived artifacts to total artefacts	34.42	26.38	16.23	10.43	0.99	4.858	3.21	0.29
Percentage of all whale-derived artefacts to total organics	46.15	33.60	30.64	11.37	9.34	9.16	4.712	3.8

ARTEFACTUAL EVIDENCE

Bowhead whale carcasses supply not only vast amounts of edible products, but also significant amounts of raw material in the form of baleen and bone that was used for the manufacture of critical material culture. If the presence of bowhead whaling is really driving the differences in faunal assemblages between these coastal sites, then this difference may be reflected in the abundance of baleen and whale bone artefacts and manufacturing detritus in associated artefact assemblages.

Figure 7 displays a bar graph of baleen or whale bone artefacts as a percent of total organic artefacts from these coastal contexts (see Table 3, compiled from data in Arnold 1992; Betts 2007; Friesen 1991, 1992, 1994, 1995; Friesen & Hunston 1994). Note here that the two Iglulualuit artefact assemblages were aggregated due to the nature of the data tables published by Morrison (1990). In general, the graph displays higher frequencies of whale bone and baleen (> 30%) in the presumptive whaling assemblages (black), when compared to the sealing-dominated contexts (gray) (< 15%). The only potential outlier is Avadlek Spit, which appears to display significantly less whale bone and baleen than other whaling contexts (and even most sealing contexts). Also, the Iglulualuit contexts may have an unnaturally high percentage of whalebone implements because of the presence of large num-

bers of whalebone mattocks, which were needed to dig through the heavy clay which characterizes the mouth of the Horton River (Morrison 1990).

Importantly, the Avadlek Spit assemblage likely has an artificially low percentage of manufacturing evidence, while McKinley Bay House 2 may have a relatively inflated frequency. Betts (2007) has documented an intensive whale bone manufacturing tradition at McKinley Bay. At McKinley Bay House 2, a significant amount of effort was expended in the analysis of fragmentary cetacean bone, specifically looking for evidence of manufacturing actions, such as cut, chopped, shaved, and hinge-fractured bone (Betts 2007). During his earlier analysis of the Avadlek Spit House 1 faunal assemblage, Betts (2000) noted a large quantity of fragmented cetacean bone, but did not analyze the fragmented sample in detail. This should represent a cautionary tale; highly fragmented whale bone remains should be carefully studied to recognize this potentially important signature, especially if the position of bowhead whales in the site's economy is ambiguous.

DIETARY CONTRIBUTION

Taken from a regional and comparative perspective, the available faunal frequencies, element distributions, and artefactual data strongly suggest the presence of bowhead whaling at some coastal locations

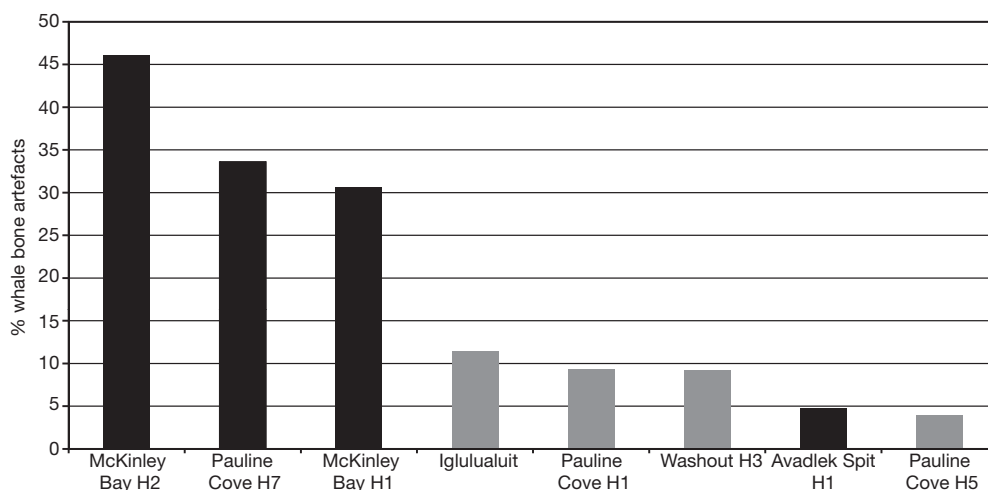


FIG. 7. — Artefact frequencies of whale bone artefacts as a percentage of total organic artefacts from coastal contexts in the Mackenzie Delta Region. Black bars represent presumptive whaling sites, while grey bars represent non-whaling sites.

