Eating Beyond Ecology: The Impacts of Hunting Technologies on Archaeofaunas from the Eastern Arctic

by

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Abstract

This dissertation explores human-animal relationships within two very different societies, Late Dorset (500 CE to 1300 CE) and Thule Inuit (1200 CE to 1500 CE), who occupied common geographical areas throughout the eastern Arctic. While scholars interested in the behaviour of Northern hunter-gatherers have tended to focus on the primacy of environmental factors and changing environments, this dissertation aims to achieve a more nuanced understanding of the role of cultural factors in shaping human-animal interaction. I pursue this goal by focusing on distinct Late Dorset and Thule Inuit hunting technologies and practices, using zooarchaeological analyses to directly examine their impacts on subsistence strategies, including encounter rates, labour strategies, resource scheduling, and diet breadth. To address marked variability in resource availability between different areas in the eastern Arctic and allow for a cross-Arctic comparison, I consider three separate regions where Late Dorset and Thule Inuit occupied either the same site or sites that are located in close proximity.

Although hunting strategies in each region were greatly influenced by regionally-specific environments, I argue that this research shows they are also culturally distinct. Results suggest that differences in Late Dorset and Thule Inuit hunting technologies impacted their archaeofaunas in various ways, they directly influenced each groups hunting strategies, and ultimately, helped shape the human-animal relationship in each society. In comparison to Thule Inuit, Late Dorset were constrained by their hunting technologies, having to rely more heavily upon specific types of terrain features and seasonal changes in the environment. Thule Inuit hunting technologies, by contrast, allowed for larger harvests of key resources, providing better provisioning and perhaps an increase in food security. These results serve to highlight the role of culture in prehistoric lifeways, even in ‘marginal’ environments.

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Chapter 1
Introduction

1.1 Introduction

In all hunter-gatherer societies, people maintain a special relationship with animals. This relationship is established through thoughts and actions that are deeply embedded within a society's everyday practices (see Hill 2011a). The nature of human-animal interactions is heavily dependent on the physical environment and ecosystem; however cultural phenomena, including technologies, social organization, and ritual, are equally important to how this interaction is navigated (De Castro 2004; Descola 1996; Ingold 1996, 2000; McNiven 2010). In this dissertation I explore human-animal interaction in the eastern Arctic, specifically within Late Dorset and Thule Inuit societies.

In the eastern Arctic, the environment supports sparse vegetation that is insufficient to provide a substantial contribution to human subsistence or economy. In spite of the limitations of this environment, throughout prehistory the Arctic has been home to very different, and successful societies; and each of these groups relied almost exclusively on animals for food and raw materials. For Northern hunter-gatherers, hunting animals was the focal point around which most other social practices were arranged and negotiated. Scholars interested in the behaviour of Northern hunter-gatherers have tended to focus on the primacy of environmental factors, and changing environments, which have been linked with population movements (D'Andrea et al. 2011; McGhee 1969/1970, 1996), technological developments (Maxwell 1985), and changes in settlement and subsistence patterns (Barry et al. 1977; Boas 1888; Dekin 1972; McGhee 1976b; Stenton 1989). The rationale of these arguments is obvious; the natural environment directly affects the short-term and long-term regional availability of animal species, and provides ecological conditions that are either favourable or unfavourable for different species (see Sabo 1981; Stenton 1989). Of necessity, changes in these conditions will have serious implications for the subsistence economies that exploit them (Frison 2004; Henshaw 2003). Less, however, has been written about how cultural differences impacted human decision-making and influenced human-animal relationships (e.g., Savelle 1987). Arguably, these differences are just as important as the environment is to shaping Arctic human lifeways. Through examining Late Dorset and Thule Inuit hunting technologies and practices, and undertaking fine-grained zooarchaeological analyses, I attempt to move beyond ecology when interpreting their archaeofaunas in order to gain a better understanding of the cultural aspects of this relationship.

Ethnographic research has established the importance of cultural beliefs and practices in human-animal interaction (Bulmer 1967; Douglas 1966; Evans-Pritchard 1956; Lévi-Strauss 1966; Tambiah 1969; Willis 1974). As this relates to hunter-gatherer societies, archaeological researchers have addressed this topic with varying degrees of success (McNiven 2010; Potter 2004), with problems stemming from the difficulty of differentiating between the impacts of social and environmental factors on human-animal interaction in the archaeological record. Variation in human behaviour between different societies, and within societies that occupy different locales, is frequently, and most easily, attributed to disparities in local ecosystems (e.g., Schalk 1977). Accordingly, to minimize disparities in environmental factors and isolate human behaviours that are primarily conditioned by social or cultural differences, I will analyze archaeofaunas from sites occupied by both Late Dorset and Thule Inuit, or from those found in close proximity within the same Arctic region.

In the Arctic, Inuit oral histories, mythology, and ethnographic sources provide great detail regarding the human-animal relationship, showing it to be one imbued with social, symbolic, and ritual meaning (Boas 1888, 1901; Burch 1980; Fienup-Riordan 1995; Lantis 1946; Nelson 1900; Rasmussen and Ostermann 1952; Rasmussen and Worster 1921; Sheehan 1985; Søby 1969/1970; Spencer 1959). Unlike Western societies, where animals are generally perceived as objects to be owned and consumed (see Strathern 1988), many Northern hunter-gatherers considered, and continue to consider, animals as non-human beings, that possess abilities similar to humans (Fienup-Riordan 1988, 1995; Nuttal 2000; Pratt 1993; Sabo and Sabo 1985; Saladin d'Anglure 1994). This ontological perspective is upheld through continuous action and engagement and is fashioned in mutual respect. The archaeological correlates of these cultural phenomena, however, are frequently unavailable or unrecognizable within the archaeological record, and accessing these correlates is particularly problematic when descendent communities do not exist, and ethnographic information is not available. Technologies, however, which are also cultural phenomena (Dobres and Hoffman 1994; Hodder 2012), are highly visible in the archaeological record and have been the focus of many Arctic archaeological studies (D'Altroy and Earle 1985; Desrosiers 2009; Desrosiers and Sørensen 2012; Houmard 2011; Riddle 2011; Ryan 2009; Wells 2012). As a result, there exists a robust dataset regarding the technologies of prehistoric Arctic cultures. In this dissertation I examine hunting technologies, and associated practices, to better understand their role in the human-animal relationship within Late Dorset and Thule Inuit societies of the eastern Arctic.

1.2 The impacts of technology on subsistence

It is well established that hunting technologies are inherently linked to hunter-gatherer subsistence practices (Croes 2004; Erlandson et al. 2009; Lupo and Schmitt 2005; Straus 2006; Vierra 1995). At the most basic level, the type of hunting technology a society employs directly relates to which resources are the focus of hunting activities. In northwest California, for instance, the co-evolution of large sea mammal harpoon heads and large ocean going canoes coincided with an increase in marine mammal hunting (Hildebrandt and Jones 1992, 2002); in northern North America the use of the bow and arrow has been linked to an increase in caribou hunting (Maschner and Mason 2013); and, in the western Arctic the adoption of fishing nets resulted in an increased reliance on fish species (see Whitridge 2001). In all, hunting technologies can influence encounter rates, labour strategies including communal or non-communal hunting, resource scheduling, and diet breadth.

The sophistication of hunting technologies and the organization of their use can also drastically affect social structure in addition to subsistence (e.g., Ugan et al. 2003). In Inuit society, the use of whale hunting technologies, including large skin boats called *umiaks,* large whaling harpoons, and floats, is generally associated with increased social stratification. Historically, large whale hunts were communal endeavors and involved highly organized whaling crews with hunting captains (Spencer 1959). Though availability was a key factor determining locations where large whales were the focus of economic activities, it is notable that in these locations social positions were much more hierarchal than in regions where subsistence was primarily based on other species (e.g., Friesen 1999). Throughout North America, the introduction of the bow and arrow led to drastic changes in subsistence practices and social structure. The bow and arrow allowed hunters a more efficient exploitation of resources (e.g., Bettinger and Eerkens

1999; Reeves 1990:170-171; Yohe 1998), and its introduction led to various rearrangements in social relations (e.g., Blitz and Porth 2013). These include an increase in self-sufficiency and less social complexity in some cases (e.g., Bettinger 2013), an increase in social complexity in others (e.g., Bingham et al. 2013), and sociopolitical instabilities (e.g., Kennett et al. 2013). The variability in societal responses is generally understood to relate to regionally specific socioecological variables (Kennett et al. 2013).

The type of mobility used while hunting, is also seen to greatly impact a society's subsistence practices (Ames 2002; Clutton-Brock 1992; Frison 1975; Hildebrant and Jones 1992; Reeves 1990). Mobility strategies directly affect prey choice, animal age at death and sex profiles, site use, and skeletal element representation. The development and use of boats, for example, drastically changed ancient hunting and subsistence activities (Ames 2002; Hildebrandt and Jones 1992). Furthermore, the use of boats can result in completely different subsistence patterns in comparison to situations where land transportation is used (e.g., Osborn 1999, Kelly 2013); it allows for the transport of larger amounts of resources over longer distances as boats can carry heavier loads with minimal costs; and, it may also provide access to a greater range of resources throughout the majority of the year (Ames 2002).

Thus, the types of technologies used and how they are employed largely shape the subsistence activities that are at the core of the human-animal relationship in hunter-gatherer societies. In order to use varying hunting technologies to access cultural differences , however, it is first necessary to define how technology is conceived.

1.3 A socially-embedded technology

Technology, as understood in this dissertation, is thoroughly embedded in social life (Dobres and Hoffman 1994; Dobres 2000a; Hodder 2012; Ingold 2000; Johnson 2010; Lemonnier 1993a; Mauss 1935; Meskell 2005; Schlanger 1998; Sinclair 2000). This is contrary to previous anthropological conceptions where technologies were viewed as exterior to social life, and their use to be purely pragmatic (Durkheim and Mauss 1963 ; Leach 1966, 1976). This past approach interpreted subsistence activities as a means-to-an-end, as a type of mechanical behaviour (Sahlins 1972). This division of technology from the social (Durkheim 1976), however, arbitrarily divides a person into two parts, separating the individual person who hunts from the social being who shares (Ingold 1988). A similar distinction between technologies and society is found within studies of Marxist anthropology. Jonathan Friedman (1974) has claimed that the social and technical affinities of production are fundamentally discrete. He posits that the acts involved in the production of food are ultimately technical, since they are mechanical forces exerted by the human body, but suggests that acts of cooperation in hunting are altogether something separate. Again, however, this position that divides the technical from the social ultimately defines hunting and gathering as part of a technical system that is distinct from the social relations involved in the distribution and sharing of foods (Ingold 2000). As Ingold (2000:318) points out, the food at the centre of the social action is a direct consequence of the hunter or gatherer's embodied qualities - their technical skill. Thus, the technical behaviour and the social behaviour of food distribution are inherently linked.

Technologies have become increasingly recognized as something more than just "hardware" (Dobres and Hoffman 1994; Hodder 2012; Lechtman 1977, 1993; Lechtman and Steinberg 1979; Lemonnier 1992, 1993b; Meskell 2004), and today they are commonly viewed as playing an important part in shaping prehistoric lifeways and influencing cultural change (Dobres and Hoffman 1994; Johnson 2010; Jordan 2014). This approach to technological studies has taken shape with the hope of adding 'life' to technologies, investigating all facets of technical activity and exploring the 'operational chain' of these materials (Lemonnier 1986; Meskell 2005). It aims to understand the socio-cultural context of technologies by explaining variations in techniques in equivalent material environments and shedding light on the technological choices of a society (Lemonnier 1986, 1992, 1993b; Hodder 2012). By doing so, it can offer valuable insights into the mechanics of weaponry and the hunting process, as well as social relations (Ingold 2000; Lemonnier 1986; McNiven 2010). It also recognizes that technologies do not act alone, but are powered by persons whose experience determines their use and effectiveness. Hunters combine skill and cumulative observational knowledge of the environment and animal behaviour in order to successfully acquire their prey (McNiven 2010). This understanding of technology entails that their use takes place within specific cultural and historic contexts of dynamic social interaction (Conkey 1991). Thus, how technologies are operated on a day-to-day basis can reveal culturally significant decisions (Dobres and Hoffman 1994).

Though hunting technologies and their associated hunting practices can provide great insight into a society's identity, particularly in how they relate to animals, alone they do not reveal the full nature of human-animal interaction, as their outcome cannot be directly examined. This, however, can be achieved by analyzing the remains of the animals hunted (see Churchill 1993). The zooarchaeological analyses of archaeofaunas and the use of relevant ethnographic information make accessing the results of these technological capabilities and hunting practices possible, and form the foundation on which this research is built.

1.4 Research Objectives

In order to gain a more nuanced understanding of Late Dorset and Thule Inuit interaction with animals, I examine their varying hunting technologies and practices and employ zooarchaeological analyses to directly examine their impact. The zooarchaeological analyses conducted in this research focus primarily on reconstructing subsistence economies and include detailed discussions of the different taxa hunted, the distribution of animal skeletal elements, the modifications found on the animal bones, and prey demography. The information derived from these analyses will help identify how each society interacted with its prey, and which aspects can be attributed to varying hunting technologies.

The zooarchaeological record, however, is also greatly impacted by site formation processes. Thus, understanding a faunal assemblage's taphonomic history is essential to reconstructing an accurate conception of past human behaviour. This helps control for biases that may affect a deposit, and any inferences made from it (Lyman 1992a, 1994b; Schiffer 1983). One way to control for taphonomy is to use a multi-scalar approach (Bar-Oz and Munro 2004). By making intra-site, inter-region, and region-to-region comparisons, any trends in zooarchaeological patterns that might occur at different scales of research can be identified (Muir and Driver 2002), and thus more accurate interpretations of any similarities or differences between assemblages can be made.

This research concentrates on Late Dorset and Thule Inuit at three eastern Arctic locales. Though the remains of these two societies are often found in close proximity to each other throughout the eastern Arctic, access to suitable faunal samples has focused this research on: 1) Iqaluktuuq, Victoria Island; 2) the Grinnell Peninsula, Devon Island; and, 3) the Smith Sound region, Ellesmere Island and northwestern Greenland. The distance between the Late Dorset and Thule Inuit occupations vary from region to region, and are greatest in the Smith Sound region. While this is not ideal, variation in the local ecosystem within the Smith Sound region is carefully considered when the analyses are interpreted. I initially explore human and animal interaction, within Late Dorset and Thule Inuit societies, by examining a central question: *what are the effects of hunting technologies on the zooarchaeological record?* In the eastern Arctic, Late Dorset and Thule Inuit hunting technologies are distinct and relatively well known (Maxwell 1985; McGhee 1996, 1990). The differences between the societies' technologies are used to predict which hunting practices they utilized and what an associated zooarchaeological signature is expected to look like (Chapter 6). This will help isolate patterns caused by these distinct technologies, and where the results of the zooarchaeological analysis differ from the predicted zooarchaeological signatures it can help reveal where, and possibly which, additional variables may be at play. To date, only one study has directly compared Late Dorset and Thule Inuit archaeofaunas (Darwent and Foin 2010).

1.6 Section Outline

In Chapter 2, I discuss the various ways in which zooarchaeologists have investigated human-animal interaction, and I present the framework of the current research. In this chapter I also address the impacts of site formation processes, taphonomy, and the problem of equifinality. At this point, the zooarchaeological methods and measures used in the analysis are reviewed and data collection methods are outlined.

In Chapter 3, I review key aspects of the Arctic environment and the animal resources that were integral to past economies. Following this I discuss the eastern Arctic's culture-history in Chapter 4, which details Paleo-Inuit[1] and Inuit settlement and subsistence practices, technologies, and site architecture.

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[1] The name 'Palaeoeskimo" is most commonly used to refer to the first group of people who migrated into the eastern Arctic. However, there has been a recent call for Arctic archaeologists to replace this term with 'Paleo-Inuit' (Friesen 2015). This change in terminology follows the lead of the Inuit Circumpolar Council, an organization representing all Inuit, Inuvialuit, Iñupiat, and Yupik that advocated for this change in 2010-2011, and it acknowledges the negative connotations and frequent inappropriate use of the term 'eskimo' (for further discussion see Hardenberg 2013). Thus, throughout this dissertation 'Paleo-Inuit' is used in place of 'Palaeoeskimo'.

In Chapter 5, I present the hunting technologies and practices of Late Dorset and Thule Inuit societies. First, I present the distinct Late Dorset and Thule Inuit hunting tool kits known from the archaeological record. I then discuss relevant ethnographic studies and Inuit oral histories of hunting technologies and practices. This information is contextualized to help reconstruct the hunting practices of both Late Dorset and Thule Inuit. I then use the differences between Late Dorset and Thule Inuit hunting technologies and practices to create a number of expected zooarchaeological correlates, which are outlined in Chapter 6.

In Chapters 7, 8, and 9, I detail each of the three study regions. In each chapter, I present the region's physical environment and available animal resources, followed by a history of archaeological research and a detailed description of the context from which the faunal assemblages were excavated. Late Dorset and Thule Inuit faunal material is presented, consecutively, concluding with an intra-regional comparison of Late Dorset and Thule archaeofaunas.

Chapter 10 consists of three parts. First, confounding factors that may also be influencing the zooarchaeological record are addressed; second, I make inter-regional comparisons; and, third, I compare the zooarchaeological expectations presented in Chapter 6 with the results of the zooarchaeological analysis and summarize any cultural trends observed in either the Late Dorset or Thule Inuit faunal samples. Chapter 11 includes concluding remarks and outlines the contribution of this study to broader studies in Arctic archaeology and hunter-gatherer research.

Chapter 2
Theoretical Considerations and Research Methods

2.1 Introduction

This dissertation examines human-animal interactions in the eastern Arctic. While research of this kind has tended to focus on environmental influences, this project explores a cultural aspect of these interactions in an attempt to move beyond interpretations focused on ecology. I pursue this objective by examining the hunting technologies and hunting practices of Late Dorset and Thule Inuit, and using fine-grained zooarchaeological analyses. I consider technologies as socially embedded phenomena (Dobres and Hoffman 1994), and the manner in which these technologies are used is believed to help shape the relationship between humans and their environments (Dobres 2000b; Hodder 2012; Ingold 2000; Jordan 2014; Lemonnier 1993b). Hunters, however, are not just mechanical operators of these technologies, but bring with them their knowledge and experience, which directly impact the outcome of hunting activities (see Chapter 3).

This research consists largely of the zooarchaeological analyses of Late Dorset and Thule Inuit archaeofaunas, since they provide the most direct means to understanding the impacts of differing hunting technologies, and ultimately how each society interacted with animals. Within the Iqaluktuuq and Grinnell Peninsula study regions, both groups would have occupied near identical environments; and, while the distance between the Late Dorset and Thule Inuit sites in the Smith Sound region is not ideal and undoubtedly resulted in variable resource structures, this is carefully considered when the results are interpreted. Regardless, as is discussed in Chapters 4 and 5, how Late Dorset and Thule Inuit exploited their environment varied. Zooarchaeological analyses are directed towards clarifying this variation, by reconstructing Late Dorset and Thule Inuit subsistence economies within the three study regions and assessing how they relate to differing hunting technologies. In this chapter, I review key approaches to human-animal interaction used by zooarchaeologists, I further discuss the impacts of technologies on subsistence, and I outline the theoretical underpinnings of the current research. Following this I present the zooarchaeological methods and measures I employ in later chapters.

2.2 Zooarchaeology and approaches to human-animal interaction

As a discipline, zooarchaeology has tended to borrow its theoretical approaches from elsewhere. Much of the research focused on human-animal interaction is rooted in studies in evolutionary ecology, and middle-range theory (see Reitz and Wing 1999). Similar to many aspects of zooarchaeological research, these approaches both use deductive reasoning, and rely on a set of *a priori* models from which to evaluate the archaeological finds and help explain variability in the archaeological record. Zooarchaeological research also shares many of its basic assumptions and examination processes with behavioural archaeology (Gifford-Gonzalez 2011). Key aspects of these approaches and how they are utilized within zooarchaeology are discussed below.

2.2.1 Zooarchaeology and Evolutionary Ecology

Evolutionary ecology is primarily concerned with the relationships between groups of living organisms and the abiotic and biotic elements found within a given environment. Underlying this theory is the basic assumption that there is continuous interplay between living organisms and their environments, and because of this they can only be understood together. The ecosystem, defined as an aggregation of living organisms and their environment and the interrelationships between them, is the basic analytical unit studied by ecologists (Chapin et al. 2011; Golley 1993; Odum 1959). This approach recognizes that particular elements are connected by complex networks, and allows the interrelationships between particular elements to be explicitly defined so that change within the system can be modeled (Chapin et al. 2011; Odum 1959). Anthropologists were quick to adopt this approach (e.g., Barth 1956), which has figured prominently in studies of present and past human populations (Bettinger 1980; Borgerhoff Mulder 1987; Butzer 1982; Dunnell 1980; Jochim 1979; Kirch 1980; Nolan and Howard 2010; Smith 1983).