in the Western Canadian Arctic. Following procedures outlined in Friesen & Arnold (1995), faunal frequencies can be utilized to calculate the relative proportion of available edible tissue represented by each taxon, a proxy measure for their relative contribution to diet. However, can the low frequencies of bowhead bone be considered representative of the relative success rate of bowhead procurement and contribution to diet? This is a critical consideration, given that no MNI (minimum number of individuals) values greater than one could be calculated from the bowhead remains in any of the whaling contexts (Table 4). The pertinent question then becomes, is one bowhead whale per house context a suitable estimate of relative abundance? Given that our estimates are based predominantly on low-architectural utility elements, these should provide a good indicator of overall contribution to diet (e.g. Savelle & McCartney 2002:367)

If the multiple ethnohistoric records are accurate, an average of about three bowhead whales per larger village per season might be taken as an indication of a typical success rate, though we stress that we are uncertain if this was an exceptional, average, or below average result, and that village size and success rates must have varied. At each village, the whale meat, fat, and maqtaq (skin

and attached fat) were likely distributed amongst multiple households, and in some cases throughout the region. While the extent of redistribution is impossible to ascertain, we point out that this was likely practiced for every large bodied mammal represented in the faunal assemblage (e.g. Henshaw 1999), and can therefore be considered a consistent bias across most taxa.

Most of the dwellings in our sample likely represent palimpsests of multiple years of occupation, in which whales were obtained during most or all years. If three whales were a typical yearly yield for a village, over the use life of most dwellings one whale's worth of edible products (an MNI of 1) likely represents a very conservative estimate of bowhead contribution to the total diet. For comparison, it is informative that Savelle & McCartney (1999), documented an average MNI of 2.2 bowheads per dwelling in the Central Arctic, based on surface observations of bowhead bones (calculated from data in Savelle & McCartney 1999: Table 1). As a result, we stress our estimate may in fact be conservative if catch rates were similar to those in the East. Yet, in the absence of any variables we could use to define a taphonomic decay rate for Western Arctic contexts, an MNI of one bowhead whale per assemblage, while likely an underestimation, is the

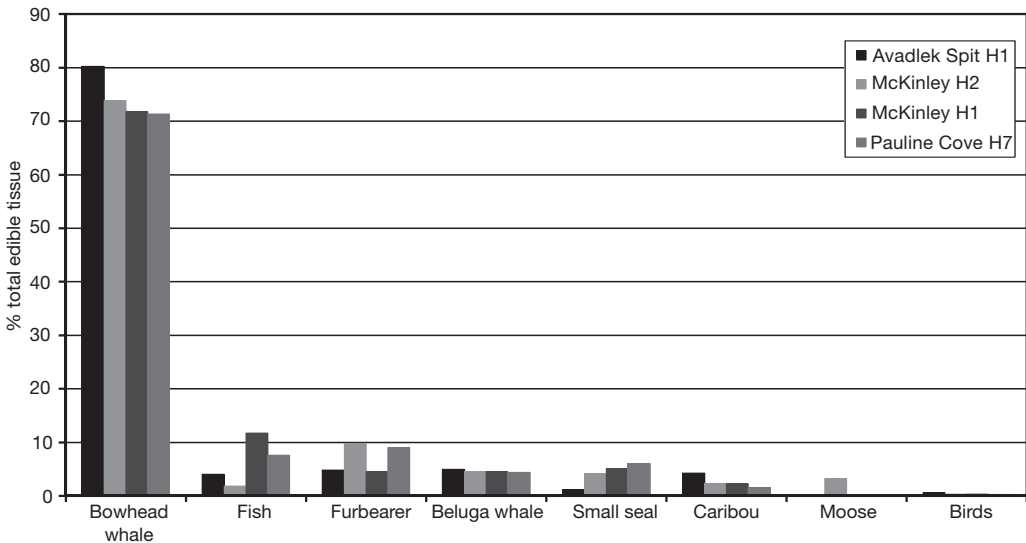


Fig. 8. — Relative meat contribution of taxa in the presumptive bowhead whaling assemblages based on % weight of total edible tissue, using techniques applied in Friesen & Arnold (1995).

only figure we can use to speculate on the bowhead contribution to diet.