Human behavioural ecology (HBE), which can be broadly defined as the study of evolution of human behaviour within specific ecological niches (Winterhalder and Smith 2000), has had a great influence on zooarchaeology, and subsistence studies in general (Kelly 1995). This is primarily because of two factors: its emphasis on adaptation in an ecological context, and its use of simple models for examining relationships between environmental variables and human behavioural evolution (Gremillion 2002). Of particular use for zooarchaeologists is optimal foraging theory. This theory, which developed in evolutionary ecology, contends that adaptive success results from maximizing the return (of energy or calories) per energy output (see Smith 1983). For the past several decades, this theory and its models have been at the forefront of zooarchaeological research, particularly those that focused on hunter-gatherer societies, as it offers valuable insight into the variable behaviour of past societies (e.g., Bayham 1979, 1982; Betts 2005; Betts and Friesen 2004, 2006; Butler 2000; Byers and Broughton 2004; Cannon 2000; Dewar et al. 2006; Johansen 2013; Lupo 1998, 2006, 2007; McGuire and Hildebrandt 2005; Munro 2004; Nagaoka 2002; Shennan 2008; Stiner et al. 2000; Ugan 2005). It is also well suited to addressing how technologies impact subsistence practices and it figures predominantly in these studies (e.g., Croes 2004; Bettinger 2013).

One widely used optimal foraging model in subsistence studies is the diet breadth model, also known as the prey choice model (see Stephens and Krebs 1986). This model postulates that individuals will choose to exploit a specific resource based on the effort it takes to capture and handle the resource and the amount of food it yields. The effort taken to capture the animal is measured through the time it takes to encounter the prey, and handling costs refer to the time spent pursuing, processing, and consuming the resource once it has been encountered (Kelly 2013). Energy expenditure is the key to this model. It follows that once energy costs are deducted the prey with the highest yield will be chosen first, and others will be added to the diet in descending rank order of net caloric return but only if their return is higher than the average of high-ranked prey already in the diet (Hawkes and O'Connell 1992). Lower ranked prey will only be added to the diet when the availability of higher ranked prey decreases. Therefore, changes in diet breadth are entirely dependent on the availability of high-ranked prey. When high-ranked prey become more abundant, diet breadth will narrow, and foraging efficiency is increased as low-ranked prey will not be targeted; however, if high-ranked prey become scarce, the diet breadth will increase, there will be a decrease in foraging efficiency, and low-ranked prey will be added to the diet. Animal body size, which often correlates with handling costs and food yield or caloric input, is frequently used as a measure of diet breath and for determining whether a resource ranks high or low (see Ugan 2005). Prey behaviour (e.g., Jones et al. 2008; Lyman 2003; Stiner 2002a; Stiner and Munro 2002; Stiner et al. 1999), and prey mobility (e.g., Bird et al. 2009) are additional variables commonly used to predict diet-breadth and help determine high and low ranked prey. Despite the obvious importance of resource structure in this model, it is suggested that hunting technologies and hunting techniques are the overriding determining factors of resource return rates (Bettinger 1993; Madsen and Schmitt 1998). Bettinger (1993:52) explains that return rates are not intrinsic to the resource, but are often the result of "the mode and circumstances of procurement". Many studies have shown, for instance, that small species return rates will increase, potentially from low-ranking to high-ranking, if they are hunted en masse (Bettinger 1993; Grayson and Cannon 1999; Madsen and Schmitt 1998; Schmitt et al. 2004; Stiner et al. 2000; Sutton 1995). Furthermore, technological change, and any change in how a technology is applied, will also impact the return rate of prey taken individually. A prime example is the increase of a resource's return rate after the adoption of the bow and arrow (see below for further discussion; Broughton 1994, 1995; Kennett et al. 2013).

In order to determine the return rates for animal resources, zooarchaeologists depend heavily on ethnohistoric, historic, and experimental sources (e.g., Lupo 1998; Madrigal and Holt Zimmerman 2002). In this way, return rates can be tailored to a particular group of people, environment, and their technological capabilities. This approach is not without its flaws, since ethnohistoric and historic records are sometimes limited and experimental studies can be biased by a number of issues (see Wylie 1985), however it provides a starting point from which to develop predictions of what the faunal record should look like under certain conditions. Even when the predictions of optimal foraging models are not met, they at least provide points from which to develop new hypotheses and open investigation to "new areas of inquiry by identifying unanticipated relationships between variables" (Gremillion 1998:149).

One of the most influential models related to optimal foraging theory that is used to explain how different hunter-gatherer societies negotiated their environment and interacted with animals is the forager/collector model. Binford (1980) put forth this model in his seminal article *Willow Smoke and Dogs' Tails: Hunter-Gatherer Settlement Systems and Archaeological Site Formation*. In this article, he argues that hunter-gatherer mobility can be predicted since it relates to the temporal and spatial distribution of resources. Binford (1980) defines two distinct hunting strategies: a foraging strategy, which is characterized by low logistical mobility, with few specialized task groups targeting specific resources, and high residential mobility, moving home camp often, since groups frequently move their camp to be close to resources; and a collector strategy, which is characterized by high logistical mobility, with specialized task groups frequently targeting specific resources in specific locations, and low residential mobility, moving home base infrequently, as groups make temporary excursions from their base camp (Binford 1987). Another distinguishing factor between these two strategies is that foragers do not typically store food, but instead gather food as it is encountered. In contrast, collectors store their food and food procurement is logistically organized. Binford (1980) points out that these strategies should be seen as part of a continuum, not as discrete categories, although groups may tend towards one end of this spectrum. These basic types of hunter-gatherer adaptive strategies are used in order to explain settlement and subsistence patterns, and within Arctic archaeology have been utilized to understand changes within both Paleo-Inuit and Inuit society over time (see Nagy 1997; Savelle 1987). For Binford (1980), the environment, particularly resource structure, dictates hunter-gatherer adaptations and determines the various mobility and settlement patterns, and economic and social relations that are characteristic of a cultural group. A similar model, developed by Bettinger and Baumhoff (1982), linked the key concepts of the forager/collector model with technologies and social structure. Invoking the rubric of the forager/collector model, this model became quite popular in studies of social complexity that discuss mobility and production (e.g., Ames 1991). Because of its popularity, subsistence changes tend to be explained as a shift from a forager to collector strategy (e.g., Murray 1999), and the forager/collector model has come to be viewed as evolutionary although it was not originally used in this manner (see Binford 2000).

While optimal foraging perspectives allow evaluation of caloric inputs and energy outputs (Winterhalder and Smith 1981), this approach has been criticized as simplifying human behaviour to quantifiable measures that do not truly represent the complicated nature of human behaviour or human-animal relationships (see Hardesty and Fowler 2001). This type of approach has long been critiqued. In 1985, Graeme Barker and Clive Gamble argued “if we use only palaeo economic data to talk of calories and nutrients, an enormous amount of potential information is being ignored” (pg.5). Additionally, since Sahlins’ (1976) monograph *The Use and Abuse of Biology,* in which he systematically refutes the use of an evolutionary approach to human social and cultural behaviour, cultural anthropologists and post-processual archaeologists tend to view applications of evolutionary theory in anthropology and archaeology as inadequate (e.g., Shanks and Tilley 1987).

Attempts to remedy the pitfalls within the optimal foraging framework first appeared in the 1990's as researchers began to focus upon the historical context in which economic decisions were made (Balée 1998, 2006; Balée and Erickson 2006; Crumley 1994); this approach is known as historical ecology. Within this field, studies move beyond simplistic mechanisms of causation by taking a closer look at the specific social context when interpreting human responses to the environment (Crumley 1994, 2001). One of the central postulates of this approach is the idea that human activity has created the environment in which it takes place (Kidder and Balée 1998; Redman 1999). Instead of dichotomizing culture and nature and the idea that humans adapted to fixed environments, studies in historical ecology seek to understand the cultural and historical production of 'landscapes', in which human action takes place (Balée 2006; Crumley 1994; Headland 1997). This differs from cultural ecology, which posits humans must adapt their technologies, populations, and cultures to the environment (Balée 2006). In comparison to earlier studies in evolutionary ecology, historical ecology is much more concerned with issues of change, contingency, and human agency (Sutton and Anderson 2010). Zooarchaeological research has successfully invoked the historical ecological framework, with studies addressing the sustainability of traditional practices over time, landscape formation, and resource management (Erlandsdon and Rick 2010; Rick and Erlandson 2008; Woollett 2007).

Today, the "one-way adaptive framework" found within applications of optimal foraging theory is no longer readily accepted and researchers are exploring alternative approaches where humans are seen to take an active role in shaping their ecosystem (see Zeder 2012). One of these more formal approaches, which developed directly out of macroevolutionary theory, is niche construction theory. This theory "refers to the activities, choices, and metabolic processes of organisms, through which they define, choose, modify, and partly create their own niches" (Laland et al. 2000:132-3). At the core of this theory is the principle that organisms deliberately enhance their ecosystems to ensure survival (Smith 2015; Laland and O'Brien 2010), and the changes made to their ecosystem will influence their own evolution and that of others. Therefore, from this perspective evolution involves the inheritance of genes in addition to an ecology that has been modified by ancestors, whereas "each offspring actually inherits an initial organism-environment relationship, or ‘niche’, from its ancestors” (Kendal et al. 2011:786). In niche construction theory, there is no contention that humans engage in goal directed behaviours, however whether or not these behaviours are governed by goals of optimizing return is questioned (Zeder 2012). Instead, decisions are seen to result from less defined overlapping goals, and subsistence choices are aimed at meeting these goals versus maximizing outcomes (Zeder 2012).

Traditional optimal foraging models, however, necessarily assume that environments and the humans that act within them are independent of one another, and are ill equipped to take into account an environment that itself develops in relation to its human actor. The goal of optimal foraging models, however, is not to duplicate reality, but instead they attempt to model reality if hunter-gatherers are behaving according to a model’s set of goals and conditions (Kelly 2013). These models provide a quantitative way to examine foraging behaviours and their results, and are a practical way to assess the different strategies available and understand variation in the hunter-gatherer diet. As Kelly (2013:76) explains “by predicting which resources a forager will take if resources are ranked only in terms of their search costs and post-encounter return rates, for example, the data collected to test optimal-foraging models can flag those resources that are taken or ignored for reasons other than energetics.” Optimal foraging models have also become more sophisticated to include variables other than energy costs, including alternate foraging costs (e.g., divisions of labour; see Bird and Bliege Bird 2000; Codding et al. 2011; Pacheco-Cobos et al. 2010), differing foraging goals (e.g., prey mobility, see Bird et al. 2009), and new currencies (e.g., prestige; see Hildebrandt and McGuire 2002). Research within the optimal foraging framework continues to provide new insight into past human behaviours and decision-making, suggesting it remains a worthwhile approach, particularly in the Arctic where the environment is known to be quite demanding (Whitridge 1992).

2.2.2 Zooarchaeology and Middle-Range Theory

Middle-range theory is also commonly found within zooarchaeological research. This approach centres on how present day facts are used to make statements about the past, particularly how archaeologists “convert… observationally static facts of the archaeological record to statements of dynamics” about human behaviour (Binford 1977: 6). To do this, middle-range theory research focuses on identifying aspects of human behaviour that correlate with material patterning (Binford 1977). As proposed by Binford (1981:32), this approach warns against making untested assumptions about archaeological remains and advocates an approach that utilizes middle-range research “where controlled information about causes and effects could be evaluated experientially rather than inferentially”. The strength of this approach for understanding archaeological materials is in its reasoning, that is, it allows reliable inferences to be made from archaeological evidence (Gifford-Gonzalez 2008). Middle-range theory proposes that archaeological static facts can be linked to dynamic human behaviour and natural processes (Binford and Bertram 1977b). This theory has been criticized for treating archaeological sites as if they were frozen in time (Schiffer 1981, 1985), or falling prey to the “Pompeii premise” (O’Brien et al. 2005). However, Binford and Bertram (1977) point out that the static facts are subject to several processes and may have changed over time. For middle-range theory researchers, ethnoarchaeology became a favoured way to link material traces, or ‘signatures’, in the archaeological record with a set of patterned behaviours in a given environment (e.g., Binford 1978, 1983, 1984; Binford and Bertram 1977a; O’Connell and Marshall 1989).

Within the middle-range framework, the reconstruction of site formation processes and comparative analogy are utilized to ‘make meaning from the archaeological record’. A central component of middle-range theory is ‘uniformitarianism’, the idea that certain processes consistently result in the same outcomes, regardless of time or place (Binford 1981; Binford and Bertram 1977b). The reconstruction of site formation processes includes natural processes as well as those resulting from human activities, including butchering and transport decisions, carcass use, and discard. This approach fits well with existing notions found within zooarchaeology, since animal bones from archaeological sites are viewed as ‘uniformitarian materials’ from which past activities could be accessed, and the use of analogical reasoning is a common practice (e.g., Brewer 1992; Gifford 1981; Gifford-Gonzalez 1991, 2008; Lyman 1987). Additionally, Binford’s (1978) ethnoarchaeological research with the Nunamiut of Alaska, particularly the development of animal part utility indices designed to explain hunter-gatherer decisions regarding animal butchery and transport, provided real tools for understanding archaeofaunas and ultimately advanced zooarchaeological methods.

2.2.3 Zooarchaeology and Behavioural Archaeology

In behavioural archaeology, culture and the environment, which are essential components of studies invoking optimal foraging theory or middle-range theory, respectively, are no longer the focus (Walker et al. 1995). Instead, research is geared towards understanding the life histories of material things, and the relationship between people and things is explored through behavioural chains- the regular processes that characterize the manufacture, use and disposal of these things (Schiffer 1975, 1976, 2005). This type of analytical strategy is related to the *chaîne opératoire* approach (Balfet 1991; Cresswell 1983; Edmonds 1990; Pelegrin et al. 1988), which developed in relation to technology as a way to create expectations concerning the traces of different stages in the process (e.g., Lemonnier 1986).

Because the goals of behavioural archaeology are to reconstruct and explain variation in past human behaviour (Schiffer 1972, 1976, 1983, 1987), understanding the cultural and non-cultural processes of site formation became necessary (LaMotta and Schiffer 1999, 2005; Schiffer 1983, 1985, 1987a; Walker 1995). The importance of site formation processes and the use of analogical reasoning within behavioural archaeology are paralleled within many zooarchaeological studies (Gifford 1981; Gifford-Gonzalez 1989,1991, 2008, 2011; Schiffer 1978, 1987; Wylie 1985, 1989). Behavioural archaeological and zooarchaeological research, which are often not mutually exclusive, frequently use experimental or actualistic studies and ethnoarchaeological research to help identify behavioural uniformities responsible for patterns in the archaeological record (Gifford-Gonzalez 2011). Similar to the behavioural archaeology approach that conceives the life history of artefacts in terms of operational chains, flow models (Schiffer 1972, 1976), developmental cycles (Goody 1971) or behavioural components (Rathje and Schiffer 1982; Reid and Shimada; Rock 1974), the analysis of faunal remains can also be "..productively organized through a kind of 'operational chain'.." (Gifford-Gonzalez 2011).

Generally, behavioural archaeology does not focus on "big picture" questions (Broughton and O'Connell 1999), however, as for zooarchaeology and all archaeological inquiry, the behavioural archaeology program has provided a more nuanced understanding of the challenges of working with various materials and has consistently demonstrated the uniformities that occur with doing so (Gifford-Gonzalez 2011).

2.3 The relationship between Technology and Subsistence

The types of hunting technologies used and the manner in which they are employed impact all aspects of hunter-gatherer subsistence (e.g., Ames 2002; Angelbeck and Cameron 2014; Clutton-Brock 1992; Frison 1975; Hildebrant and Jones 1992; Reeves 1990; Shott 1990; Winterhalder 1981). While much research has focused on the role of technologies in human evolution and cultural change (e.g., Clark 2011; Kuhn 2004), the present research is primarily concerned with how hunting technologies impact subsistence practices. The goal is to gain a more nuanced understanding of how two different hunter-gatherer societies, Late Dorset and Thule Inuit, interacted with animals in a similar environment. How this interaction is governed by hunting technologies is at the root of this discussion. In this section I discuss previous research on the topic, including several examples where hunting technologies have impacted subsistence practices, and I outline how these impacts are reflected in the zooarchaeological record.

Using ethnographic and ethnohistoric accounts of numerous modern hunting societies, Churchill (1993) investigated the relationships between weapon technologies, techniques, and prey body size. The results of his study highlighted the interrelationship between hunting strategies, prey behaviour, and the landscape. His findings were threefold and suggest: 1) an association between the use of thrusting spears, large-bodied prey, and hunting techniques that are dependent on physiographic features and terrain types; 2) atlatl-propelled darts are associated with less dependence on terrain features, and an increase in small bodied prey; and, 3) the bow and arrow was not dependent on prey size or terrain features. Across the 96 societies included in Churchill's (1993) study, hunting with thrusting spears was associated with hunting methods that limited the escape of an animal by using physiographic features, including corrals, snow drifts, or bodies of water, or by the assistance of dogs; and, thus dependence on these additional factors make this weapon system subject to the most limitations. When using this method, for instance, terrain features must be both suitable for capture and the animals must be present for hunting to be a success; in other words, success is dependent on hunter and prey being in the right place at the right time (Churchill 1993). The spears themselves are essentially used as a dispatching tool, but hunters are required to confine the prey, ambush it, or pursue them to get close enough to strike. This type of hunting practice was found to be most successful for hunting medium to large prey animals since smaller prey can more easily escape impediments, and larger animals are more easily exhausted when pursued (Churchill 1993). Comparatively, when societies used the atlatl he found there was an increase in hunting small to medium sized game, a pattern he suggested could also be found in the archaeological record. On sites dating to the late Upper Palaeolithic that contain clear evidence for atlatl use, for example, the faunal record indicates a broadening of the subsistence base, with the inclusion of smaller, more agile alpine game (e.g., Straus and Clark 1986, Straus 1985, 1987a,b). The greater range allowed by the atlatl was understood to free the hunter somewhat from environmental circumstances and made stalking in an open environment possible. He found that hunters who used the bow and arrow, however, harvested various animals of all sizes, employing a variety of hunting techniques. Because the success of this technology is not dependent on terrain features, hunters were able to tailor their hunting strategy to the behaviour of their prey.

The impact that the bow and arrow had on hunter-gatherer hunting strategies is difficult to overstate (see Angelbeck and Cameron 2014; Railey 2010). Its overall efficiency and versatility made it a much more advantageous technology than a spear or lance, despite the fact it is much more time intensive to make (e.g., Reeves 1990). Comparably, the bow and arrow is more accurate and reliable than the spear, it allows targets to be hit from greater distances, and arrows can be thrown from positions of concealment versus an upright exposed position that will potentially scare prey (Kennett et al. 2013). Additionally, it has a more compact, portable nature than spears, which allows it to easily be carried over long distances to follow prey (Lombard and Phillipson 2010). In addition, arrows can be reloaded many times allowing for many launches versus the one allowed with a spear. Altogether, these attributes have a niche broadening effect (Sisk and Shea 2009), they decrease risks associated with hunting large prey and increase the returns of hunting smaller fast-moving species, including birds and fish (Sisk and Shea 2009). Ultimately, they increase the probability of a successful hunt. In a recent study of the Coast Salish pre-contact economy, Angelbeck and Cameron (2014) have shown that after the transition from spear to the bow and arrow there is an increased focus on artiodactyl hunting. A pattern that is consistent with the observations of Hanson (1991), and Butler and Campbell (2004) whose research included faunal assemblages from sites throughout the Northwest Coast. Prior to the introduction of the bow and arrow, however, small mammals were more important.

Use of the bow and arrow, therefore, allowed these societies to refocus their efforts on high-ranking resources, such as deer.

Similar to the bow and arrow, the use of traps has also been shown to have a niche broadening effect (e.g., Lombard and Phillipson 2010; Wadley 2010), although they are primarily associated with hunting smaller species. Subsistence diversification, or an increase in species richness, specifically the introduction of a new species into the diet is called the “broad spectrum revolution” (e.g., Flannery 1969; Stiner et al. 1999, Stiner 2001), and is often associated with the increase of small animals in subsistence activities. Hunting small species without these technologies, however, is very difficult, and this contributes to their low ranking in prey-choice models (see Stiner et al. 1999).

As mentioned earlier, hunting small species individually or en mass will impact their overall return rate in comparison to the energy expenditure of their capture and therefore will impact subsistence practices (e.g., Madsen and Schmitt 1998). Zooarchaeological analysis can be used in order to determine which hunting technique was used. Jones (2006), for example, investigated whether or not European rabbits were hunted individually or mass harvested in southwestern France during the late Pleistocene. Since mass harvesting can generally be determined by examining demographic profiles (e.g., Klein 1982), Jones examined the demographic profiles of the rabbits found in the faunal assemblages recovered from various sites. Jones points out that in order for these profiles to be reliable, it is first necessary to have a clear expectation of what they should look like based on hunting technique and animal behaviour. Through historical records of harvesting methods he determined that assemblages including young rabbits that have not yet left the nest, and adults that are mostly female, are good indicators of mass harvesting (Jones 2006). Using data related to rabbit epiphyseal fusion sequence, tooth eruption, and sexual dimorphism, she was able to determine that at some sites rabbits were taken using both methods, while at others they were primarily taken individually. Thus, the variable techniques used to capturing rabbit were identifiable in the zooarchaeological record, and she was able to show that rabbit would have generally been a low-ranking resource at these sites since they were largely captured individually.