Like all animals included in a dietary reconstruction, an average body mass must be utilized (e.g. Friesen & Arnold 1995); however, as discussed by McCartney (1995:99), bowhead whale body mass can vary significantly with body size, and Inuit hunters were known to preferentially select younger individuals for harvest. Here we base our averages on data cited in Savelle & McCartney (1994, see also McCartney 1995), which indicate that ca. nine metre yearlings were preferentially targeted by Neoeskimo whalers where possible.

One ca. 12,000 kg nine metre yearling would contribute a conservative estimate of ca. 4550 kilograms of edible meat, fat, and maqtaq (calculated from data in Betts 2000: Table 3, Table 5, after George *et al.* 1990, McCartney 1995; see also recent data in George *et al.* 2007). McCartney (1995:98) notes that as much as 50% of a fresh whale carcass can be harvested, but very large whales often spoil before they are completely butchered, resulting in 25% or less recovery of edible tissue. Therefore an estimate of 37.5% of the live weight is utilized here. Even using this very conservative estimate,

this would feed a 10 member household for approximately one year, assuming an average yield of 2.73 calories per gram of edible tissue, and a caloric requirement of 3500 calories per person per day (calculated from data in Betts 2000: Table 3, Table 5, after George *et al.* 1990, McCartney 1995; see also data in George *et al.* 2007).

Figure 8 (see also Table 4) displays the percentage weight of total edible tissue for all taxa represented in the presumptive bowhead whaling assemblages, based on an average nine metre bowhead yearling, and following procedures in Friesen & Arnold (1995). Edible tissue weight calculations are based on MNI data, and edible tissue yields were calculated from data presented in Friesen & Arnold (1995) and Betts (2000). Edible weight for a bowhead was determined from a nine metre yearling weighing an estimated 12,126 kg, with an edible portion of 37.5% (after data in McCartney 1995:98-99).

Though obviously fraught with uncertainty due to several sources of error, including the use of MNIs as estimates of taxonomic frequencies, the figure clearly displays the massive productivity of even one successful bowhead whale hunt, which could have provided between 71 and 80 % of

TABLE 4. — NISP, MNI, and meat weight calculations for presumptive coastal bowhead whaling sites.