Generally, more complex or specialized technology is associated with a greater return rate and targeted exploitation of specific resources (e.g., Kelly 2013). This is seen with the use of the bow and arrow versus the spear, it is also seen when fishing with nets versus spears. While again, the net requires more upfront costs in relation to its construction, netting technology has the ability to greatly increase yield in comparison to its construction costs. This, however, is not always the case. When netting technologies are used to hunt terrestrial resources such as small mammals, for example, the more people involved, the lower the return rate will be and the advantages of using a more specialized technology decreases (e.g., Lupo and Schmitt 2002). Nevertheless, the use of more specialized technologies result in acquiring higher frequencies of the resources they are used to capture, in comparison to situations where less specialized tools are used (e.g., Angelbeck and Cameron 2014).

Specialized technologies and hunting strategies frequently coincide with a narrow diet breadth (Morrison 1994), or a reduction in subsistence diversity (e.g., Binford 2001). To the contrary, in a diachronic study examining hunter-gatherer economic intensification in the Mackenzie River Delta, Betts and Friesen (2004) have shown that taxonomic richness increased over time; and, they posit this diversification, or an increase in diet breadth, served to buffer risk of resource failure and allowed for more stable economies. These faunal assemblages, however, were largely comprised of a few key species, exhibiting low taxonomic evenness that remained stable over time, which reflected the intensification or specialisation of hunting strategies in the region.

Specialized technologies, specifically those involving mass harvesting, require ways of dealing with the greater return of a resource for the harvest to be viable. Food processing activities, including storage, are essential for the cost of these technologies or techniques to pay off. These types of activities are shown to have direct impact on the distribution of animal skeletal elements at archaeological sites (e.g., Binford 1978, 1981; Friesen 2001). In northwestern North America, for example, the distribution of salmon elements, specifically the low frequency of cranial elements and abundance of vertebrae in faunal assemblages has been used by several researchers to suggest the stored food was consumed (e.g., Belcher 1992). By differentiating the sites where this distribution resulted from density mediated attrition, Butler and Chatters (1994) have lent credence to this claim, and have found some sites where this distribution resulted from cultural activities, likely food storage.

How prey is transported from the kill site to the camp is also shown to impact subsistence practices in various ways that are accessible in the faunal record. How easily prey is transported once it is captured, for instance, will influence how it will be processed, specifically whether or not elements will be culled and left behind at the kill site, or if an animal will be transported whole (see O'Connell et al. 1990). Transport costs are determined using a variety of factors, but generally consider the weight of the prey, the available transportation technology, and the transport distance (Ames 2002:29). Even when animals are not captured great distances from camp, transport costs will influence how an animal is transported. Ames (2002) has shown that boats have the capacity to easily transport a much higher weight in comparison to what can be transported via foot. Thus, animals can easily be brought whole back to site by attaching floats to the animal and dragging them or hauling the whole carcass in the boat. The presence of whole sea mammal skeletons on sites is used as evidence of this practice (e.g., Huelsbeck 1994). When weight is not an issue when transporting prey, Ames (2002) suggests that factors other than nutrition will influence processing and transport decisions, including whether or not an animal was primarily hunted for its meat or raw material. He posits that for aquatic hunter-gatherers processing will generally occur at the residential site, rather than the kill site.

Overall, these examples show that hunting technologies and associated practices influence subsistence practices and can be revealed in the zooarchaeological record. They also demonstrate that hunting technologies and practices are linked to all aspects of a faunal assemblage, including species distribution and abundance, skeletal element distribution, and prey demography.

2.4 Dissertation Approach

This dissertation examines the impacts of hunting technologies on Late Dorset and Thule Inuit archaeofaunas. Aspects of the theories discussed above- specifically the concepts that humans will optimally exploit their environment, that uniformitarian processes impact faunal assemblages, that these assemblages are created through operational chains, and the use of analogical reasoning, are brought together providing 'anchor points' that allow the exploration of more subjective, and culturally specific behaviours that may appear in the archaeological record (see Gifford-Gonzales 2008:18). Acknowledging that the optimal foraging framework can simplify the human-animal relationship, it is used informally in this dissertation as a means to identify zooarchaeological correlates that may relate to costs and benefits of using various technologies, and to highlight whether or not other factors may be at work. In this way, I address the “big picture” question of how varying hunting technologies impact Late Dorset and Thule Inuit archaeofaunas. Inuit ethnographic and ethnohistoric sources, and to a lesser extent Inuit oral histories are utilized to inform these predictions, however they are also used to make meaning of patterns that do not meet the predicted results. With careful zooarchaeological analysis, data are linked to various past human behaviours or taphonomic processes in a way that acknowledges the life history of the faunal assemblage. The information regarding each society’s technologies, and descriptions of analogous hunting practices allow for a more nuanced understanding of how these societies interacted with animals.

In order to get at the meaningful data within the zooarchaeological record, however, several issues must be dealt with. Of primary importance is the confounding issue of equifinality (see Brewer 1992; Lyman 2004), since more than one process can yield similar results, and pinpointing the variable(s) responsible for a particular archaeological pattern is not generally straightforward. Although debates exist over whether zooarchaeologists correctly utilize the term equifinality (Rogers 2000), for the purposes of this research equifinality is defined as different events resulting in the same patterning (Lyman 2004). In order to control for equifinality, the faunal analyses presented in Chapters 7 through 9 use an approach designed by Bar-Oz and Munro (2004) to unravel the taphonomic histories of study assemblages, including all post-depositional events that introduce, alter or delete material from the archaeological record (Schiffer 1983). Reconstructing the taphonomic history of the assemblages will help identify the technological effects on faunal remains (including puncture, burn, or cut marks) and any trends in the faunal material that reflect activities such as butchering, burning, and consumption; all of which can potentially help to interpret social organization, and food distribution (Friesen and Betts 2006). In order to understand how technologies impacted the faunal remains, and ultimately discuss how Late Dorset and Thule Inuit peoples interacted with animals in each of the study regions, there are several scales of zooarchaeological analyses. First, faunal samples from individual contexts are considered separately; second, each society’s faunal material is combined and considered together; and, finally faunal data is compared from region to region. This allows the detection of subtle differences in the zooarchaeological record that relate to differences in human behaviour.

2.5 Zooarchaeological Methods

The analysis chapters are initially divided by study region. Within each chapter, the Late Dorset and Thule Inuit faunal data are presented separately and the faunal material recovered from the contexts of each group is discussed in detail. My analytical procedures initially occur at this stage and taxonomic frequencies, animal element distributions, and modification frequencies are presented. Particular attention is given to the primary resource (the resource that is interpreted to contribute the largest amount of meat in a given context). Notable patterns of secondary, less important, resources are also reported where warranted. Following the research program set forth by Bar-Oz and Munro (2004:204-206) I include 1) summaries of taphonomic variables, 2) a discussion of assemblage completeness and fragmentation, and 3) the comparison of various subgroups (e.g., skeletal representation of immature versus adult individuals). Following the initial presentation of the data in each analysis chapter, an intra-regional comparison between Late Dorset and Thule Inuit archaeofaunas is made, beginning with a summary of the respective taphonomic histories. I then discuss how the data may relate to various aspects of each group's behaviour and technologies. In addition, I discuss other influencing factors, for example any discrepancies in the season(s) of occupation, the duration of site occupation, and food storage practices.

The six faunal assemblages analyzed for this dissertation were collected and stored in various institutions, the details of which can be found in Chapters 7-9. The excavations that produced the faunal assemblages occurred over a 32-year period and were undertaken by various researchers; as a result recovery methods were variable. This variation is taken into account within each analysis chapter, as well as in Chapter 10 when overall trends in the archaeofaunas are synthesized. Unlike the Grinnell Peninsula and Smith Sound assemblages, the Bell site faunal assemblages were not subject to previous analyses and I conducted the initial sorting and cleaning of the material prior to identification. Bone specimens were gently cleaned using dry brushes to remove any debris, although water was used if sediment obscured bone morphology. The faunal assemblages recovered from the Grinnell Peninsula and Smith Sound sites were all subject to previous sorting and analyses, therefore the bone specimens from these sites were largely free of debris prior to the identifications performed for this research. Previous identifications of these bone specimens were not consulted or included in this research. The specimens recovered from these sites were all deposited into bags once they were removed from the ground. Each bag included the relevant contextual information, including the site name, feature, square, and level.

2.5.1 Sampling and the Study Samples

Faunal samples were secured from three separate eastern Arctic regions to ensure a robust zooarchaeological study. The regions and sites chosen were ultimately dependent upon access to available and representative faunal material. In the Arctic it is standard practice to sample a house, midden, or activity area, in order to reconstruct subsistence practices; however, research at the Cache Point site, an early Inuit site located in the Western Arctic, has shown that these areas can produce strikingly different faunal assemblages (Friesen and Betts 2006). Thus, faunal samples collected from a single context are not necessarily representative of an entire occupation. It remains unclear whether or not this holds true for Late Dorset sites, where the space within houses tends to be less defined and the absence of dogs in Late Dorset society removes the destructive influence of this taphonomic agent (see Howse 2008). Regardless, both houses and middens are subject to varying taphonomic processes, for example household maintenance activities may result in increased bone fragmentation, and bone material discarded during warm season months is potentially subject to a greater degree of weathering (see Whitridge 2001). To ensure the faunal material discussed in this research is representative of each site's economy, in each study region faunal samples excavated from both house and midden features have been selected and analyzed.

The first regional analysis includes faunal samples collected from Late Dorset and Thule Inuit house and midden structures from the Bell site, Victoria Island, central Canadian Arctic. The analysis builds on previous research conducted by Friesen (2002a) and myself (2008). Part of the Late Dorset faunal sample presented and discussed in Chapter 7 was initially analyzed for my Master's research paper (2005) the results of which were published in 2008. The Bell site is unusual in that the economy is focused on terrestrial and riverine resources, and seal appears to contribute little to the diet (Friesen 2002; Howse 2008). Conversely, previous research has shown that Late Dorset (Bendix 1998, 2000a,b; Damkjar 2005; Darwent 2001; Helmer 1981; Mary-Rousselière 1976; Murray 1996, 1999a; Schledermann 1990) and Thule Inuit societies (Darwent and Foin 2010; Desjardins 2013; Johansen 2012; McCullough 1989; Norman and

Friesen 2010; Park 1989; Sabo 1981; Taylor 1972; Whitridge 1992) primarily maintained a marine-oriented subsistence economy in many other regions. Exceptions include the southern Baffin Island region, where Late Dorset (e.g., Milne et al. 2012) and Thule Inuit (e.g., Stenton 1989) relied largely on caribou for at least part of the year. Thus, this study offers a rare opportunity to further explore Late Dorset and Thule Inuit subsistence practices in terrestrial-oriented economies. The faunal material from the Bell site was all collected by trowel and was screened using a 1/8th inch (3 mm) mesh.

The second regional analysis included faunal samples provided by Dr. Robert Park of the University of Waterloo that were excavated in 2001 from a Late Dorset occupation at Hornby Head (RbJq-1), Devon Island, High Arctic. These samples were excavated from house structures and midden features, and were subject to initial analysis by Park's undergraduate students. Thule Inuit faunal assemblages excavated nearby Hornby Head at Porden Point (RbJq-6) were also analyzed. The Porden Point faunal samples came from features excavated in 1985 by Rochelle Allison, a master's student at the University of Calgary. Allison initially analyzed the faunal samples, however her project was never completed and the results of her analysis have never been published. The faunal remains from this region were recovered by trowel, but were not subject to screening. The Hornby Head and Porden Point sites are both located on beach ridges near the coast and are heavily marine-oriented (see Chapter 8).

The Smith Sound region, located in the High Arctic, is the third study region, and encompasses a larger area than the two previously mentioned. The Late Dorset faunal samples were excavated between 1996 and 1998 from houses and middens at the Southwest Point Site, Qeqertaaraq, Greenland. This site was excavated as part of the Gateway to Greenland Project, a collaborative research program undertaken between the Danish National Museum, the Greenland National Museum and Archives, and the Universities of Nuuk, Copenhagen and Århus (Appelt and Gulløv 1999; Appelt et al. 1998). Bo Bendix initially analyzed the faunal samples discussed in Chapter 9 as part of a larger sample that formed the focus of his masters' research project undertaken at the University of Copenhagen (Bendix 1998, 2000a,b). This site was excavated by trowel, and the back dirt was carefully examined for micro remains, however no screening occurred. The Thule Inuit faunal samples included in this regional analysis came from the Skraeling Island site that was excavated between 1978 and 1980 by Dr. Karen

McCullough (1989) and Dr. Peter Schledermann (Schledermann 1978b; Schledermann and McCullough 1980). These faunal samples were initially analyzed by McCullough and included in her PhD dissertation (subsequently published as a monograph in 1989), which investigated the origins of the Ruin Island phase of the Thule Inuit culture. The faunal material from this site was excavated by trowel, however no screening occurred.

2.5.2 Recording and identification

The faunal samples excavated from the Canadian sites were identified using the extensive osteoarchaeology reference collection of the University of Toronto, in addition to the ornithology collection of the Royal Museum of Ontario, Toronto, Ontario, and the animal bone collections of the Canadian Museum of Nature, Aylmer, Quebec. The Late Dorset faunal samples excavated from Qeqertaaraq, Greenland, (see Chapter 9) were identified using the animal bone reference collection of the Zoological Museum in Denmark, where the material is currently housed. This museum contains over 10 million specimens, and has one of the most renowned and complete collections of Arctic species. Illustrations of seal elements found in Lisa Hodgetts' (1999) PhD Thesis and the online database VZAP were used to complement the physical reference collections and ensure each bone specimen was identified to the lowest possible taxonomic category. All the faunal material discussed in the current research was identified and recorded by myself.

Bone specimens were analyzed according to their context (e.g., feature, square, level). Initially, specimens were separated according to class and then species, and all attempts to refit bone fragments occurred at this stage of identification. Databases were constructed using Microsoft Access and File Maker Pro. Various data were recorded for each bone specimen, including element, element portion, percentage of element, side, skeletal age (whether epiphyses were unfused, fusing, or fused), degree of weathering, and sex. A number of measurements were also taken on caribou mandibles and seal femora. Any noteworthy morphology, for example the general porosity and size of juvenile specimens, and the presence of pathologies, were included in a comment section. In addition to the identification, any modifications found on the bone specimen were recorded. This includes cut marks, burning, and gnawing. Because the location of cut marks can indicate various butchery activities, this was recorded. Additionally, the type and location of gnaw marks were also recorded. As a point of transparency, ivory specimens were found in each of the samples, however due the likelihood ivory was conserved because of its high value as a raw material, these specimens have been excluded from the samples and subsequent analyses. The following section outlines the quantitative methods and measures that form the core of this research program.

2.5.3 Taxonomic Frequencies

The most basic unit of measurement used in the current analysis: are the number of identified specimens (NISP) and the number of specimens (NSP). These are considered fundamental, or direct, measures as they describe the most obvious properties of a given phenomenon (Lyman 2008), and are less subject to the various decisions involved in the calculation of derived measurements (e.g., *minimal animal units*, MAU; see also Banning 2000). NISP gives consideration to both fragmentation and articulation. Thus, the unfused epiphysis and matching diaphysis of a femur is considered one specimen. In addition, two fragments of the same element that exhibit recent breaks are tallied as one specimen. NSP is tallied in the same manner, however it also includes specimens that are taxonomically indeterminate.

NISP is provided for each of the study faunal assemblages and is presented for each context. For the purposes of comparison, this measure is normalized; the NISP for each individual taxon is divided by the total NISP, then multiplied by 100 and presented as %NISP. The total NSP is also included for each faunal sample and is used to calculate the overall percentage of a sample that could be identified to species and class.

2.5.3.1 Taxonomic Richness and Evenness

The taxonomic structure and composition of archaeofaunas, also known as taxonomic diversity, can refer to a number of variables (Lyman 2008). In this dissertation, taxonomic composition is discussed in terms of richness, heterogeneity, and evenness. Taxonomic richness refers to the number of non-overlapping taxa (NTAXA) in an assemblage (Grayson 1984). Specimens are generally taxonomically identifiable to different taxonomic levels (see Lyman 2008). Taxonomic richness for the study assemblages is calculated at the species level when possible, although in various circumstances the genus level is considered. For example, if duck specimens were identified but a species could not be determined, duck is considered to have contributed to taxonomic richness. If several different species of duck are identified, these different species in addition to the general duck category are considered. Though the duck category likely includes specimens belonging to the identified duck species, and including this category does inflate richness, more specimens are likely to be identified to this general category resulting in a higher NISP. Therefore, to ensure a large portion of the sample is not ignored, and that evenness is accurately determined, it is included in the determination of taxonomic richness. Though attention is paid to potential overlap and whether the inclusion of these categories greatly impacts richness will also be considered.

Taxonomic evenness, also known as taxonomic equitability (Magurran 1988), refers to the distribution of specimens across taxa (Grayson and Delpech 1998; Grayson et al. 2001). Taxonomic evenness can be measured in several ways, in this dissertation the Shannon index of evenness and the reciprocal of Simpson's index are used. In order to calculate the Shannon idex of evenness, the heterogeneity of a sample, which simultanelusly measures evenness and richness and provides an alternative way to measure diversity, must first be established. Following Lyman 2008, heterogeneity is quantified using the Shannon-Wiener heterogeneity index (Magurran 1988), also known as the Shannon diversity index, and is calculated as:

$$H = - \Sigma P_i (ln P_i)$$

where P_i is the proportion (P) of taxon i in the assemblage. The proportion, or importance, of taxa in an assemblage is multiplied by the natural log of that proportion (Lyman 2008:192). Heterogeneity is high when the species of a randomly chosen specimen is difficult to predict and it is low when an accurate prediction can be made (Pianka 1978:287). Values generally vary between 1.5 and 3.5, with the greater value indicating a greater heterogeneity.

The Shannon index of evenness is the ratio of observed evenness in a sample to the maximum possible evenness (Magurran 1988). The Shannon index of evenness is the Shannon-Wiener heterogeneity index divided by the log of NTAXA or richness. Thus, evenness is calculated by:

$$e = H / lnS$$

In this measure H is the Shannon-Wiener heterogeneity index, and S is taxonomic richness. This index will range between 0 and 1. The lower the value of e, the less even the assemblage, and when the value is closer to 1 taxa are more equally abundant (Lyman 2008:195).

The Simpson's index is another measure of taxonomic evenness that calculates the degree to which an assemblage is dominated by the most abundant taxon in a sample:

$$D = \Sigma n_i [n_i - 1] / N [N-1]$$

In this index n_i is the number of individuals in a taxon and N is the total number of individuals in the sample. Because, however, the total species richness is likely underestimated in archaeological data, the reciprocal of the Simpson's index is employed in this dissertation (Jones 2004). The lower the index the more an assemblage is dominated by a single taxon. This index is a better measure of the dominance of an assemblage by a single taxon than the Shannon index of evenness, and it is also less sensitive to richness (Magurran 1988). Therefore, they are both considered when addressing variability in mammal remains amongst the study assemblages.

2.5.4 Animal Element Distribution

Animal element distribution is discussed using two derived measures: *minimum number of elements* (MNE) and *minimum animal units* (MAU). In the analysis chapters, these measures are presented and discussed using a standardized form, and the raw data is included in the Appendix.

MNE values are used to quantify the relative representation of skeletal elements in a given sample. For this research MNE's are calculated based on the frequency of specific parts of each element of an identified species; elements were initially separated into lefts and rights, any shaft fragments that could not be assigned a side were excluded and the remaining proximal, distal, and shaft fragments were tallied with the most frequent part being the MNE. In order to maximize the data available, age (size, porosity, and whether an element's epiphysis was fused, fusing, or unfused), was also taken into account. For example, a fused proximal right humerus and an unfused, slightly smaller and more porous, distal right humerus would result in an MNE of two. The percentage of the element that a bone fragment formed was also utilized when calculating the MNE for mid-shaft fragments of long bones. For example, 20% of a right femur mid-shaft fragment and 10% of a right femur mid-shaft fragment would equal an MNE of one.

However, because this dissertation is primarily concerned with variation in the frequencies of skeletal parts versus the frequencies of skeletal elements, MNE's are converted to MAU's. This is done by dividing the MNE by the number of that element in one individual (Binford 1984). The MAU's are standardized for the sake of comparison between features. To do this, the highest MAU value for each sample is set as 100 and every other element is then expressed as a percentage of this value by dividing each MAU by the highest MAU value and then multiplying by 100 (Binford 1978, 1981,1984; Binford and Bertram 1977a). This measure allows one to address questions regarding the transport of preferred parts, element survivability, and how a carcass was used (see Binford 1978; Lyman 2008).

2.5.4.1 Utility Indices and Density-Mediated attrition

Various indices have been developed to interpret animal element distributions and help identify influencing cultural and natural agents. Generally, these indices provide a numerical scale against which to compare animal element distributions. Binford (1978) introduced the concept of utility indices almost four decades ago in his work with the Nunamiut of Alaska. He suggested that transport decisions were related to several factors including the quantity of food available, the season of procurement, the size and sex of the animal(s), the number of hunters, and the travel conditions. Using the measurements of various anatomical parts of both caribou and domestic sheep, Binford (1978) developed indices designed to predict butchering and transport decisions, and ultimately the procurement goals, that impact faunal assemblages. His work demonstrated that the Nunamiut butchered and transported animals in a predictable manner according to the varying economic utility of different animal parts. These utility indices provide a set of expectations of how different strategies are reflected in archaeofaunas. A number of studies have built on Binford's (1978) work with the Nunamiut, revising and simplifying his methods (e.g., Friesen 2001; Jones and Metcalfe 1988; Metcalfe and Jones 1988; Morin 2007) and creating indices for additional taxa found in archaeological contexts. Several indices are used in this research including Food Utility indices (Lyman et al. 1992; Metcalfe and Jones 1988), Meat Drying Indices (Friesen 2001), an Unsaturated marrow index (Morin 2007), a preference-ranking index (Diab 1998), and Bone Density indices (Butler and Chatters 1994; Lam et al. 1999; Lyman 1994; Novecosky and Popkin 2005). The data sets used are included below in Tables 1-4. In this dissertation, the relationships between these indices and animal element distributions are assessed using Spearman's rank order correlation coefficients (see Chapters 7-9).

In Chapters 7-9, Food Utility Indices (FUI) for caribou (Metcalf and Jones 1998) and seal (Lyman et al. 1992) are used (Table 1-2). Both these indices scale the variation in the amount of meat, marrow, and bone grease associated with different anatomical parts. Their interpretation assumes that when transporting a carcass, the parts of the animal with the most edible material, including meat, marrow, and bone grease, will be favoured. Elements with high FUI, for instance, will be transported from the kill site, whereas those with low FUI will be left behind.

Friesen's (2001) Meat Drying index (MDI) for large mammals is also applied (Table 1). This index is a revised version of Binford's (1978) Drying Utility Index and is used to help predict which animal parts will be chosen for storage by drying. While meat can be easily preserved through freezing during the winter months, during the warm season meat needs to be processed in a specific manner in order to store it without it spoiling. In the Arctic, this tends to involve meat drying. Meat drying requires surface area to be maximized to allow moisture to evaporate. This can be accomplished through cutting the meat into thin strips. Marrow and brain tend to spoil quickly therefore corresponding elements such as crania and long bones are not chosen for meat drying (Friesen 2001). The MDI index is calculated using three variables: the total amount of meat attached to the bone, the weight of bone in relation to meat weight, and the amount of marrow and brain associated with the element. Binford's (1978) index was not straightforward, using partial bones and what appear to be arbitrary figures, whereas Friesen's (2001) index presents a more simplified MDI that relies on whole bone values.

An Unsaturated Marrow Index (UMI) is utilized to help interpret caribou element distributions identified in the study assemblages. This index was also introduced by Binford (1978) and based on his work with the Nunamiut. Binford (1978) proposed that the Nunamiut selected caribou elements for marrow cracking according to their oleic acid content, a criterion also proposed as important in the selection of bones for grease rendering. He used three variables to construct his index: fat quality, fat quantity, and processing time. Later, research by Jones and Metcalfe (1988) disputed the importance of oleic acid in the selection of elements for marrow procurement and grease rendering and suggested instead that marrow quantity alone was the primary factor in element selection. Work by Morin (2007) has since demonstrated that although the selection of elements for marrow procurement is strongly correlated with marrow quantity, the relationship with the quantity of unsaturated fatty acids is stronger. The preference for marrow with high quantities of unsaturated fatty acids is believed to be related to several factors including their more palatable taste and texture, their tendency to become rancid more quickly than saturated fats, and the nutritional condition of the animal (Morin 2007). This last factor is important because fat-depletion in animals that are stressed or starving tends to begin in proximal bones where saturated fatty acids are more prevalent. Morin (2007:81) suggests that this may have led groups to focus on the distal portions of bones where unsaturated fatty acids are prevalent. Morin (2007) argues that the Nunamiut selected elements based on their high quantities of unsaturated fatty acids and that this was an attempt to maximize energy returns. Using the quantity of unsaturated fatty acids, versus oleic acid or total fat content, Morin (2007) has developed a new UMI index, which is used in this dissertation (Table 2.1).

A food preference-ranking index for ringed seal is used in Chapters 8 and 9. Unlike the previous indices, this index is based on qualitative information garnered from interviews with an Iñupiat hunter (Diab 1998). Diab (1998) constructed this index based on taste preference for different parts of the seal skeleton. This index ranks the preference for various ringed seal elements on an ordinal scale (Table 2.2). Although this index is based on limited data, and is culturally specific, it serves as a reminder that archaeofaunal assemblages are not only impacted by transport and butchery decisions but also by more variable factors that are more difficult to ascertain from the archaeological materials.

Archaeofaunas, however, are also largely impacted by taphonomic factors. Variability in the mineral density of skeletal elements is considered the primary factor determining why certain elements, or parts of elements, preserve better than others (Binford and Bertram 1977a; Brain 1981; Lyman 1984). Generally, the denser the bone specimen the more likely it is to survive the impacts of taphonomic agents, including carnivore activities, trampling and chemical diagenesis, as well as human activities such as marrow and grease rendering (Lyman 1984; Lyman 1994; Marean 1991). Thus, bone mineral density indices for various taxa are considered in order to determine the extent to which these factors have impacted animal element distributions found in the study assemblages. When a significant amount of destruction has occurred, a positive correlation between bone density and element frequency is expected to occur.

Some debate, however, exists when measuring element survivorship in regards to how skeletal part abundance is computed and the source of density datasets. The first issue concerns whether or not long-bone diaphyses should be included when computing skeletal part abundance. It has been suggested that long-bone diaphyses should be excluded, and abundance be based on long-bone epiphyses alone, because diaphyses will always be underrepresented as they are less easily identified (Stiner 2002b). Others argue that including long-bone diaphysis counts in element abundance is necessary because any inferences of animal carcass exploitation must consider data from all parts of the animal (Pickering et al. 2003). The latter approach has been adopted for this dissertation. This is because long-bone diaphyses form a large part of the animal skeleton, and they tend to be prevalent in archaeofaunas due to their high density (Marean and Kim 1998).

Another, related debate concerns the method used to measure bone density. Various technologies have been employed to measure bone density including: photon densitometry, a cost-efficient method which measures the density of particular cross-sections (Kreutzer 1992; Lyman 1984); computed tomography, a costly but more accurate method that measures variation in bone shape and cross-sections (Lam et al. 1999); and the most recent, induction digital photodensitometry, a cost-efficient method that also accounts for variation in shape and cross-section (Symmons 2004). Unfortunately, digital photodensitometry (DP) has not yet been used to obtain density data for animal species identified in the study assemblages. The ensuing analyses use density indices for caribou (Table 2.1) and fox (Table 2.3) that were constructed using computed tomography (Lam et al. 1999; Novecosky and Popkin 2005); however, density indices for fish (Table 2.4) and seal (Table 2.2) were constructed from data obtained through photon densitometry (Butler and Chatters 1994; Lyman 1994).

Table 2.1 Food Utility index values (Metcalf and Jones 1988), meat drying index values (Friesen 2001), unsaturated marrow index values (Morin 2007), and density index values (Lam et al. 1999) for caribou.

Caribou Element	**Food Utility Index**	**Meat Drying Index**	**Unsaturated Marrow Index**	**Density Index**
Cranium	9.1	1.9	n/a	n/a
mandible	31.1	66.4	n/a	1.07
atlas/axis	10.2	88.2	n/a	0.62
Cervical	37.1	186.7	n/a	0.45
Thoracic	47.3	311.3	n/a	0.53
Lumbar	33.2	205.8	n/a	0.51
Rib	51.6	745.4	n/a	0.96
Sternum	66.6	195.2	n/a	n/a
Scapula	44.7	89.5	n/a	1.04
Humerus	P 44.7, D 36.8	18.5	22.8	1.12
radius/ulna	P 25.8, D 20.2	16.4	26.3	1.09
metacarpal	P 9, D 7.1	15.5	19.6	1.1
Carpal	12.7	n/a	0.9	n/a
innominate	49.3	196.8	n/a	1.02
Femur	P 100, D 100	17	34	1.15
tibia/fibula	P 62.8, D 44.1	13	51.1	1.13
metatarsal	P 19.5, D 15.4	11.2	46.5	1.1
Tarsal	27.7	n/a	0.9	n/a
phalanges	8.6	67.3	2.1	0.92

P=proximal, D=distal

Table 2.2 Food utility index values (Lyman 1992a), density index values (Lyman 1994), and Iñupiat preference ranking (Diab 1998) for small seal.

Seal Element	Food Utility Index	Density Index	Preference ranking *
cranium	27.4	no data	11
mandible	n/a	0.84	n/a
atlas/axis	35.8	0.54/0.56	
cervical	n/a	0.35	9
thoracic	24.9	0.34	n/a
lumbar	32.9	0.38	8
sacrum	n/a	0.43	n/a
rib	100	0.4	7
sternum	2.7	n/a	n/a
scapula	19.8	0.43	6
humerus	10.7	P 0.43, D 0.6	5
radius	4.8	P 0.63, D 0.45	4
ulna	4.8	P 0.44, D 0.79	4
front flipper*	2.3	-	n/a
innominate	44.5	0.47	3
femur	4.5	P 0.5, D 0.57	2
tibia/fibula	16.5	P 0.39, D 0.48	1
hind flipper**	7.7	-	n/a
astragalus	-	0.45	-
calcaneum	-	0.45	-

P=proximal, D=distal

*inverse values are used for statistical correlation

**includes carpals, metacarpals, front phalanges

***includes tarsals, metatarsals, hind phalanges

Table 2.3 Density Index values for red fox (Novecosky and Popkin 2005).

Fox Element	Density Index*
mandible	0.89
atlas	0.74
axis	0.67
thoracic	0.45
lumbar	0.55
caudal	0.99
sacrum	0.43
rib	0.32
sternum	0.43
scapula	0.38
humerus	0.75
radius	0.83
ulna	0.83
carpal**	0.55
innominate	0.69
femur	0.63
tibia/fibula**	0.54
astragalus	0.77
calcaneum	1.12
tarsal**	0.67
metapodial	0.75
phalanges	0.61

*scan site values are averaged

**scan site values for carpals, tarsals, and tibia/fibula are averaged

Table 2.4 Density Index values for chinook salmon (Butler and Chatters 1994).

Fish Element	Density Index*
angular	0.11
ceratohyal	0.04
dentary	0.12
exoccipital	0.06
maxilla	0.12
opercle	0.05
otolith	0.78
pterotic	0.07
coracoid	0.04
pectoral fin ray	0.17
basipterygium	0.07
vertebra-type 1	0.16
vertebra-type 2	0.17
vertebra-type 3	0.18
vertebra-type 4	0.17
hypural	0.09

*scan site values are averaged

2.5.5 Modification Frequencies

The impacts of taphonomic factors can also be determined by assessing modifications on the bone specimens. The frequencies of these modifications can help infer information regarding butchering, cooking and consumption practices, refuse disposal, and scavenger activities (see Friesen and Betts 2006). For this dissertation cut marks, burning, gnawing and fragmentation are assessed.

2.5.5.1 Butchery patterns

The interpretation of cut marks and butchery patterns is not often a straightforward process. This is largely due to the amount of variation that occurs when multiple datasets are considered (see Dominguez-Rodrigo 2002). There are also a variety of reasons for why cut marks occur in the first place, including the size of the carcass (Lyman 1992b), the skill of the butcher, and the type of implement being used (Dewbury and Russell 2007). Furthermore, the cut marks themselves would not have been intended by the butcher, as cutting or nicking bone would dull and even cause damage to tools. For the purposes of this research cut marks are tallied and their location is used to help infer the activities that caused them, particularly butchering activities. Cut marks found near joints, for example, were likely inflicted during disarticulation, cut marks encircling the shafts of lower limb bones or are found at the base of antlers, ears, mouth and chin, tend to result from skinning, and cut marks found at the mid-diaphysis are frequently the result of meat removal (Binford 1981).

2.5.5.2 Burn marks

Burning on bone specimens may occur for several reasons. Burnt bones typically do not result from everyday cooking practices because in order for bones to burn the meat attached to the bones would be completely charred and devoid of moisture rendering it inedible (Koon et al. 2003). It could, however, result from an accident when roasting (Gifford-Gonzalez 1989; Pearce and Luff 1994; Wandsnider 1997). Additionally, burnt bones may have been prepared as a burnt offering or as part of a ritual (Tchesnokov 1995; Vaté and Beyries 2007); bone could be burned as a method of trash disposal (Cain 2005; Howse 2008; Spennemann and Colley 1989); or if it was used as fuel (Costamagno et al. 2005; Théry-Parisot 2002). The colour of burning can also indicate the intensity of the heat (Shipman et al. 1984; Stiner et al. 1995). When bone is burned at a low temperature it will turn black as the organic components are carbonized, however bones exposed to greater heat will appear white or light blue in colour as the carbon becomes oxidized, and when completed oxidation occurs bone will become calcined (Reitz and Wing 1999).

2.5.5.3 Gnaw marks

Gnawing on bone will create various marks including pitting, furrows, punctures and fragmentation (Binford 1981). The size and type of mark can help to identify the animal that inflicted it. For instance, in the Arctic smaller puncture marks around 2-3 mm in size were likely created by a fox (see Darwent 2002). Depending upon the particular circumstances, further information can also be inferred. If gnaw marks are found on bone specimens within a dwelling structure, for example, it may indicate dogs were kept inside the dwelling, or the marks may have been inflicted after the dwelling was abandoned (see Friesen and Betts 2006).

2.5.5.4 Fragmentation

From the extent and intensity of bone fragmentation it is possible to infer information regarding a number of human and scavenger activities, including butchering, food preparation, and trampling. The extent of bone fragmentation indicates the proportion of bone specimens that are anatomically incomplete or complete. For this research, the proportion of bone specimens that are fragmentary (%fragmentary) was considered. To calculate the %fragmentary, the number of elements that are anatomically complete is subtracted from the total NISP, and the resulting number is then divided by the total NISP and multiplied by 100 (Lyman 2008). The intensity of bone fragmentation is measured using a bone fragmentation index, and calculated using the NISP:MNE ratio (Lyman 1994, 2008). This index helps identify the proportion of bones that have been broken from the original element into smaller pieces, or how many pieces an element has been broken into on average (Lyman 2008). Anatomically complete elements are excluded from this index, since their inclusion would decrease the fragmentation rate and because the fragmentation index is meant to reflect fragment size. As the ratio of NISP:MNE increases, so does fragmentation. A high rate of fragmentation could result from various activities including: marrow or grease production, as these activities involve the fracturing of long bone shafts into smaller pieces (Outram 2001); trampling, which could indicate a space was heavily used, for instance an entrance way to a house (Friesen and Betts 2006); or, from scavenger activity (Friesen and Betts 2006).

2.5.6 Seasonal Indicators and Prey Demography

A site's faunal list will provide some indication of which season(s) animals were killed in, and therefore when a site was occupied. Inferences can be made from the presence of seasonally available species, and the ratio of seasonally available species to yearlong residents. The age of an animal when caught can also help determine prey demography and site seasonality.

Generally, tooth eruption data is considered more accurate than long bone epiphyseal fusion data, with the eruption of teeth occurring during a more narrow time period then epiphyseal fusion sequences, which result in broader age categories. Element fusion data is frequently used to supplement and confirm age at death profiles based on dentition (Moran and O'Connor 1994). Unfortunately, carcass butchery and processing, in addition to the fragmentary nature of archaeofaunas, often result in small samples of dentition and the long bone portions required for age at death estimates. Thus, interpretations based on these data are limited. Long bone epiphyseal fusion data is presented in MNE's and is discussed using *minimum number of individuals* (MNI). MNI is another derived measure, which is essentially the minimum number of individuals needed to account for the bones identified to that taxon (Ringrose 1993), and is used here specifically to quantify numbers in particular age classes.

Various morphological features that are difficult to quantify but are associated with maturation are also used to estimate age at death, including overall bone porosity, bone size and shape, and the development of muscle attachments (Reitz and Wing 2008). Additionally, the presence of medullary bone in long bones of bird can help narrow time of death estimates. Medullary bone develops in breeding females approximately one to two weeks before egg laying and is reabsorbed between one and three weeks after the last egg has been laid (Rick 1980).

Determining when a site was occupied, however, is not a straightforward process, since animals are not always consumed right away and storing food or even trading food can result in age at death estimates and species frequencies that do not represent the period during which a site was occupied. However, when various sets of faunal data are considered together with additional archaeological features, for example house architecture, stronger inferences can be made.

2.6 Conclusion

The theoretical approaches to human-animal interaction used by zooarchaeologists and the zooarchaeological methods described in this chapter have been chosen in order to address the goals of this dissertation as outlined in Chapter 1. These include how technologies impacted Late Dorset and Thule Inuit archaeofaunas from the eastern Arctic, and whether or not Late Dorset and Thule Inuit archaeofaunas reflect cultural differences. Zooarchaeological analysis is conducted at various scales in order to best understand how the archaeofaunas were formed, identify the taphonomic processes that may have impacted the assemblages, and untangle any influencing variables.

Chapter 3
The Arctic Setting

3.1 Introduction

The natural environment has always influenced human behaviour. In the Arctic, where animals provide the primary food sources, this relationship is pronounced as a result of the seasonal availability of animal resources and low species richness. In addition to animal availability, the success of past and present Northern societies is reliant upon detailed knowledge of the local environment and their resources. In this chapter, I describe some general characteristics of the Arctic environment, and discuss how particular facets of the environment, including climate, sea ice, and vegetation, impact Northern lifeways, particularly subsistence hunting. Following this, I discuss the characteristics of different Arctic ecosystems and the animal resources that sustained life for past Northern hunter-gatherers. The physical environment and local ecosystems of each of the three study regions are outlined in Chapters 7-9.

3.2 Arctic Environment

Researchers define and delineate the Arctic in a variety of ways. These variations are inherently linked to geographical, biological, or socio-political criteria pertinent to each particular study (see Keskitalo 2004). These criteria include, but are not limited to, the Arctic Circle, permafrost (Price 1972) and climatic boundaries (Sater et al. 1971), terrestrial and marine ecosystems, and vegetation makeup, in addition to Northern political units and the locations of Northern societies (Larsen and Fondahl 2004). The Arctic is also frequently referred to as the region which has a 10°C Celsius July isotherm (Stager and Mcskimming 1984). However, in terms of human occupations, and for the purposes of this research, the Arctic is considered to consist of the area that is continuously covered by permafrost, which includes the Arctic Archipelago, Greenland, and northern Quebec, in addition to Alaska (Figure 3.1). The Late Dorset and Thule Inuit societies examined in this dissertation once inhabited a very large geographical area, spanning Arctic and Subarctic environments, including Alaska, Arctic Canada, northern Quebec, Labrador, and Greenland. The three study regions forming the core of this research can all be found in the area known as the eastern Arctic, which generally refers to those North American Arctic locales north of the tree line and east of the Mackenzie Delta region (Figure 3.1).

In the North American Arctic, glacial ice persisted well after it retreated in the rest of North and South America. In the western Arctic, glaciers began to melt between 16,000 and 14,000 years ago (Huntington et al. 2005; Mann and Hamilton 1995). In the eastern Arctic, including the Canadian Arctic Archipelago and Greenland, glaciers were longer lasting. Ice cores from the Agassiz Ice cap, on Ellesmere Island indicate higher temperatures occurred during the summers between 7550 BCE and 6500 BCE (9500 and 8500 BP), which resulted in extensive summer melting (Koerner and Fisher 1990). However, glacial melt varied spatially and temporally across the Arctic (McBean et al. 2005). By 5550 BCE (7500 BP), glaciers had retreated past present-day termini in many areas (McBean et al. 2005). De-glaciation of the Arctic helped form the diverse terrain seen today, including moraines, drumlins, fjords, gravel beaches, and glacial till deposits. In various locations this glacial retreat caused the earth's surface to rebound from the tremendous weight of the retreating glacial ice, and over thousands of years this gradual process has continued to change the height and position of Arctic coastlines. As a result, the earliest coastal settlements are today found on upper beach ridges, or inland, some distance from the current coastline.