Taxon (in order)	Taxon (in order)	Edible Portion (g)	Pauline Cove F7 NISP	Pauline Cove F7 MNI	Available Meat (g)	%	Avadlek Spit H1 NISP	Avadlek Spit H1 MNI	Available Meat (g)	%
<i>Spermophilus parryii</i>	Arctic ground squirrel	520.8	7	2	1041.6	0.0	12	7	3645.6	0.1
<i>Ondatra zibethicus</i>	Muskrat	763	10	4	3052	0.0	1	1	763	0.0
<i>Delphinapterus leucas</i>	Beluga whale	280000	16	1	280000	4.4	17	1	280000	4.9
<i>Balaena mysticetus</i>	Bowhead whale	4547250	17	1	4547250	71.3	2	1	4547250	80.2
<i>Canis lupus</i>	Wolf	26250	1	1	26250	0.4	3	1	26250	0.5
<i>Canis familiaris</i>	Dog	10000			0	0.0			0	0.0
<i>Canis lupus/Canis familiaris</i>	Wolf/Dog	18125	44	2	36250	0.6			0	0.0
<i>Alopex lagopus</i>	Arctic fox	1600	13	4	6400	0.1	18	2	3200	0.1
<i>Vulpes Vulpes</i>	Red fox	2600	1	1	2600	0.0	22	2	5200	0.1
<i>Vulpes sp.</i>	Arctic/Red fox	2100	121	2	4200	0.1	30	1	2100	0.0
<i>Ursus arctos</i>	Grizzly	231700			0	0.0	2	1	231700	4.1
<i>Ursus maritimus</i>	Polar bear	294000			0	0.0			0	0.0
<i>Ursus maritimus/ Ursus arctos</i>	Polar/Grizzly bear	247850	7	2	495700	7.8			0	0.0
<i>Martes americana</i>	Marten	579.6			0	0.0	2	1	579.6	0.0
<i>Gulo gulo</i>	Wolverine	8750			0	0.0			0	0.0
<i>Phoca hispida</i>	Ringed seal	63700			0	0.0			0	0.0
<i>Phoca hispida/Phoca vitulina</i>	Ringed/Harbour seal	63700	320	6	382200	6.0	8	1	63700	1.1
<i>Alces alces</i>	Moose	200750			0	0.0			0	0.0
<i>Rangifer tarandus</i>	Caribou	47675	84	2	95350	1.5	53	5	238375	4.2
<i>Gavia stellata/ Gavia pacifica</i>	Red-throated loon/ Pacific loon	3150	4	2	6300	0.1			0	0.0
<i>Gavia immer</i>	Common loon	3150			0	0.0	3	1	3150	0.1
<i>Gavia sp.</i>	Loon Sp.	3150			0	0.0	5	1	3150	0.1
<i>Branta canadensis</i>	Canada goose	1890			0	0.0	2	1	1890	0.0
Anserini	Goose	1890	4	1	1890	0.0	5	1	1890	0.0
<i>Cygnus sp.</i>	Swan	6930			0	0.0			0	0.0
<i>Anas crecca</i>	Green-winged teal	700			0	0.0	1	1	700	0.0
<i>Anas sp.</i>	Dabbling duck	700			0	0.0			0	0.0
<i>Somateria mollissima</i>	Common eider	770			0	0.0	13	2	1540	0.0
<i>Melanitta fusca</i>	White-winged scoter	770			0	0.0	26	3	2310	0.0
<i>Clangula hyemalis</i>	Oldsquaw	630	4	1	630	0.0	211	17	10710	0.2
<i>Mergus merganser</i>	Common merganser	700			0	0.0	1	1	700	0.0
Anatinae	Duck	770	1	1	770	0.0	84	5	3850	0.1
<i>Lagopus lagopus/Lagopus muta</i>	Willow/Rock ptarmigan	420	7	2	840	0.0	16	4	1680	0.0
Tetraoninae	Grouse/Ptarmigan	466.9			0	0.0			0	0.0
Stercorariinae	Jaeger	1400	2	1	1400	0.0			0	0.0
<i>Larus hyperboreus</i>	Glaucous gull	1400			0	0.0	5	1	1400	0.0
<i>Larus argentatus/Larus hyperboreus</i>	Herring/Glaucous gull	1400	1	1	1400	0.0			0	0.0
<i>Sterna paradisaea</i>	Arctic tern	420			0	0.0	10	2	840	0.0
<i>Bubo scandiacus</i>	Snowy owl	1120	1	1	1120	0.0	3	1	1120	0.0
<i>Clupea sp.</i>	Herring	478			0	0.0	29	11	5258	0.1
<i>Salvelinus alpinus</i>	Arctic Char	3825	1	1	3825	0.1	47	7	26775	0.5
<i>Salvelinus namaycush</i>	Lake trout	8500			0	0.0	5	1	8500	0.1
<i>Salvelinus sp.</i>	Arctic char/Lake trout	6162.5			0	0.0	10	3	18487.5	0.3
<i>Coregonus sardinella/ Coregonus autumnalis</i>	Cisco	265.2			0	0.0	50	13	3447.6	0.1
<i>Coregonus nasus</i>	Broad whitefish	1700			0	0.0			0	0.0
<i>Coregonus clupeaformis</i>	Lake whitefish	4930			0	0.0	185	25	123250	2.2
<i>Coregonus sp.</i>	Whitefish/Cisco	3315	256	125	414375	6.5			0	0.0
<i>Salvelinus/Coregonus</i>	Whitefish/Cisco/Trout	6290	402		0	0.0			0	0.0
<i>Stenodus leucichthys</i>	Inconnu	7650	124	7	53550	0.8	31	5	38250	0.7
<i>Lota lota</i>	Burbot	5270	7	2	10540	0.2	1	1	5270	0.1
	Total				6376933.6	100			5666931.3	100

TABLE 4. (end) — NISP, MNI, and meat weight calculations for presumptive coastal bowhead whaling sites.