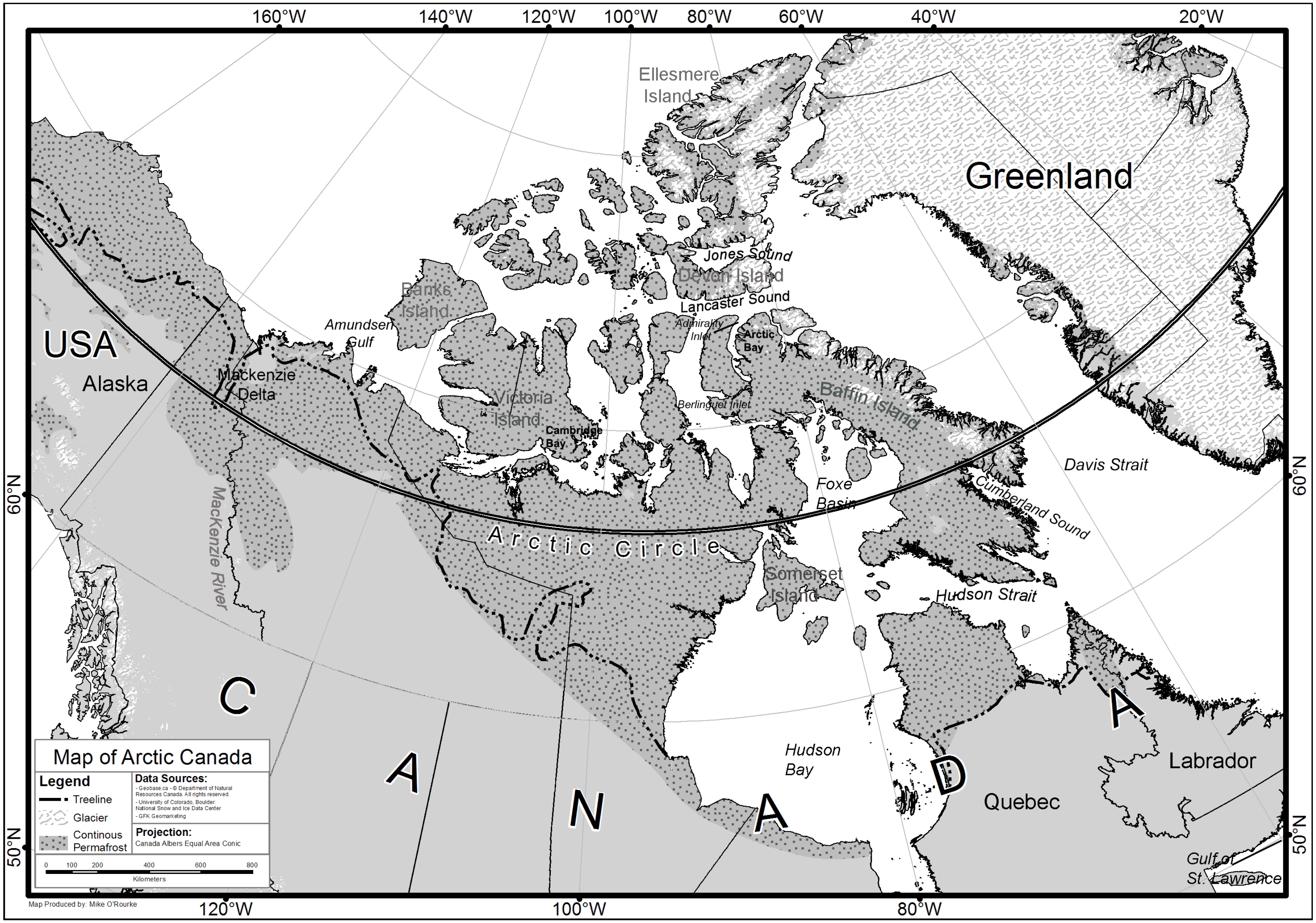


Figure 3.1 Map of the eastern Arctic.

3.2.1 Climate

In the Northern Hemisphere, the Arctic is the most climatically-sensitive region, particularly along the sea-ice margins (Walsh 2008). In addition, extreme climatic differences exist throughout the Arctic, and vary by season and location. Generally, the Arctic climate is characterized by a low amount or absence of sunlight in winter and very long days during the summer (McBean et al. 2005). Its particular solar input patterns, which result from its high latitude location, distinguish it from similar cold environments (Stager and Mcskimming 1984). These solar patterns also influence plant production, and the reproduction and onset of appetite in various animal species (Usher et al. 2005). Between October/November and mid-February, north of the Arctic Circle (66.5° N) is characterized by a low amount or absence of sunlight. In the most northerly locales, the sun reappears in mid-February and daylight and nightfall continues until mid-April (Stager and Mcskimming 1984). After this point, although it will vary depending upon the specific Arctic location, the sun does not set until late August or September. On average, the warmest day of the year does not exceed 10° C. During the winter temperatures between -40°C and -45°C are common. However, temperatures vary according to location and even those at the same latitude will have different temperatures (Callaghan et al. 2005).

Various factors, including wind patterns, wind speed and direction, precipitation patterns, and fog conditions, all of which are highly variable from region to region (Sater et al. 1971), are key elements of the Arctic climate. In addition to impacting temperature, wind patterns and wind speed have direct bearing on sea ice movement, build-up, and melt (Jeffries et al. 2012), ultimately affecting the availability of marine mammals and the suitability of hunting conditions (see section 3.3.1). Precipitation also impacts sea ice conditions, as well as the growth and availability of certain types of vegetation. Climatic variability throughout the Arctic is largely the result of diverse topography, which includes rocky coastal shores, flat coastal plains, and mountain ridges (Hare and Thomas 1974; Maxwell 1981). The locations of rivers, lakes, ponds, and coastlines are also contributing factors to regional climate systems.

3.2.1.1 Important Long Term Climatic Changes

The Arctic has undergone significant short-term and long-term temperature fluctuations. Researchers have often discussed these changes in relation to human migration and settlement patterns (Barry et al. 1977; Mudie et al. 2005), although few studies have examined regionally-specific manifestations of climate change and human occupation (Anderson et al. 2011; Henshaw 2003; Jacobs and Stenton 1985; Mudie et al. 2005; Woollett 2007). Two significant fluctuations that influenced Late Dorset and Thule Inuit lifeways include the Medieval Warm Period (MWP) and the Little Ice Age (LIA), and are suggested to have played important roles in each group's hunting strategies, seasonal mobility, and technological development (Barry et al. 1977; McGhee 1969/1970; 1976b; 1996; Rowley-Conwy 1999; Schledermann 1996).

The MWP was characterized by a global temperature increase occurring roughly between the 9th and 14th centuries CE (Crowley and Lowery 2000). However, there was much temporal climate variability and spatial variability in the magnitude of its impacts (McBean et al. 2005). The second important climatic event is known as the Little Ice Age (LIA), during which temperatures dramatically cooled, between 1450-1850 CE, although the onset varied with location (Grove 1988). During this period summers became much shorter, and there was an increase in land-fast ice and a decrease in open water (Barry et al. 1977).

3.2.2 Sea Ice

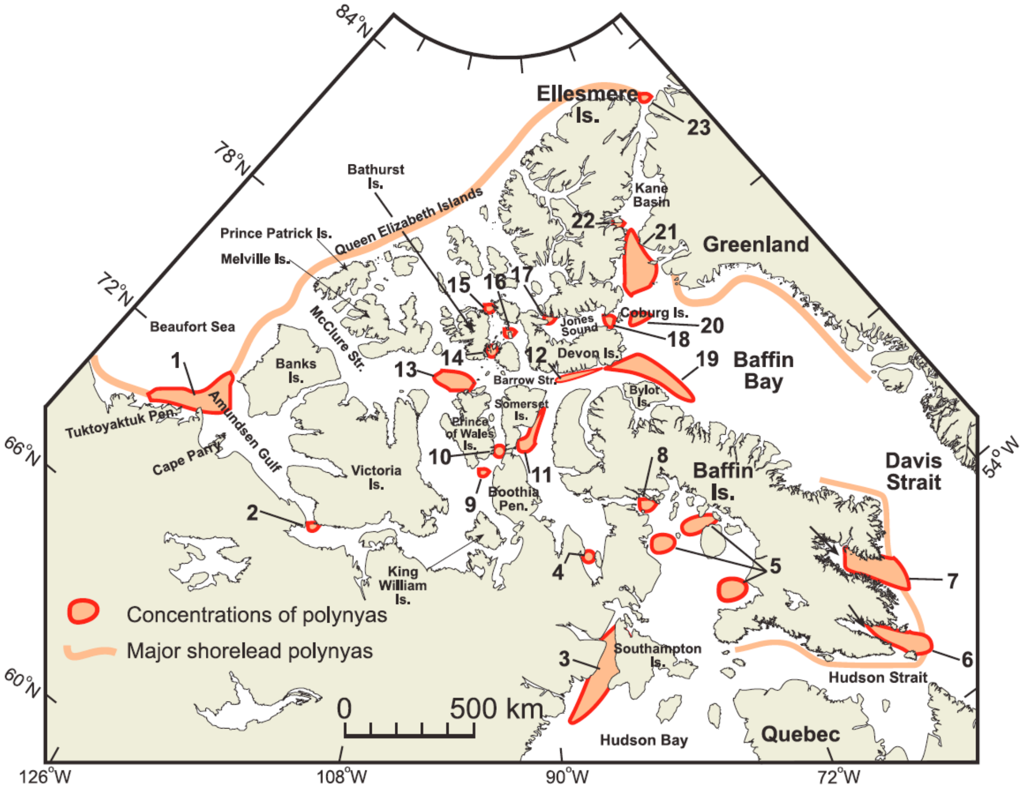
Today and in the past, a working knowledge of the complex and dynamic sea ice environment is essential to Northern communities, and a good understanding requires long-term experience and observation. For most of the year, everyday activities are intertwined with local ice conditions that sustain marine life and provide the means for hunting and travelling (Laidler et al. 2010). However, the sea ice was not only the setting of critical economic activity, but was also an important location of social and cultural development, reproduction, and change. In the historic period, and earlier, winter life in some regions took place on the sea ice where snow house (iglu) villages were built.

Sea ice conditions are largely dictated by the seasonal cycle of temperature and weather patterns. In the Arctic, sea ice reaches its maximum extent in March when it covers 14-15 million km^2; its minimum occurs in September when it covers 6-7 million km^2 of the Arctic Ocean (Comiso 2003; Parkinson et al. 1999). The formation and extent of sea ice, however, is regionally variable, and is ultimately dependent upon a region's environmental conditions and terrain. Sea ice extent, break-up, and solar radiation, directly impacts the timing and pattern of primary production, which promotes marine life (Bluhm and Gradinger 2008). Changes in sea ice conditions due to climatic variability will impact hunting practices, and the locations where it can be safely carried out. Short-term and long-term variability in the formation, thickness and extent of ice has direct bearing on how and when animals are hunted on the sea ice, and the composition of the marine mammal species harvested (see Burns 1968). For example, during very cold and stormy winters, the build up of thick sea ice can prevent ringed seals from maintaining breathing holes, which ultimately negatively impacts their survival and their harvest (Smith and Stirling 1978). Long-term changes in sea ice conditions, such as a decrease in the extent and stability of ice, can also negatively impact ice-obligate species. Harp seals are particularly vulnerable, since they give birth on the sea ice. For some time, a relationship between a decreasing quality and quantity of sea ice and decreasing seal populations has been suggested (Fay 1974; Harwood 2001; Lavigne and Schmitz 1990; Lowry 2000; Sergeant 1991; Tynan and DeMaster 1997). New data indicate that harp seal pup mortality is associated with unstable ice conditions, and from 1979 through 2011 harp seal populations across the Atlantic fluctuated in tandem with the climatic fluctuations and associated ice conditions at breeding areas (Johnston et al. 2012). In addition, long-term changes in sea-ice conditions will impact the migratory routes of various marine species. A decrease in the extent of ice can lead to new ranges, as has occurred in recent years, and possibly during the MWP (Dyke et al. 1996), when Alaskan bowhead whale ranges expanded in the eastern Arctic (Heide-Jørgensen et al. 2012). Thus, changes in sea ice conditions have important implications for marine mammal distribution, harvesting activities, and food security.

Sea ice also provides an important means for travel during the winter, connecting communities in different locations via ice highways. Before the advent of snowmobiles, winter travel primarily took place along the coast and sea ice (Aporta 2009).

3.2.3 Polynyas

A key component of the Arctic’s sea ice environment is polynyas, areas of open water that remain ice-free throughout much or all of the year (Hannah et al. 2009; Stirling 1980). From the earliest settlement of the region, populations positioned themselves near these open-water sources for continuous access to food and material resources (Schledermann 1980b). Generally, polynyas are important centres of marine mammal reproduction and migration, and their rich bioactivity make them important feeding areas year-round. Polynyas vary in size and shape, and fall into two broad categories: latent polynyas and sensible-heat polynyas (Smith et al. 1990; Stirling 1980, 1997). Latent polynyas are created by wind and/or ocean currents, which serve to remove surface ice (Smith et al. 1990). Sensible-heat polynyas are formed by the influx of warm subsurface waters. These categories are not mutually exclusive and both mechanisms often contribute to these ice-free zones (Smith et al. 1990). Generally, polynyas are conditioned by meteorological phenomena (Pease 1987), they are also dependent upon shelter from coastlines, fast ice, or an ice bridge (Hannah et al. 2009; Ingram et al. 2002; Williams et al. 2007). A total of 61 distinct and recurring polynyas, also known as primary polynyas, have been identified across the Arctic, 21 of which occur in the eastern Arctic (Figure 3.2; Barber and Massom 2007; Hannah et al. 2009). Less predictable, less expansive polynyas, that are only periodically ice-free, are called secondary polynyas (Stirling 1980). These polynyas occur throughout the Arctic, and provide Northern hunters with access to marine resources during the less productive winter months.



1 Cape Bathurst
2 Lambert Channel
3 Roes Welcome Sound
4 Committee Bay
5 Foxe Basin
6 Frobisher Bay
7 Cumberland Sound
8 Fury and Hecla Strait
9 Franklin Strait
10 Bellot Strait
11 Prince Regent Inlet
12 Lancaster Sound
13 Viscount Melville Sound
14 Karluk Brooman
15 Queens Channel and Penny Strait
16 Dundas Island
17 Hell Gate – Cardigan Strait
18 Lady Ann Strait
19 Bylot Island
20 Coburg Island
21 North Water (NOW)
22 Flagler Bay
23 Lincoln Sea

Figure 3.2. Map of known polynyas in the Canadian Arctic (Hannah et al. 2009:84).

3.2.4 Vegetation

The Arctic environment provides relatively extreme constraints on both animal and plant life. A lack of sunlight for extended periods, and a generally harsh climate, results in a short growing season and low biodiversity (Jacobs 1988). This low productivity in plant life ultimately forced Northern societies to depend primarily on animal resources for sustenance. Eastern Arctic vegetation is traditionally subdivided into three zones: Low, Middle and High Arctic (Polunin 1951). The area just north of the tree line, comprising most of Banks Island, the southern half of Victoria Island and Baffin Island, is considered the Low Arctic, and contains the highest number of plant species across the Arctic, including dwarf birch, willow, grasses, sedges, rushes, mosses, and lichens (Jacobs 1988). Blueberries, crowberries, bearberries, mountain cranberries, and cloudberries can also be found in some Low Arctic regions.

Where available, Inuit have traditionally collected these berries seasonally for food, either eating them immediately or storing them for future use (Bennett and Rowley 2004). Typically berries were a welcome way to vary the Arctic diet, which primarily relied on animal meat (for exception see Jenness 1922), and caribou fat mixed with berries is considered a northern delicacy. Traditionally, Inuit also consumed various other plant species that are found throughout the eastern Arctic, but are most plentiful in Low Arctic regions, including willow leaves, blueberry blossoms, fireweed flowers, pussy willow, and mountain sorrel Bennett and Rowely 2004). The roots of several plant species were also consumed. Additionally, plant species were used for insulation, tinder, lamp wicks, and bedding. Arctic heather was often collected in large bundles and arctic cotton were collected and used as wicks.

With increasing latitude, the number of plant species and the maximum height of shrubs begins to decline as a result of extreme climatic conditions and a decrease in soil availability (Bliss 1962). The Middle Arctic is the transition zone between the Low and High Arctic, where the tundra vegetation gradually shifts into the polar desert (Gajewski 2012). In the High Arctic, vegetation is relatively sparse and barren ground becomes more frequent (Walker 2000; Walker et al. 2005). Recently, studies have shown that the distribution and frequency of different plant species in the Arctic is extremely susceptible to climatic changes (Hinzman et al. 2005; Sturm et al. 2001; Tape et al. 2006). Fluctuations in temperature change the narrow Arctic growing season, and impact the success rate of different plant species in varying ways (Hudson and Henry 2009). This is also highly dependent on local ecology. Studies have shown that over the past 40 years the Arctic has warmed by 1.6°C (McBean et al. 2005). While temperature increases tend to stimulate vegetation productivity (Stow et al. 2004; Zhang et al. 2008; Zhou et al. 2001), this is not always the case. Studies have shown that lichen has decreased in various High Arctic communities (Hollister et al. 2005; Robinson et al. 1998; Walker et al. 2006), which has been attributed to an increase in vascular plants (Walker et al. 2006). A decline in tundra-wide lichen is significant, since it is an important resource for caribou (Hudson and Henry 2010), and potentially could have adverse impacts on caribou populations in different regions (Joly et al. 2011).

Although trees are not found in the majority of the eastern Arctic, wood was an important commodity that was incorporated to varying degrees into past Arctic lifeways. To some extent it was used in the construction of houses, to make kayak and umiak frames, and was fashioned into various weapons, tools and utensils (Alix 2004, 2005). Oral tradition and ethnographic sources suggest some groups would travel into more southerly regions in order to gather wood (Bennett and Rowley 2004; Giddings 1952, 1961), however driftwood was likely the primary source for most Arctic peoples (see Dyke et al. 1997). In the eastern Arctic, where driftwood availability is patchy (Alix 2009b), the wood originates from western North American river drainages as well as Siberia (Eggertsson 1994; Hellmann et al. 2013).

3.3 Arctic Ecosystems

The Arctic environment comprises three general ecosystems: marine, freshwater, and terrestrial. Similar to the Arctic climate, the productivity of each ecosystem varies from region to region. These ecosystems support a variety of animals, and their abundance and availability is seasonally variable. In order to successfully hunt these animals, familiarity with their behaviours is necessary. Important details regarding these animals' life histories, including physical characteristics and behaviour, are discussed below.

3.3.1 Marine Ecosystems

Marine animals, especially mammals, are essential to human survival in this northern environment. While the number of marine species used by past societies is in some cases less than terrestrial species, the densities and importance of marine species are generally far greater. In fact, marine mammals provided the greatest biomass to many past Arctic economies, and their blubber provided an important source of fuel in a region where wood sources are sparse. These mammals are specifically tuned to seasonally-variable ecological conditions, and thus are greatly impacted by large-scale changes in the climate (Laidre et al. 2008).

Ringed seals (*Pusa hispida*) are the most widely distributed and abundant Arctic species (Loeng et al. 2005; Mansfield 1967). These animals are the smallest of the Arctic pinnipeds, weighing 4-5 kg at birth (Smith et al. 1991) with adults averaging approximately 91kg (Banfield 1974). Ringed seals are not sexually dimorphic, however hunters can differentiate the sexes through certain cues. For example, during the spring, adult males will secrete a strong scented substance from their facial glands, which will persist for various lengths of time and is used by hunters to distinguish males from females (Hardy et al. 1991; Ryg et al. 1992). Previously analyzed archaeofaunas suggest they were the predominant prey species of Arctic hunter-gatherers (e.g., Bendix 1998, 2000a,b; Darwent 2001; Helmer 1981; Murray 1995, 1996). Ringed seals are a resident Arctic species, and their ability to maintain breathing holes in thick sea ice allows them to occupy areas far from the ice-edge. In the winter, they can be found under the sea ice (McLaren 1958; Smith 1987), and during the spring, they can be found basking on the sea ice or at the ice-edge (McLaren 1962). From ice break-up until it freezes during the fall, ringed seals spend the majority of their time foraging and are not frequently observed out of the water (Kelly et al. 2010).

Ringed seals are particularly dependent on the sea ice, and thrive best in locations where land-fast ice is stable and long lasting (McLaren 1962), since they depend on the ice for breeding, molting, and resting (Kelly et al. 2010). Thus, regional yearly variations in sea ice distribution and abundance will have great effects on the reproduction, distribution, abundance, and survival of ringed seals (Smith et al. 1991; Smith and Stirling 1978). During the summer and early fall they occupy annual ice, and the highest densities of these animals are generally found in waters with shallow-mid-depths (100-200 m), where ice coverage is between 40-80% (Freitas et al. 2008). Ringed seals need sufficient snow cover in order to construct lairs, and in the spring stable ice conditions are necessary in order to successfully rear newborns (Kovacs and Lydersen 2008; Usher et al. 2005). Today, biologists warn that warming temperatures will cause an early break-up of the sea ice which could result in a separation of mother and pup, which would lead to increase in neonatal mortality and a decrease in the overall ringed seal population (Kovacs and Lydersen 2008; Usher et al. 2005). Cooler temperatures provide favourable conditions for ringed seals, however sometimes younger seals cannot maintain breathing holes and are forced to the floe edge. When temperatures are exceptionally low, older and larger individuals will do the same (Schledermann 1976a).

Recent studies suggest that the size, morphology, and anatomical features of ringed seals will vary between populations of different local areas (Furgal et al. 2002). For instance, in the region of Arctic Bay, seals found at the floe-edge were described as the smallest seals in the area, with seals in the land-fast ice in Admiralty Inlet, slightly smaller than those found in adjacent Inlets (Furgal et al. 2002). Arctic Bay hunters also indicated that the seals captured in Berlinguet Inlet have large intestines with larger diameter and thicker walls than those hunted in areas nearby, and that blubber thickness, as well as the taste and texture of the meat also varied (Furgal et al. 2002). These differences are suggested to be the result of differences in the local diet of these seals, and although hunters' preferred tastes were not recorded; it stands to reason that variations in taste, blubber and texture of the seal meat would influence the chosen hunting location today and in the past.

Bearded seals (*Erignathus barbatus*) are also found year-round, however, they are solitary animals and their distribution is patchy. They are much larger than ringed seals, weighing between 270-340 kg. During the summer and fall they occupy bays and estuaries (Mansfield 1964; McLaren 1962; Smith 1991). In the winter, bearded seals tend to favour ice-free areas along ice edges and leads and concentrate near polynyas (Kovacs and Lydersen 2008). However, this varies regionally as in the Hudson Strait, Foxe Basin, and eastern Hudson Bay they inhabit the shifting pack ice and leads, but in the Amundsen Gulf area they are found under the sea ice where they maintain breathing holes (Smith 1981). Bearded seals are bottom feeders that frequent shallow waters, and tend to avoid deep water (McLaren 1962). Traditionally, their skins were used for boot leather or to make rope (Smith 1981).

There are three additional seal species that were important in past eastern Arctic economies, however they are less prevalent in the zooarchaeological record in most regions. These include harbour seals (*Phoca vitulina*), harp seals (*Phoca groenlandica*), and hooded seals (*Cystophora cristata*). Harbour seals have a very broad distribution, which also includes more temperate areas. In the Arctic, they are not numerous and their populations tend to be very small (Boveng et al. 2003). They can be found year-round in the eastern Arctic along the shallow coastlines of eastern Baffin Island, Hudson Bay, Hudson Straight, Baffin Bay, and along southern and eastern shores of Greenland (Burns 2002; Jefferson et al. 2008; Teilmann and Dietz 1994). They are solitary in the water but will congregate on land from May to August, when they breed, suckle, and molt (Teilmann and Dietz 1994). They are also known to sometimes swim up rivers during the spring. Harbour seals are a sexually dimorphic species, with females weighing between 60-110 kg and averaging 1.7 metres in length, and males weighing between 70-150 kg, and averaging 1.9 metres in length (Jefferson et al. 2008). Their skins are prized since they have very fine silky hairs, and historically they were used in the Greenlandic national costume (Teilmann and Dietz 1994).

Harp seals are a gregarious and migratory species that stay close to pack ice throughout the year. This species is not sexually dimorphic, averaging 1.7 metres in length, and weighing approximately 130 kg early in the pupping season, however, this will vary throughout the year and from year to year (Lavigne 2002). The harp seal's pelage changes throughout its life span and historically, young pups in the first two weeks of life were highly valued for their white coats and fat yield. Hunters can easily target specific age groups since they are easily identified based on the seal's pelage (Roff and Bowen 1986). There are three distinct populations of harp seals (Sergeant 1991). The Northwest Atlantic population, which is genetically distinct from the two additional populations (Perry et al. 2000), visits the eastern Arctic. This population is formed by two intermixing herds: the "Front" herd that whelps of the coast of southern Labrador or northern Newfoundland, and the "Gulf" herd that whelps in the Gulf of S. Lawrence (Sergeant 1991). Females in the Front herd give birth in early March and in late February in the Gulf on the pack ice where they nurse their newborns for approximately 12 days (Sergeant 1991). By Late April both herds migrate north following the receding pack ice. During the spring, harp seals can be found in Baffin Bay, and off the coast of west Greenland. In late June/early July they travel northward towards the Thule District/Smith Sound region, Jones Sound, and Lancaster Sound for the summer (July-August), and a smaller number move into the Hudson Bay and Foxe Basin regions. In late summer, harp seals leave the High Arctic and move southward towards Hudson Strait and Labrador. In the Hudson Bay region the herds divide as they move south to whelp (Banfield 1974; Lavigne 2002). As this species has a predictable migration route, and travelled in very large herds (which can number in the thousands), it was often the focus of economic activities in nearby coastal locations (e.g., Hodgetts et al. 2003; Hodgetts 2005a; Meldgaard 2004).

Hooded seals also live on the edge of the Arctic pack ice and are found east of Baffin Island, surrounding Greenland and south along Labrador and Newfoundland (Banfield 1974; Sergeant 1965b). In spring, hooded seals will gather into two main groups: one can be found off the east coast of Newfoundland, and the other group will congregate in Davis Strait or off the coast of East Greenland, depending on sea ice conditions (Lavigne and Kovacs 1988). These seals are quite large, weighing between 300-400 kg, and unlike many of the other seal species they are quite aggressive in their behaviour (Banfield 1974).

The Atlantic walrus (*Odobenus rosmarus rosmarus*) is a tremendously important resource today, and in the past, to many Northern hunters not only for their skins, blubber, and meat as is the case for other sea mammals, but also for their ivory tusks, which provide a valuable raw material for tools and "art" (Hughes 1960; McGhee 1977; Nelson 1969). Furthermore, their whiskers could be dried for piercing hide or preparing other artefacts (see Desjardins 2008), and their intestines were often used to make raincoats and containers (Banfield 1974). Walruses are widely distributed throughout the eastern Arctic, and they will often travel great distances throughout the year (Banfield 1974). They frequent the waters east of Cornwallis and Ellesmere Islands, and southward around the coastlines of Hudson Bay. They can also be found year-round in various ice free waters, or polynyas, the largest concentrations of which are found in northern Foxe Basin and the North Water Polynya (Born et al. 1995; Stirling 1997). In these open water areas, walruses will breed between January and April (Stirling et al. 1981), and calves are born between mid-April and mid-June (Jefferson et al. 2008). They demonstrate sex-specific behaviours, since females and their pups will often summer apart from mature males (Born et al. 1995). The cows weigh approximately 560 kg and bulls are significantly larger, weighing up to 1500 kg (Banfield 1974). However, both sexes have the large ivory tusks, although the tusks of males tend to be longer, reaching up to 1 metre in length, and thicker with higher frequency of grooves and fracture lines (Jefferson et al. 2008). Walruses are gregarious animals and spend most of their time on pack ice. They are quite aggressive and are known to attack boats, turn over and break through ice, and even chase hunters (Freeman 1974/75; Nelson 1969). Due to their size and aggressive behaviour, in the past walrus hunting is assumed to have required the cooperation of several hunters. Ethnographically, walrus hunting was known as a prestigious activity because of the difficulty and danger involved in their capture (Boas and Collins 1964; Freeman 1975; Hughes 1984; Mary-Rousseliere 1984; Nelson 1969; Saladin d'Anglure 1984).

Bowhead whales (*Balaena mysticetus*) are the largest whale species harvested in the eastern Arctic. They are a baleen species and adults weigh between 75 and 100 metric tons (Reeves and Leatherwood 1985). Males will grow to between 14 and 17 metres, and females tend to measure between 16 and 18 metres but can measure up to 20 metres in length (Rugh and Shelden 2009). Their head forms over one third of their body size, and their baleen can measure as long as 4 metres. They are insulated from the cold Arctic waters by 5.5-28 cm of blubber and 2.5 cm of skin (Rugh and Shelden 2009). They are unique among whale species because after they have been killed they do not sink but float to the water's surface and therefore can be towed back to land. In addition, these whales are typically slow solitary swimmers, though they are sometimes found in pods (Moore and Reeves 1993).

Bowhead are well adapted to the Arctic's ice covered waters, and are able to easily move through areas of heavy ice cover (George et al. 1989). They can be found in Arctic waters during the summer and the majority migrate south in autumn to spend the winter in Subarctic seas (Laidre et al. 2008). However, low numbers will overwinter in the North Water polynya and in polynyas along the east coast of Baffin Island (Koski et al. 2006; Richard et al. 1998). Today, there are five bowhead whale populations, two of which are found in the eastern Arctic occupying the Davis Strait-Baffin Bay area, and the Foxe Basin-Hudson Bay area (Laidre et al. 2008). Recently, the loss of Arctic sea ice has been linked to changes in the migration patterns of bowheads (Heide-Jørgensen et al. 2012). Previously, the concentration of thick ice in the Northwest Passage created a clear boundary between the two whale populations. However, recent observations indicate that both the Greenland population (the Davis Strait-Baffin Bay group) and the Alaskan population (Bering-Chukchi-Beaufort group) now enter the Canadian High Arctic in the summer (Heide-Jørgensen et al. 2012). Researchers propose a conservative estimate of less than 50% ice coverage would allow bowheads to cross the Northwest Passage. Based on the concentration of sea ice within this area it is also suggested that this passage was possible in at least six of the past 30 years (Heide-Jørgensen et al. 2012). In addition, during the commercial whale hunt in the 1800's at least two whaling irons used aboard ships who inhabited the Canadian Arctic waters were found in bowhead whales harvested in the Chukchi Sea (Bockstoce and Burns 1993). Furthermore, recent studies of bowhead DNA suggest intermixing did occur between the bowhead whale population of Foxe Basin-Hudson Bay, and the Alaskan population, although these studies were based on small sample sizes so the results are not conclusive (Givens et al. 2010; Heide-Jørgensen et al. 2010b).

McCartney and Savelle (1993) state that the Cumberland Sound, eastern Baffin Island, and Somerset Island areas have the most abundant archaeological bowhead whale bone. Similar to the case for walrus, hunting bowhead whales was a communal effort, since manoeuvring the large carcass to the water's edge and then onto land would have been an enormously difficult task (Murdoch 1892; Spencer 1959). However, the effort was well rewarded since these mammals provide several tons of edible meat, blubber, skin, and baleen for artefacts. In the past, Thule Inuit utilized their large bones for manufacturing houses (Savelle 1997), sled runners, kayak frames, and a number of small household utensils including cups and pails (Boas 1907). Ethnographically, the hunting of bowhead whales in the Arctic is best known from the Western Arctic (Friesen 1999; Sheehan 1995; Spencer 1984) where Inuit were organized into formal groups with captains, called *umialiks*. There is little documentation regarding recent bowhead whale hunting from the eastern Arctic, though information is available from the Labrador region for whale hunting after the arrival of Europeans (Kaplan 1980; Richling 1993).

Belugas (*Delphinapterus leucas*), or white whales, occupy various Arctic locations and form both migratory and non-migratory populations (Hobbs et al. 2005). Migratory populations will travel long distances and can be found during the summer in Foxe Basin, Hudson Bay, Baffin Bay, and off the west coast of Greenland (Vibe 1967); in the fall they will travel south to Hudson Strait to spend the winter (Finley et al. 1982). The non-migratory populations in the eastern Arctic will generally remain within a 100 km radius around Cumberland Sound and the Gulf of St. Lawrence (Hobbs et al. 2005; Kingsley 2000). Beluga populations vary in range and size. Today, the largest population numbers approximately 15,000, and can be found during the summer in the North Water polynya of Baffin Bay (COSEWIC 2004a). In Baffin Bay, especially along southeastern Devon Island, in eastern Jones Sound and in Smith Sound a smaller number of beluga will over-winter (Finley and Renaud 1980; Richard et al. 1998; Vibe 1967). Beluga can be found along shallow coastlines during the summer months, and will often visit various river estuaries (Sergeant 1973). Beluga whales measure 3-4 metres in length and can weigh up to 2000 kg (Banfield 1974) but average between 675 kg-1075 kg (Martell et al. 1984). Beluga skin and blubber was, and still is, considered a delicacy amongst many Northern peoples. Beluga blubber also provided oil for lamps and their skins were often used to make boots and laces, and to make skin boats (Banfield 1974). Their stomachs were sometimes used for floats and for oil bags, as were their esophagi, which were also used as windows (Stefansson 1914).

The narwhal (*Monodon monoceros*) is another important Arctic whale species that was harvested for its meat, blubber, and skin. They were prized for their ivory tusks, which were used in art and tools. Narwhals summer in the deep fjords of Baffin, Ellesmere, and Devon Islands, and the northern coasts of Southampton Islands and Greenland (Heide-Jørgensen 2001). The winter is an important time for feeding for the narwhal (Laidre and Heide-Jørgensen 2005), during which they can be found in deep waters near pack ice in the Greenland Sea, Hudson Strait, and Baffin Bay-Davis Strait (Heide-Jørgensen et al. 2010a). In areas where both narwhals and beluga are found, the beluga will stay in the shallow, near shore waters, whereas narwhals will always prefer the deeper waters far from shore (Laidre and Heide-Jørgensen 2005). These mammals are particularly sensitive to climate changes due to small populations and restricted areas of distribution (Laidre et al. 2008). They are also the only cetacean that occupy areas with dense winter sea ice for long periods (Laidre et al. 2008). They are sexually dimorphic with females weighing approximately 600 kg and males weighing up to 1000 kg (Banfield 1974).

Polar bears (*Ursus maritimus*) are also a pan-Arctic species traditionally hunted by Northern peoples. Although taxonomically they are a terrestrial species, they spend the majority of their time on the sea ice. Their diet comprises various marine mammals, birds, and fish, however, they rely heavily on ringed seals; so much so, that any changes in ringed seal productivity are suggested to be mirrored in polar bear reproduction and cub survival (Stirling and Derocher 1993; Stirling and Øritsland 1995). They are also highly susceptible to climate changes, especially those that impact sea ice conditions. For instance, if the formation of sea ice occurs late, access to prey is decreased and a longer period of annual fasting will occur, impacting their weight gain (Usher et al. 2005). In the eastern Arctic, their remains have been identified at Paleo-Inuit and Thule Inuit archaeological sites (Darwent 2001; McCullough 1989; Murray 1996). Adult males can reach 2-3 metres in length and weigh up to 500 kg (Banfield 1974:311). Without any natural predators, polar bears would have been a dangerous species to past hunters, but their warm winter coats would have been a valuable resource for bedding and clothing, and their meat for food.

Various seabirds, including migratory species such as geese and ducks (Anatidae), and various auk species (Alcidae) are found throughout the eastern Arctic. Seabirds are particularly plentiful near polynyas, where they can find food. They not only provide meat, but also feathers for clothing and bedding, and their bones were often used to make tools such as needles (Ammitzboll et al. 1991).

3.3.2 Terrestrial Ecosystems

The terrestrial ecosystem supports fewer animal species than the marine ecosystem. However, in the eastern Arctic there are several economically important terrestrial species. These animals are well adapted to the Arctic's seasonal climate, including temperature fluctuations, ambient light, and the availability and quality of food (McCarthy et al. 2005).

For people, the most important terrestrial resource in the eastern Arctic is the caribou (*Rangifer tarandus*), which can provide all of the basic necessities for Arctic living (Birket-Smith 1929; Brink 2005; Burch 1972; Marsh 1942; Rasmussen 1929), including food, clothing, shelter, and raw materials (Spiess 1979). In terms of food, caribou provide an excellent source of meat, fat, and marrow. Caribou experience a seasonal cycle of appetite and growth; this is linked to the Arctic's photoperiod, which is associated with changing levels of circulating hormones (McCarthy et al. 2005). Throughout the winter, a caribou's appetite is 70% less than what it is during the autumn (Mesteig et al. 2000). Their body growth slows, and may even stop (Ryg and Jacobsen 1982), and fat reserves are mobilized even if good quality food is available (Larsen et al. 1985). These physiological adaptations to the Arctic seasons result in the caribou's seasonally variable body mass. In early fall they are at their fattest when males can weigh up to 153 kg and females up to 84 kg (Spiess 1979:28). A medium sized bull weighing 110 kg will yield 22 kg of fat and 50 kg of edible meat. Spiess (1979:28) proposes this would provide 66 days of food; however in the winter after losing his fat the same bull would only provide 15 days of food. There is also significant variation between the fat content of bulls and cows. Cows are smaller and yield less meat, however they have a higher percentage of body fat, which in December results in cows yielding food that could last more than twice the amount of days than that from bulls, since at this time of year bulls have lost their fat and therefore contribute fewer calories (Spiess 1979:29).

In regards to their skin, the caribou coat begins to molt during the spring, and they are often infested with parasites and are generally of poor quality throughout the summer. However, by early fall their coats are in excellent condition. Fall caribou skins were highly valued in the production of winter clothing, since they consist of long guard hairs that form a superior insulating agent able to withstand the harshness of the Arctic climate (Burch 1972; Spiess 1979). During the winter, caribou skin was often too thick for clothing, but was valued as bedding. With the rarity of wood in the eastern Arctic antler was a valued resource that was often used in its place (McGhee 1977b). Bulls and cows both have antlers, although males will generally grow larger antlers (Banfield 1974; Burch 1972). Bulls develop their antlers in March. They harden just after mid-September, and are shed between November and February just after the rut. Cows develop their antlers between June and September; they begin to harden in late October and are not shed until April/May after calving (Banfield 1974; Burch 1972), although the timing of calving varies slightly amongst the different herds. Occasionally, Inuit would incorporate antler into their house structures (see Gordon 1994; Lee and Reinhardt 2003:47,56; Taylor 1960:80-81), however Arctic hunter-gatherers mainly valued antler for the construction of tools such as handles, sockets, boxes, lances, arrowheads, and harpoon heads (Lemoine 2005; McGhee 1977).

Ethnographic accounts and archaeological finds indicate the importance of many other parts of the caribou skeleton. For instance, scapulae and metapodiae were used as skin scrapers; astragali formed part of the bow drill mouthpiece; sesamoids and phalanges were used as game pieces; and teeth were sometimes used to decorate clothing or worn as amulets (Boas 1964; Mathiassen 1927; Balikci 1970; Morrison 1988). Inuit groups are also known to have used caribou sinew to construct bowstrings and bow backing (Anoee 1982; Balikci 1970; Boas 1964; Gubser 1965; Turner 1979).

The economic significance of these animals is regionally variable. The barren-ground caribou (*Rangifer tarandus groenlandicus*) are largely found in Low Arctic regions. However, a smaller subspecies, the Peary caribou (*Rangifer tarandus pearyi*), are found in the Arctic Archipelago (Gunn et al. 1981). Peary caribou are much smaller in size and much paler in colour than the barren-ground caribou (Pielou 1994). They do not make the long-distance migrations made by the barren-ground species, but instead spend the winter on the tundra. Barren-ground caribou are a highly mobile species that travel in small and large herds depending on the season. In the spring, the herd is segregated by sex since pregnant females move away from the coast to calf; during the summer the herds disperse in small groups and move towards the coast in search of ocean breezes where they are protected from biting insects (Smith 1991). During late summer, the dispersed smaller herds come together for the rut; at this time caribou are found in large herds, after which the herd disperses again into smaller groups segregated by age and sex (Smith 1991).

These animals are curious creatures that have a keen sense of smell and particularly good hearing in cold weather. Caribou can see things at great distances, but are tuned to perceive movement instead of form (Banfield 1974; Burch 1972). The combination of these sensory capabilities makes hunting these animals quite easy and knowledge of these traits are used by Arctic hunters to efficiently acquire them throughout the different seasons (see Chapter 5 for discussion of hunting methods). While caribou can provide essential resources, their populations tend to fluctuate significantly which often occurs in a cyclical fashion (Festa-Bianchet et al. 2011; Gunn 2003; Joly et al. 2011; Morneau and Payette 2000; Vibe 1967). These cycles have been estimated to last between 60-100 years (Meldgaard 1986). In the past, Arctic hunters would vary their adaptive strategies to focus on other resources when caribou populations crashed (Stenton 1989).

Muskoxen (*Ovibos moschatus*) are also found throughout the eastern Arctic. These animals can be found mainly in lowland grassy areas (Larter and Nagy 1995). Today, muskox populations are relatively stable, however in the past changes in local environments and human predation significantly depressed these populations and on Baffin Island caused their elimination (Barr 1991; Mech 2005). They typically form small groups averaging around 15 individuals (Banfield 1974). Males weigh between 320-430 kg, whereas females will average about two-thirds their size (Burch 1977). Traditionally, the were harvested for their meat, their skins were used for clothing or bedding, and their horn coverings were valued for constructing ladles and other implements (Banfield 1974).

Today, grizzly bears (*Ursus arctos horribilis*) are well adapted to living on the Arctic tundra and are increasingly observed across the Canadian Arctic Islands, although they have traditionally not been found north of the Arctic mainland between 66° and 70° N (Doupé et al. 2007).

Historically, the Inuit of the Mackenzie region wore their head skin and forepaws during winter ceremonies and the remainder of the skin was used for bedding (Stefansson 1914). However, it remains uncertain whether grizzly bears were found on the Arctic Islands prehistorically.