Taxon (in order)	Taxon (in order)	McKinley Bay H1 NISP	McKinley Bay H1 MNI	Available Meat (g)	%	McKinley Bay H2 NISP	McKinley Bay H2 MNI	Available Meat (g)	%
<i>Spermophilus parryii</i>	Arctic ground squirrel	68	5	2604	0.04	1	1	520.8	0.0
<i>Ondatra zibethicus</i>	Muskrat	8	3	2289	0.04	17	6	4578	0.1
<i>Delphinapterus leucas</i>	Beluga whale	9	1	280000	4.42	10	1	280000	4.5
<i>Balaena mysticetus</i>	Bowhead whale	1	1	4547250	71.77	3	1	4547250	73.8
<i>Canis lupus</i>	Wolf			0	0.00			0	0.0
<i>Canis familiaris</i>	Dog	7	1	10000	0.16	6	2	20000	0.3
<i>Canis lupus/Canis familiaris</i>	Wolf/Dog			0	0.00		1	18125	0.3
<i>Alopex lagopus</i>	Arctic fox			0	0.00	126	5	8000	0.1
<i>Vulpes vulpes</i>	Red fox			0	0.00			0	0.0
<i>Vulpes sp.</i>	Arctic/Red fox	231	6	12600	0.20	114	5	10500	0.2
<i>Ursus arctos</i>	Grizzly			0	0.00			0	0.0
<i>Ursus maritimus</i>	Polar bear			0	0.00	1	1	294000	4.8
<i>Ursus maritimus/Ursus arctos</i>	Polar/Grizzly bear	4	1	247850	3.91	3	1	247850	4.0
<i>Martes americana</i>	Marten			0	0.00			0	0.0
<i>Gulo gulo</i>	Wolverine	1	1	8750	0.14			0	0.0
<i>Phoca hispida</i>	Ringed seal	132	4	254800	4.02			0	0.0
<i>Phoca hispida/Phoca vitulina</i>	Ringed/Harbour seal	5	1	63700	1.01	117	4	254800	4.1
<i>Alces alces</i>	Moose			0	0.00	2	1	200750	3.3
<i>Rangifer tarandus</i>	Caribou	135	3	143025	2.26	26	3	143025	2.3
<i>Gavia stellata/</i>	Red-throated loon/			0	0.00			0	0.0
<i>Gavia pacifica</i>	Pacific loon								
<i>Gavia immer</i>	Common loon			0	0.00			0	0.0
<i>Gavia sp.</i>	Loon Sp.	18	2	6300	0.10	2	1	3150	0.1
<i>Branta canadensis</i>	Canada goose			0	0.00			0	0.0
Anserini	Goose	11	2	3780	0.06	7	1	1890	0.0
<i>Cygnus sp.</i>	Swan	9	1	6930	0.11	6	2	13860	0.2
<i>Anas crecca</i>	Green-winged teal			0	0.00			0	0.0
<i>Anas sp.</i>	Dabbling duck	43	5	3500	0.06			0	0.0
<i>Somateria mollissima</i>	Common eider			0	0.00			0	0.0
<i>Melanitta fusca</i>	White-winged scoter			0	0.00			0	0.0
<i>Clangula hyemalis</i>	Oldsquaw			0	0.00			0	0.0
<i>Mergus merganser</i>	Common merganser			0	0.00			0	0.0
Anatinae	Duck			0	0.00	20	2	1540	0.0
<i>Lagopus lagopus/Lagopus muta</i>	Willow/Rock ptarmigan			0	0.00	16	3	1260	0.0
Tetraoninae	Grouse/Ptarmigan	17	2	933.8	0.01			0	0.0
Stercorariinae	Jaeger			0	0.00			0	0.0
<i>Larus hyperboreus</i>	Glaucous gull			0	0.00			0	0.0
<i>Larus argentatus/Larus hyperboreus</i>	Herring/Glaucus gull			0	0.00			0	0.0
<i>Sterna paradisaea</i>	Arctic tern			0	0.00			0	0.0
<i>Bubo scandiacus</i>	Snowy owl			0	0.00			0	0.0
<i>Clupea sp.</i>	Herring			0	0.00			0	0.0
<i>Salvelinus alpinus</i>	Arctic Char			0	0.00			0	0.0
<i>Salvelinus namaycush</i>	Lake trout			0	0.00	11	2	17000	0.3
<i>Salvelinus sp.</i>	Arctic char/Lake trout	6	1	6162.5	0.10			0	0.0
<i>Coregonus sardinella/</i>	Cisco			0	0.00			0	0.0
<i>Coregonus autumnalis</i>									
<i>Coregonus nasus</i>	Broad whitefish			0	0.00			0	0.0
<i>Coregonus clupeaformis</i>	Lake whitefish			0	0.00			0	0.0
<i>Coregonus sp.</i>	Whitefish/Cisco			0	0.00			0	0.0
<i>Salvelinus/Coregonus</i>	Whitefish/Cisco/Trout	706	112	704480	11.12	190	10	62900	1.0
<i>Stenodus leucichthys</i>	Inconnu	2	2	15300	0.24	14	2	15300	0.2
<i>Lota lota</i>	Burbot	18	3	15810	0.25	40	3	15810	0.3
	Total			6336064.3	100.00			6162109	100.0

available edible tissue in these contexts. This result is in the same order of magnitude as the dietary contribution of beluga whales at the Kuukpak site, which was calculated by Friesen & Arnold (1995) as 66% of the total edible tissue weight, based on MNI. Though speculative, we believe this graph provides a fair, but strictly relative, indication of the potential dietary importance of bowhead whale at coastal sites where bowhead hunting was successful, and indeed provides a striking explanation for the low frequencies of other high ranked mammals in these whaling-based faunal assemblages.