Dogs (*Canis lupus*), members of the Canidae family, were used for millennia by the earliest inhabitants of the eastern Arctic, but they seem to disappear for approximately 2000 years until after Thule groups immigrated (Maxwell 1985) around 1300 CE. Early Inuit groups used dogs as pack animals and to pull their sleds. Also, they would have been killed for their meat when food was scarce (Rasmussen and Koch 1921) and perhaps for their fur (Murdoch 1892; Nelson 1900).

Another important Arctic Canid is the arctic fox *(Vulpes lagopus*), which can be found across the eastern Arctic (Angerbjörn et al. 1999). Females weigh between 2.5-3.3 kg and males weigh between 3.2-4.0 kg (Banfield 1974). Historically, these animals were highly valued for their winter coat (Holtved 1967), which has two colour morphs, a white and a blue (Meinke et al. 2001). The blue fox is not as common as the white, and results from a rare combination of recessive genes (Bolen 1998). The arctic fox molts twice, during the spring (April/May) and again during the fall (September/October). The white fox turns brown ventrally and light grey dorsally during the summer, whereas, the blue fox is more of a chocolate brown during the summer (Audet et al. 2002; Pagh and Hersteinsson 2008; Tannerfeldt and Angerbjorn 1998; Vibe 1981). Although they are of the same species each colour morph tends to occupy different habitats (Braestrup 1941; Hersteinsson and Macdonald 1982; Vibe 1967, 1981). The white fox spends most of the winter in snow covered areas subsisting on rodents, and, the blue morph tends to stay at the coast where it primarily feeds on fish (Pagh and Hersteinsson 2008). Northern societies have used fox furs to construct parkas and other clothing throughout the historic period (e.g., Holtved 1967; Rasmussen 1921), a practice that likely dates back to the prehistoric period as their bones are found on sites throughout the eastern Arctic (e.g., Darwent 2001; Monchot and Gendon 2011; McCullough 1989). The demand and value of the arctic fox fur dramatically increased during the 20th century after the establishment of the Hudson Bay Company and the fur trade in the North (Usher 1971). This development greatly impacted the everyday life and hunting schedules of Inuit, and resulted in an influx of southern goods including rifles, ammunition, and household products into the eastern Arctic.

Today, the red fox (*Vulpes vulpes*) is found across the Low Arctic, and has been observed as far north as southern Ellesmere Island, although this is outside their traditional range (Banfield 1974; MacPherson 1964). Red foxes are larger than the arctic fox weighing between 3.6-6.8 kg, and have several other morphological differences including a long neck, tail and muzzle (Clutton-Brock et al. 1976). They also exhibit a different colour pelage than the arctic fox. Red foxes have a red coat with black and white marking, but can also be black or silver-black (Adalsteinsson et al. 1987). Red fox have been identified at archaeological sites from northern Quebec (Monchot and Gendron 2010), however whether they inhabited the more northern regions in prehistory is currently unknown.

The Arctic wolf (*Canis lupus arctos*) can be found in the majority of the eastern Arctic with the exception of Greenland (Banfield 1974). They weigh between 26 and 79 kg. Traditionally, arctic wolves were hunted for their fur, which was used for the trimming of coats and boots, and their tails were often worn as belts by men and boys (Stefansson 1914:146).

Today, the wolverine (*Gulo gulo)* is found in various parts of the Arctic, including Alaska, the Mackenzie Delta region, Victoria Island, King William Island, Prince of Wales Island, Somerset Island, Devon Island, Ellesemere Island, Baffin Island, the Boothia and Melville Peninsulas, northern Quebec and Labrador (Slough 2007). Wolverines are a medium sized carnivore, averaging about 1 m in length, and are the largest member of the weasel family. They are a sexually dimorphic species, with females ranging from 7.5 to 11 kg, and males weighing between 12 and 16 kg (Banci 1994; Gardner 1985; Peterson 1966). They can be found in low densities year-round, and occupy home ranges varying from 50-400 km^2 for females and 230-158 km^2 for males (Gardner 1985; Magoun 1985; Whitman et al. 1986). In ideal habitats, five individuals will share an area of 1000 km^2. Historically, wolverines were valued for their furs; their head skins were worn in ceremonies, while the rest of their skin was used for trimming of coats and boots. The Mackenzie Delta Inuit would tie each paw to a belt and wear them as pendants (Stefansson 1914:146).

The Arctic hare (*Lepus arcticus*) is another valuable fur-bearer found across the Canadian Arctic and Greenland. Arctic hare provides a small food resource weighing between 4.0-5.4 kg, with the females being slightly larger than the males (Banfield 1984). They are easily caught during the winter when their tracks are visible in the snow and may be trapped in the summer.

Small mammals including the arctic ground squirrel (*Spermophilus parryii*), two genera of lemmings (*Lemmus* and *Dicrostonyx*), and ermine (*Mustela ermine*). However, while they were sometimes captured for their fur, they were not traditionally hunted for food.

Apart from sea birds, important birds include year-round Arctic residents such as the ptarmigan (*Lagopus spp*.) and the common raven (*Corvus corax*). Ptarmigan were historically hunted for their meat and ravens primarily for their feathers, and symbolic value (Beechey 1831; Boas 1901; Murdoch 1892; Nelson 1900; Rasmussen and Worster 1921). In addition, many gull species, such as arctic tern (*Sterna paradisaea*), and jaegers (*Stercorarius spp.*) are referenced in oral histories from throughout the eastern Arctic (e.g., Bennett and Rowley 2004) and are sometimes found in zooarchaeological samples (e.g., Betts and Friesen 2004, 2013; Darwent 1995, 2001; Johansen 2012; Norman and Friesen 2010).

3.3.3 Freshwater Ecosystems

Various fish species inhabit freshwater lakes and ponds throughout the eastern Arctic. Because of the small size and delicate nature of fish bone, in comparison to other species, taphonomic agents have impaired the ability to accurately judge their importance during prehistoric times (Whitridge 2001). However, several species appear in the zooarchaeological record and continue to be harvested by Northern groups today. Arctic char (*Salvelinus alpinus*) is perhaps the most important fish species harvested in the eastern Arctic. They are a large fish that average 50 cm in length and 1.7 kg in weight (Smith 1981). They are mainly anadromous, however some populations are landlocked in inshore waters throughout the year. They can be overwhelmingly abundant during their runs to and from the sea, the timing of which varies depending on the location. They can also be harvested throughout the year in river systems and lakes. Lake trout (*Salvelinus namaycush*) are also found year-round in many lakes and rivers throughout the eastern Arctic. Typically they range between 38 and 50 cm, and average under 5 kg, however, they can reach over 20 kg (Scott and Crossman 1973:21). Whitefish (*Coregonus spp*.) were also harvested by past Northern societies; they average around 38 cm in length and around 2 kg (Scott and Crossman 1973). Cod species (Gadidae), such as Greenland cod (*Gadus ogac)* have proven to be an important species to Thule Inuit groups who once inhabited the Pembroke site near Cambridge Bay, Victoria Island (Norman and Friesen 2010; Norman 2009). These are a marine fish species that are found in high densities inshore during the winter and spring, however, they will move to offshore locations to find cooler temperatures (Morin and Doson 1986; Morin et al. 1991). Sculpin (*Myoxocephalus* spp.) will also occasionally appear in the zooarchaeological record (Norman and Friesen 2010). However, these fish have little edible value and may have been used as dog food (Smith 1991).

3.4 Conclusions

In order to provide context for this dissertation, this chapter has outlined the general eastern Arctic environment, its ecosystems, and the behaviour of key animal resources. Past Northern lifeways, specifically hunting practices, were directly linked to several facets of the environment, which greatly impacted hunting conditions and animal availability. Animals were also highly sensitive to climatic shifts, which directly influenced their availability and abundance. Successful adaptation to this environment, however, required a detailed knowledge of environmental conditions and also of animal behaviour. Together, these criteria had a profound effect on cultural development, change, and survival in the Arctic.

Chapter 4
Culture History of the Eastern Arctic

4.1 Introduction

Despite the harsh environment of the eastern Arctic, several distinct hunter-gatherer groups successfully inhabited this region in prehistory. There were two major waves of human migration into the eastern Arctic, both of which originated in Alaska. The first occurred at approximately 2550 cal BCE, roughly 2500 years after the depletion of the Pleistocene ice sheets (Wright 2004). This migration was made by Paleo-Inuit people (more commonly known as Palaeoeskimos), and represents one of the last major episodes in which hunter-gatherers moved into a previously unoccupied area (Savelle and Dyke 2009). Within a few centuries these groups had dispersed throughout the eastern Arctic (Dumond 1984; Irving 1964; Maxwell 1985), adapting to the various local ecosystems and changes in the environment until they disappeared during or shortly after the 13th century CE (Friesen 2004a). The second migration into the eastern Arctic was made by an Inuit society known as Thule, and occurred in the 13th century CE (Friesen and Arnold 2008). It has been debated whether later Paleo-Inuit, the Dorset people, disappeared prior to the arrival of Thule Inuit, or whether they were assimilated or eliminated by Thule people (Friesen 2000; Park 1993). New radiocarbon dates suggest these groups likely overlapped for between 50 and 200 years (Raghavan et al. 2014), and that in some regions they may have lived side by side (Friesen 2004a; Friesen and Arnold 2008; McGhee 2000, 2009b). Regardless, the Thule culture prevailed, eventually developing into the various Inuit societies of the 19th century, and the Inuit populations of today.

In this chapter, I review the various Paleo-Inuit and past Inuit societies who once inhabited the eastern Arctic. I include a discussion of previous archaeological research, and I review our current knowledge regarding site chronology and distribution, architecture, settlement and subsistence practices, and technologies.

4.2 Paleo-Inuit People

“Paleo-Inuit” (also referred to as Palaeoeskimo, Paleoeskimo, or Palaeo-Eskimo) refers collectively to a population that preceded the Thule Inuit and inhabited the same geographical regions. Those belonging to the various Paleo-Inuit cultural traditions utilized small chipped stone tools, a people whose material culture is referred to by some as the Arctic Small Tool Tradition (ASTt; Irving 1968). The Danish ethnographer H.B Steensby (1917) was first to use the term 'Palaeoeskimo' to distinguish the earliest Arctic inhabitants from the ancestors of modern Inuit whom he called 'Neoeskimos'. Further distinction of these two cultural groups came in 1925, when Diamond Jenness, who was analyzing artefact collections from Cape Dorset, Baffin Island, identified characteristics that he believed to represent different temporal and cultural affiliations. Based on differences in harpoon manufacture and degree of preservation, Jenness was able to distinguish what he believed to be three distinct cultural groups. The first collection he ascribed to the Thule Inuit, as these artefacts showed clear ties to historic Inuit groups. The second of these groups he called the 'Cape Dorset Complex' (Jenness 1925), which he believed pre-dated the Thule Inuit. Stratigraphic proof of the culture chronology came when Henry Collins (1950) excavated the Crystal II site, near Frobisher Bay, and found a distinct layer containing Cape Dorset artefacts under a layer containing Thule Inuit artefacts. Jenness (1925) also claimed the Cape Dorset Complex were not the initial settlers of the area; he believed the third artefact collection he was working with belonged to a group who held cultural affiliations with the Cape Dorset complex, yet were separated by time. Subsequent investigations by archaeologists across this Arctic have proven Jenness' (1925) assertion to be correct and this third collection were ascribed to a group that pre-dated the Dorset culture. These earliest Arctic peoples are known as Early Paleo-Inuit, a designation comprising several regional and temporal variants; and, the Late Paleo-Inuit culture is what Jenness (1925) called the Cape Dorset Complex, which is generally known as the Dorset culture.

4.2.1 Early Paleo-Inuit

Early Paleo-Inuit descended from the Denbigh Flint Complex of northwest Alaska, who also utilized small chipped stone tool technologies (Giddings 1951). This early Paleo-Inuit grouping has been divided both temporally and geographically to include Pre-Dorset, Independence I, and Saqqaq. Slight variations between the tool kits, architecture, subsistence and settlement practices of these groups exist and are presented below. These variations tend to reflect adaptations to regional ecosystems. Early Paleo-Inuit sites are generally comprised of few single-family dwellings, and a sparse distribution of artefacts and animal bones of various species, indicating that Early Paleo-Inuit were highly mobile and maintained a flexible economic system (Bielawski 1988; Savelle et al. 2012). Dog bones have been found on several Paleo-Inuit sites (Arnold 1979; Meldgaard 1962), suggesting they brought dogs with them from their Alaska homeland. The extent to which dogs figured within Early Paleo-Inuit society, however, was probably limited (Morey and Aaris-Sørensen 2002). Although Arnold (1979) suggests they were integral to Paleo-Inuit lifeways, their patchy appearance in the archaeological record has been interpreted by many researchers to mean they were not routinely present, nor did they play a central role in Arctic lifeways prior to the arrival of Thule Inuit (Darwent 2004; Morey and Aaris-Sørensen 2002).

A series of studies focusing on Early Paleo-Inuit population dynamics have been undertaken on southwest Victoria Island (Savelle and Dyke 2002; Savelle et al. 2012), western Boothia Peninsula (Savelle and Dyke 2009), Kent Peninsula and King William Island (Dyke and Savelle 2009), and, along the Gulf of Boothia (Dyke et al. 2011) and the Foxe Basin (Savelle and Dyke 2014a). These studies examined variability in site size and frequency, and variability in house size and frequency were used to estimate past populations and group fission-fusion behaviours. The results of these studies suggest the occurrence of several "boom and bust" population cycles within Early Paleo-Inuit society. It is proposed that Early Paleo-Inuit people lived in nuclear family or small extended family groups for most of the year, aggregating yearly in groups of approximately 100 people (Dyke et al. 2011; Savelle and Dyke 2009). In these regions, with the exception of the Foxe Basin, a peak in population occurred early in the Pre-Dorset settlement. The exact time of this peak varied; on southwest Victoria Island it was noted between 2050-1850 cal BCE (Savelle and Dyke 2002) and on the Boothia Peninsula, the Kent Peninsula, and King William Island it was noted between 2250 and 1650 cal BCE (Dyke and Savelle 2009; Savelle and Dyke 2009). Examined house features suggest sites were occupied for no more than a single season, and the lack of significant food storage features suggest a foraging settlement system (Savelle et al. 2012). This population peak was followed by a decline in Late Pre-Dorset populations, at 1850 cal BCE. Similar declines in Pre-Dorset site frequency have been noted in several additional Arctic regions, including Cornwallis-Bathurst Island (Dyke et al. 2011; Schledermann 1978a), the North Devon Lowlands (Helmer 1991; Maxwell 1985; McGhee 1996), and northern Ellesmere Island (Sutherland 1992). Several suggestions have been made to explain these decreases in early Paleo-Inuit populations, including over-exploitation of key resources (McCartney and Helmer 1989); negative impacts of climate change on the availability of animal resources (Dekin 1972; Dumond 1987; Fitzhugh 1976a; Maxwell 1985; McGhee 1996; Schledermann 1978a, 1990; Sutherland 1992), and the inevitable die-offs that occur in hunter-gatherer societies inhabiting peripheral environments (McGhee 1976b; Plumet 1996). Savelle and colleagues (2012) have suggested there is no compelling evidence that climate changes caused these local population shifts; and, instead they suggested that population decline might be linked to a decrease in primary resources due to overharvesting, and the inability of local regions to support larger populations. However, after investigating population dynamics in Foxe Basin, Savelle and Dyke (2014a) now state that present data does not rule out climate as an influencing factor.

The Foxe Basin region, which is also known as the Paleo-Inuit 'core area', has been considered by some to be the centre of Paleo-Inuit activity and cultural development for over 3000 years (Dyke et al. 2011; Maxwell 1976, 1985; McGhee 1976b; Savelle and Dyke 2009, 2014a; Savelle et al. 2012). It is commonly held that the rich and diverse animal life of Foxe Basin was able to sustain stable substantial populations and was a respite for populations from peripheral regions in times of stress (Barry et al. 1977; Desjardins 2013; Murray 1996, 1999a). Recent research demonstrates, however, that Paleo-Inuit occupations within the core area were not stable, and in fact had population 'boom and bust' cycles (Savelle and Dyke 2014a; Savelle et al. 2009), as documented in other regions throughout the eastern Arctic where populations continued to expand and contract throughout the Paleo-Inuit period (Dyke and Savelle 2009; Dyke et al. 2011; Savelle and Dyke 2002, 2009; Schledermann 1978a; Sutherland 1996). The population dynamics within the Foxe Basin region are variable (Savelle and Dyke 2014), and are inconsistent with those identified in the various other regions subject to paleo-demographic studies (Dyke and Savelle 2009; Dyke et al. 2011; Savelle and Dyke 2002, 2009; Savelle et al. 2012). However, within Foxe Basin there appears to be a region-wide population increase that took place during the initial Dorset period, around 550 cal BCE, which is followed by a population crash between 350/50 cal BCE and 450 cal CE (Savelle and Dyke 2014: 265).

4.2.1.1 Independence I

Independence I peoples were the first to occupy the High Arctic. Eigil Knuth (1952, 1954, 1967) named these Early Paleo-Inuit after discovering ruins at Independence Fjord in Peary

Land, northernmost Greenland. However, it was Hans Peder Steensby (1917) who was first to suggest that a group of muskox hunters migrated across Ellesmere Island to northeastern Greenland, a route that later became known as the "Musk ox Way" (Knuth 1966/67, 1967). Independence I sites are confined to the Canadian High Arctic and Peary Land, northeastern Greenland (Grønnow and Jensen 2009; Knuth 1952, 1954, 1958, 1966/67, 1967, 1977/78,1981, 1983). Recently, radiocarbon dates from various sites in Peary Land have been reconsidered, and the earliest presence of Independence I is now understood to be sometime between 2450-2200 cal BCE (ca. 4390 - 4133 BP; Grønnow and Jensen 2009). Independence I subsistence practices were variable, and were largely determined by the local resource base and structure (Andreasen 1996; Darwent 2003; McGhee 1979; Schledermann 1978b; Sutherland 1996). Generally, Independence I were opportunistic hunters exploiting any resource they encountered, although there is no conclusive evidence they hunted whales (Darwent 2003). Their toolkit included various burins and scrapers, narrow side blades, bifaces, microblades, bipointed projectile points, lance heads, bone needles and arrow fragments (Knuth 1952, 1967; Maxwell 1985; McGhee 1979). Their house structures tended to be elliptical in shape, and often contained double platforms with mid-passages creating two elliptical shaped floor areas, one on either side (Andreasen 2003; Knuth 1967). These structures contained square hearths, also known as box hearths, that contained round stones that have been interpreted as boiling stones (Knuth 1967; Schledermann 1990). Box hearths and boiling stones are traits also found in Denbigh Flint Complex structures in Alaska (Knuth 1967, 1977/78; McGhee 1979). Flagged floors were rare in these structures, and the mid-passages were commonly orientated 90° to the coast (Knuth 1954). Independence I structures sometimes included a different internal layout, these structures are known as "platform dwellings" as they include a central fireplace flanked on three sides by raised areas as well as an open space on the side adjacent the door (Jensen and Pedersen 2002).

4.2.1.2 Saqqaq

Known Saqqaq sites are generally confined to the west coast of Greenland and on Ellesmere Island (Grønnow 1994, 1996b; Kramer 1996a,b; Larsen and Meldgaard 1958; Meldgaard 1952; J. Meldgaard 2004; Møberg 1999). In Greenland, Saqqaq sites have yielded radiocarbon dates between approximately 2450 and 850 cal BCE (Jensen 2006). Saqqaq material remains are consistent through time and space as regards to raw material selection, technological design (Desrosiers and Sørensen 2008; Grønnow and Sørensen 2006; Sørensen 2012), and dwelling construction (Grønnow 2012; Grønnow and Jensen 2009; Jensen 2006; Sørensen 2012). Saqqaq people subsisted on a range of resources but zooarchaeological studies suggest they depended heavily on marine species (Larsen and Meldgaard 1958; Meldgaard 2004; Møberg 1986). Their toolkit was very similar to that of Independence I, however they tended to include a relatively low frequency of microblades and a high frequency of grinding and polishing tools (Schledermann 1990). *Killiaq* (a slate material) was the preferred raw material for the manufacture of tools (Jensen 2006), the majority of which appears to have been acquired from a single outcrop area on the Nuussuaq Peninsula in west Greenland and from a smaller outcrop in southern Disco Bay. To date, the best-preserved Saqqaq artefacts were excavated from the Qeqertasussuk site, located on Disco Bay, Greenland, and include harpoon heads, lances, atlatls, bow and arrow fragments, and possible watercraft fragments (Grønnow 1994, 1996a,b, 1997; Meldgaard 2004). Dwelling structures were oval or circular, and similar to Independence I and Denbigh Flint Complex sites, they included stone lined mid-passages with box hearths containing fire-cracked rocks (Larsen and Meldgaard 1958). Early Saqqaq sites also sometimes included informal stone lamps made of sandstone, whereas formal soapstone lamps appear later in the Saqqaq period after 1900-1700 cal BCE (Grønnow et al. 2014).