SUMMARY AND CONCLUSIONS

In summary, we believe the available data provide compelling evidence for a focal bowhead hunt at multiple coastal promontories in the Western Canadian Arctic during the Mackenzie Inuit Period. Specifically, evidence suggests the presence of intensive bowhead whaling at both Herschel Island and the Northern Tuktoyaktuk Peninsula, but not at Iglulualuit.

The evidence for multiple subsistence strategies at Herschel Island is worthy of further discussion. To some degree, these differences may reflect the temporal differences among the assemblages which span a long period from roughly 1400 to 1900 A.D. During this period, climate change may have impacted whale migration routes or behaviour; and in later historic contexts the commercial bowhead hunt would have had significant impacts on the availability of bowhead whales to local hunters. However, the differences between the Herschel Island contexts are also suggestive of differences in the success rate of hunts between the Qikiqtaryungmiut and Nuvugarmiut. We note that this variability may to some degree reflect differences in sample size, given that we are comparing five excavated contexts at Herschel Island to two contexts at McKinley Bay. However, it is intriguing that these two locations are specifically mentioned in the literature as having different whaling schedules, the former during the spring/summer ice breakup, and the latter during the return migration in August

and September (although we note these observations were temporally limited).

This may suggest a fundamental difference in access to bowhead whales which might have impacted the success rate of the respective whale hunts. Perhaps there was greater uncertainty with the lead-based spring hunts and/or open water fall hunts (in which bowheads occurred in smaller aggregations) conducted at Herschel Island, compared with the open water fall hunts conducted on demonstrably larger bowhead aggregations off the Tuktoyaktuk Peninsula (e.g. Hardwood & Smith 2002: figure 3). If so, this may explain the differences in faunal signatures at the contexts on Herschel Island. If the bowhead hunt failed at Herschel Island, intensive winter sealing may have been adopted during the winter and spring to account for any caloric shortfall. As discussed previously, this type of prey switching is a typical response of specialized predators to a drastic decline in their preferred prey species.

This strategy might not have been employed (or employed less frequently) on the Tuktoyaktuk peninsula, as the scheduling of the hunt may have resulted in higher success rates. If so, perhaps Richardson's (in Franklin 1971: 217) observation of a house surrounded by large numbers of bowhead whale skulls is truly representative of the productivity of the Nuvugarmiut whale hunt. The fact that nothing of this nature has been observed on Herschel Island despite intensive archaeological investigation provides some limited negative evidence to support the supposition of a less productive whale hunt.

Whatever the actual success rate, our estimation of the contribution of edible tissue in each of these contexts indicates the enormous contribution of even one bowhead whale to the diet of the Nuvugarmiut and Qikiqtaryungmiut. Even though meat weight calculations must be viewed critically, it seems clear that wherever bowheads were successfully hunted, they were the number one ranked species in terms of dietary contribution. It also underlines the potential catastrophe that might have ensued if a bowhead hunt was not successful. Nevertheless, the available evidence suggests that this potential calamity was avoided by reorganizing winter and spring subsistence to focus on seals.

Though beyond the scope of this paper, this study suggests some additional questions relating to the social aspects of Mackenzie Inuit bowhead whaling. Given the well documented contrasts in social organization between bowhead whalers and winter sealers in the North American Arctic (e.g. Friesen 1999, Henshaw 1999; Sheehan 1985; Spencer 1959), what was the nature of social organization among the Qikiqtaryungmiut, who appear to have alternated between both economic specializations on a year-to-year basis? Additionally, did umialik-like hierarchies exist among the Nuvugarmiut and Avvarmiut, where whaling appears to have been a more stable and productive pursuit? Finally, how did these bowhead whaling groups contrast with the unique beluga whaling societies on the East Channel of the Mackenzie River, and their distinctive social structures surrounding the communal beluga whale drive (e.g. Friesen 1999)? We hope that this paper provides a framework for assessing the structure of bowhead whaling economies in the Western Canadian Arctic, which may allow us to eventually move towards an exploration of these broader regional subjects.

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