4.2.1.3 Pre-Dorset

Pre-Dorset sites have been identified throughout the Canadian Arctic Archipelago (Arnold 1981b; Betts and Friesen 2004; Friesen 2002a; Gordon 1975, 1976; McGhee 1976b, 1979; Meldgaard 1960b; Meyer 1977; Milne 2000, 2003a,b; Savelle and Dyke 2002,2009; Savelle et al. 2009; Savelle et al. 2012; Taylor 1964, 1967, 1968, 1972) and northern Labrador (Fitzhugh 1972, 1976b, 1980; Tuck 1975, 1976a), maintaining the largest geographical range of all the Early Paleo-Inuit groups. Their sites consist of tent rings with varying shapes (Ryan 2003b). However, throughout the eastern Arctic, there is an underrepresentation of Pre-Dorset dwelling structures (Maxwell 1985); this is believed to be the result of the destructive behaviour of later site occupants who frequently reused the stones that formed Pre-Dorset dwellings to create new features (Milne 2003a). Similar to other Early Paleo-Inuit groups, Pre-Dorset were opportunistic hunters with a flexible economy (Maxwell 1985; McCartney and Helmer 1989;

McGhee 1979; Müller-Beck 1977; Schledermann 1990; Sutherland 1996; Taylor 1972). Their toolkit was similar to that of Independence I and Saqqaq groups, and included bifaces, scrapers, microblades, endblades, arrowpoints, adzes, various types of burins that decrease in frequency over time as the frequency of burin-like tools increased (Maxwell 1985:109), few slate knives, self-bladed harpoon heads, needles, self-bladed or slotted lance heads, and fishing tools (Maxwell 1985:86,90-91, 95). Maxwell (1985:91) suggests that awls were rare on Pre-Dorset sites and that this was surprising because of the delicacy of Pre-Dorset needles. However, Raymond Le Blanc (1994b) proposes they were not as rare as Maxwell claimed, and that bipointed objects that have been described as fish spears (Arnold 1981b), were in fact awls. Box hearths have been identified on Pre-Dorset sites in Labrador (Cox 1978; Thomson 1981, 1982) and at Igloolik (Meldgaard 1962) and boiling stones, which are frequently associated with these features have been identified at the Pre-Dorset Arnapick site, located along the Hudson Strait (Taylor 1968); however, in other Arctic regions informal hearths that consist of flat stones and burnt blubber are most common. This may suggest that soapstone lamps began to replace the box hearths at Pre-Dorset sites, since fragments of soapstone vessels, including pots and lamps, are frequent, but are absent on Denbigh Flint Complex sites in Alaska and have not been found on Independence I sites or the oldest Saqqaq sites (Dumond 1987; Giddings and Anderson 1986; Knuth 1967; Maxwell 1985; McGhee 1976b).

4.2.1.4 The Paleo-Inuit Transition

Generally, the time between the late Pre-Dorset period and the beginning of the Dorset period is referred to as the Paleo-Inuit transition period, when Paleo-Inuit settlement and subsistence strategies and technologies began to shift (Helmer 1991; McGhee 1981b; Schledermann 1990). Dorset people are also referred to as Late Paleo-Inuit, and although they are believed to be related to Pre-Dorset people the nature of this relationship is a matter of debate (e.g., Raghavan et al. 2014; Savelle and Dyke 2014). The shift from Pre-Dorset to Dorset did not occur simultaneously across the eastern Arctic, and is best understood in terms of regional chronologies. Researchers have referred to the transition period as a subdivision within the Paleo-Inuit period (e.g., Cox 1978; Helmer 1980, 1994; Maxwell 1985; Nagy 1994, 2000; Schledermann 1978a, 1990; Taylor 1968), however, more recently researchers tend to describe it as transition occurring at the end of the Pre-Dorset period or the beginning of the Dorset period (Grønnow and Sørensen 2006; Houmard 2011). It has also recently been argued that the Paleo-Inuit culture did not undergo transition, but that the variations in settlement and material remains should instead be viewed as various definable Paleo-Inuit units (Desrosiers 2009), or rather different groups of related people who had different ways of doing things. Regardless, it is clear that Pre-Dorset and Dorset varied in a number of ways, specifically in regards to their subsistence practices, architecture, tool styles, and the use of different raw materials. Overall, Dorset people spent more time hunting key resources (Nagy 1997) and occupied larger more substantial structures than Pre-Dorset (e.g., Savelle et al. 2012). Several technologies used by Pre-Dorset fall out of use during the Dorset period (e.g., the bow and arrow), and technologies specifically suited for hunting on the sea ice begin to appear (Cox and Spiess 1980; Darwent 2004; Mary-Rousselière 1976; Meldgaard 1962; Spiess 1978).

Originally proposed by Meldgaard (1960a, 1962), the changes that occurred during the Paleo-Inuit transition have primarily been attributed to a period of ecological stress, which ultimately led to a shift in adaptive strategies (see also Fitzhugh 1972, 1976a; Maxwell 1985; Møberg 1986; Renouf 1993; Schledermann 1990). Nagy (1997) proposed an alternative explanation, postulating that the cultural change between early and later Paleo-Inuit groups was directly related to their knowledge of the local environment. Nagy's (1997) claims were based on her investigation of Paleo-Inuit sites in the Ivujivik area. She argued that when Pre-Dorset first entered this region they did not have enough traditional knowledge to exploit the environment in an efficient manner, and it was only after generations of accumulated traditional knowledge, regarding the availability and accessibility of resources, that groups could become more specialized. In the Ivujivik area, this transition coincided with broad subsistence strategies during the Pre-Dorset period, and more specialized subsistence strategies directed towards seal hunting during the Dorset period. In addition to a change in subsistence practices, Dorset people became less mobile which is evidenced through higher frequencies of food caches and more substantial architecture (Nagy 1997).

In the 1960's, William E. Taylor Jr. proposed the idea that the Paleo-Inuit transition was a culture continuum based on his excavations at the Arnapik and Tayara sites, Nunavik (Taylor 1958, 1959, 1968). After comparing his findings with additional Paleo-Inuit sites, including the site T-1 (Tunermiut 1) of Southampton Island (Collins 1956a,b) and those of the Igloolik area

(Meldgaard 1962), he concluded that Dorset primarily evolved from the earlier Pre-Dorset. Following this, the Nunavik sites became the basis for many Paleo-Inuit interpretations (see Maxwell 1985). Early on, Meldgaard (1960b, 1962) challenged the claim of a Pre-Dorset to Dorset transition, believing Dorset represented the arrival of a new people from the south. While Taylor, did not discount a southerly connection there was no evidence one existed (Taylor 1968:102-103), and over the years the idea has not garnered much attention. Within Arctic archaeological research, the general consensus is that Pre-Dorset transitioned into Dorset (e.g., Maxwell 1985, 1997; McGhee 1996), and Paleo-Inuit culture chronology has heavily relied upon Taylor's excavations at Nunavik. The idea of a Pre-Dorset to Dorset transition is further supported by the genetic data recently released by Raghavan et al. 2014, suggesting long-term genetic continuity within the Paleo-Inuit gene pool. However, there are several scenarios of how and where this transition occurred. Some researchers believe that this development occurred *in situ* across the Arctic (e.g., Cox 1978; Helmer 1980, 1994; Maxwell 1985; Nagy 1994, 2000; Schledermann 1978a; Schledermann 1990; Taylor 1968). In contrast, others argue that a large-scale population break occurred throughout the Arctic and that only in the core area did Dorset develop from Pre-Dorset (Fitzhugh 1997a; McGhee 1976b; Ramsden and Tuck 2001; Tuck and Fitzhugh 1986; Tuck and Ramsden 1990). Yet another perspective proposes that the development of Dorset occurred in multiple geographic cores, as opposed to all Pre-Dorset occupied regions, before expanding to re-colonize the rest of the eastern Arctic (e.g., Cox 1978; Helmer 1991; Le Blanc 1994b; Maxwell 1980; Schledermann 1990; Tuck and Fitzhugh 1986; Tuck and Ramsden 1990). The newly published research by Savelle and Dyke (2014), which notes unstable populations, as well as breaks in occupancy, in the Foxe Basin region, currently lends more credibility to this latter perspective.

In an effort to resolve the uncertainty regarding Paleo-Inuit transition and culture chronology, several new studies have reinvestigated some of the early hypotheses. Recent research conducted in Nunavik has raised significant questions regarding Taylor's findings and any interpretations that have used his findings as a basis for understanding the Paleo-Inuit transition (e.g., Desrosiers et al. 2006; Desrosiers et al. 2008). In addition, material culture studies and surveys of the Foxe Basin region are providing new evidence for interpretation.

For five field seasons between 2001 and 2006, a multidisciplinary team of researchers from the

Avataq Cultural Institute returned to the Tayara site and conducted further excavations. The data collected, and subsequent research, has led to reinterpretations of the site's stratigraphy, the occupation sequence identified by Taylor, and Taylor's harpoon head typology (Desrosiers et al. 2006; Desrosiers et al. 2008; Todisco and Bhiry 2008a, 2008b; Todisco et al. 2009). Using geomorphology the team identified three occupational levels, however contrary to what Taylor suggested, the new evidence indicates these occupations were not continuous, but interrupted by geomorphological activity that ultimately resulted in the site's well-preserved artefacts and faunal material (Desrosiers et al. 2008; Todisco and Bhiry 2008a, 2008b). Armed with this new information, as well as new radiocarbon dates, they showed that much of what Taylor based his assumptions on were materials excavated from the Dorset phase, and that in two areas of Taylor's trenches he misidentified the beginning of the Dorset phase as Pre-Dorset (Desrosiers et al. 2008). Although Taylor acquired radiocarbon dates, they were made on sea mammal bones we now know are unreliable due to the marine reservoir effect (Bowman 1990). As a result, the lithic artefacts Taylor identified as belonging to the Pre-Dorset period actually belong to the Dorset period. Using newly acquired data from the Tayara site, as well as that collected from GhGk-63, Nunavik (Desrosiers and Gendron 2004), the harpoon head chronology presented by Taylor (1968), which has served as the main source of typological data for Paleo-Inuit harpoon heads (Maxwell 1985), has now been exposed as problematic. It would now seem that the majority of the Tayara site harpoon heads belong to Middle Dorset, not to Early Dorset as Taylor identified them (Desrosiers et al. 2006). Therefore, it appears the Tayara site is no longer a valid type-site for the Paleo-Inuit transition.

Working with artefacts excavated from the core area, both Nunavik and the Igloolik region, Claire Houmard (2011) investigated the technological use of various raw materials throughout the Paleo-Inuit period, giving specific attention to the material culture changes that mark the Pre-Dorset to Dorset transition. She identified an evolution in Paleo-Inuit technological practices from Pre-Dorset to Dorset, with the appearance of new functional categories, new types of objects, and changes in the anatomical elements selected for the osseous industry. The same functional categories, and the same choices for raw material remained consistent from the late Pre-Dorset to Early Dorset time periods, leading Houmard (2011) to suggest continuity between the early and late Paleo-Inuit periods. However, whether the late Paleo-Inuit culture developed *in situ,* or a new group of Paleo-Inuit moved into the region from another area, has yet to be resolved.

Recent surveys of the core area conducted by James Savelle and Arthur Dyke (Savelle and Dyke 2014a; Savelle et al. 2009) are also shedding new light on the Paleo-Inuit transition, and are raising questions regarding the validity of a single core area development. For the past forty years, the core area has often been perceived as the centre of Paleo-Inuit activity and the development of the Dorset culture; however, little work assessing the importance of this area in Paleo-Inuit society has occurred since the 1960's. Savelle and colleagues (2009) have now shown that at the Kapuivik site a clear continuity between Pre-Dorset and Dorset features is not evident, with the Dorset occupation located some distance from the terminal Pre-Dorset occupation. Additionally, there appears to be large changes in population through time, challenging the notion of the core area's substantial stable Paleo-Inuit population. These findings indicate the need for further work in the area in order to establish its importance in Paleo-Inuit society and the development of the Dorset culture.

The conflicting views regarding this period, in addition to regional variability, have contributed to the numerous terms that have been ascribed to it. Moreover, as new research occurs the criteria used to define the Paleo-Inuit periods, as well as the names used to describe them, are continuing to evolve (see Grønnow and Sørensen 2006). In Greenland, it has been called Independence II, Early Dorset, and Dorset I (Andreasen 1996, 1997, 2000, 2003; Appelt 2003; Jensen 1996; Knuth 1966/67, 1967). However, Grønnow and Sørensen (2006:61) have recently argued that Independence II and Dorset I are indistinguishable, and should be united under the term "Greenlandic Dorset" and associated with the Late Paleo-Inuit. In the Canadian Arctic, transitional sites have been referred to as Transitional Pre-Dorset to Dorset, Early Dorset, and Independence II (Helmer 1980, 1991; Maxwell 1985; McGhee 1981b; Meldgaard 1960a, 1960b, 1962; Nagy 1994, 2000; Schledermann 1990; Sutherland 1996). The Lagoon Complex is also understood to be a transitional phase and has been identified at two sites in the Western Canadian Arctic (Arnold 1980, 1981a, 1981b; Le Blanc 1994a,1994b). In the Low Arctic, including Nunavik, Labrador, and Newfoundland, these sites have been called Late Pre-Dorset/ Groswater, Transitional, Early Dorset, Groswater Dorset, Groswater (e.g., Auger 1984; Bishop 1977; Cox 1978; Fitzhugh 1972, 1976a, 1976b, 1980b; Le Blanc 2000, 2001; Pintal 1994; Plumet 1994; Renouf 1994, 1999a, 2003, 2011; Tuck 1976a), and most recently Terminal

Pre-Dorset (Desrosiers et al. 2008). A comparison of regional transitional sites is beyond the scope of this dissertation, however, it should be noted that in each region transitional sites exhibit slightly different subsistence strategies and technologies, as seen in both technological style and source of raw materials.

4.2.2 Late Paleo-Inuit: The Dorset Culture

The late Paleo-Inuit period began with the emergence of the Dorset people, who appear in the archaeological record at approximately 650-550 cal BCE (Savelle and Dyke 2014a), although as discussed in the previous sections this date is somewhat variable from region to region. Archaeologists generally refer to three phases of Dorset: Early, Middle, and Late (Maxwell 1985). A Terminal Phase, representing the very end of the Dorset period, is also sometimes referenced (e.g., Friesen 2007a; Hood 1998; Mary-Rousselière 1976; Maxwell 1985; McGhee 1996; Meldgaard 1962). The timing of the initial manifestation of the Dorset culture varies regionally, as do the cultural terminologies used to describe it and whether or not it is associated with the Early or Late Paleo-Inuit period. Some researchers propose that Middle Dorset most accurately represents the true beginning of the Dorset period, and that Early Dorset represents the terminal phase of the Pre-Dorset period (Ramsden and Tuck 2001). This is based on the level of similarity between the Pre-Dorset and Early Dorset traditions (Maxwell 1985; Schledermann 1990), and the temporal break between the Early and Middle Dorset periods that occurs in some regions (Ramsden and Tuck 2001). Pierre Desrosiers (2009) has recently suggested that for the Nunavik region, where Dorset appear later, Early and Middle Dorset should be classified together as one temporal phase called the “Classic Dorset”, covering the period between 250 BCE and 450 CE (2200 BP and 1500 BP; uncalibrated radiocarbon years).

In comparison to their predecessors, Dorset sites are larger and appear to have been more intensively used (Savelle et al. 2012). They include an increased number of storage caches, suggesting they were more sedentary, with low residential mobility (see Damkjar 2000; Erwin 2001; Le Blanc 2009; Nagy 1997; Renouf 1993; Robbins 1985). In some regions, they inhabited sub-rectangular to rectangular semi-subterranean dwellings in the winter (Fitzhugh 2002; Hood 1998; Maxwell 1985; McGhee 1976b; Meldgaard 1962; Ramsden and Tuck 2001; Savelle and Dyke 2014a) that were much more substantial then Pre-Dorset dwellings. Throughout the Paleo-Inuit period, groups lived in dispersed nuclear families or small extended families for most of the year, however during the Dorset period there appears to be a reduction in the frequency of single-family dwellings and micro-band settlements (see Dyke and Savelle 2009; Savelle and Dyke 2009; Savelle et al. 2012). Evidence also suggests Paleo-Inuit people had annual aggregations, with groups of 100 people or more. During the Early Paleo-Inuit period the minimal social units did not change during these annual aggregations, however, by Dorset times minimal social units were larger, and occupied one or several large dwellings (Savelle and Dyke 2009).

Despite the regional and temporal variations found within the Dorset period, several technological changes characterize this period. This includes the disappearance and the development of several hunting technologies (e.g., bow and arrow, snow knives, ice creepers), likely accompanied by changes in hunting practices. In addition, Dorset, particularly Late Dorset, developed a prolific art tradition, including portable carvings and petroglyphs, likely associated with shamanistic activities (e.g., Taçon 1983). The artistic florescence during the Late Dorset period appears to reflect changes in ideology caused by socio-cultural stress as the result of environmental changes and cultural pressure (McGhee 1981b, 1996; Sutherland 2001; Taçon 1983; Thomson 1982). This is inline with more recent findings that various changes in artistic depictions occurred throughout the Late Dorset period, including a decrease in regional variation that occurred over time (Hardenberg 2013). Two important hunting practices that were used by Early Paleo-Inuit people appear to fall out of use during the Dorset period, this includes hunting with dogs and hunting with the bow and arrow. As previously noted, dog remains are infrequent in Early Paleo-Inuit contexts, and most likely were of minor importance in Early Paleo-Inuit society. It follows that their general absence from Dorset sites is likely due to a limited number initially being brought from Alaska, ultimately contributing to their inability to survive the Pre-Dorset period (Morey and Aaris-Sørensen 2002). In regards to the bow and arrow, it seems most plausible that the knowledge regarding its construction was lost. As described earlier, Pre-Dorset demographics in several eastern Arctic regions indicate that population booms during the early phase of the Pre-Dorset period were followed by population busts (Savelle and Dyke 2002, 2009; Savelle et al. 2009). Although, in some regions, there was a slight peak in population during the Early Dorset period at around 250 BCE (2200 BP), populations did not recover substantially until Late Dorset times (see Dyke et al.2011; Savelle and Dyke 2002, 2009; Savelle et al. 2012). Thus, these busts, characterized by the constriction of site size, and perhaps isolation of regional groups, in addition to the limited availability of suitable raw materials and a complicated construction process, may have led to the disappearance of the bow and arrow technology. In addition to the disappearance of these hunting technologies is the disappearance of the bow drill. With the absence of the bow drill, holes such as those found in needles and harpoon heads were gouged, resulting in ovate perforations rather than round ones like those found during the Early Paleo-Inuit period (McGhee 1996).

Several new technologies also appear during this period. These are frequently attributed to a cooler temperature and an economy that emphasized hunting sea mammals on the ice (Cox and Spiess 1980; Darwent 2004; Spiess 1978), and include snow knives, "ice creepers", sled shoes, ice chisels and scoops, and large harpoons (Mary-Rousselière 1976; Meldgaard 1962). The ice-adapted technologies and an increase in sea ice hunting, as well as a lack of robust winter dwellings like those used by early Inuit, have been used by researchers to suggest Dorset people constructed snow dwellings (Maxwell 1985), although it is probable some Dorset over wintered in semi-subterranean houses. Regardless, the reduction in the frequency of single-family dwellings and micro-band settlements that occurred during this period may be because many Dorset winter settlements were located on the sea ice (Savelle et al. 2012). It follows that the Neoglacial cooling that coincides with the Dorset period (Barry et al. 1977), resulted in an increase in the duration of sea ice, and hence ringed seal availability, forcing a reorientation of the Dorset economy (Savelle et al. 2012). However, whether or not these changes precipitated the development of the Dorset culture is unclear.

4.2.2.1 Early Dorset

Acknowledging that the traditional division between Early Paleo-Inuit and Dorset may be somewhat flawed due to the various factors discussed above, this section focuses on developments that occur in the period between approximately 650-550 cal BCE and 50 cal BCE, regardless of cultural-historical relationships, and for the purposes of this discussion it is referred to as Early Dorset. Typically, sites designated as Early Dorset are more substantial than Pre-Dorset sites; in some regions house structures are now semi-subterranean, there is an increased reliance on storage, and sites are more densely occupied (e.g., Savelle and Dyke 2002, 2009, 2014a). There is also an increase in polished slate technologies, and the appearance of the burin like tool, among other technological changes (e.g., Maxwell 1985; Meldgaard 1962). Early Dorset sites are found throughout the eastern Canadian Arctic (e.g., Cox 1978; Helmer 1992; Mary-Rousselière 1976; Maxwell 1985; Nagy 2000; Plumet 1994; Taylor 1972; Tuck 1976a) and Greenland, where they have previously been referred to as Independence II and Dorset I, (Appelt 2003; Jensen 1998; Meldgaard 1977; Møberg 1986) and more recently designated as Greenlandic Dorset (Grønnow and Sørensen 2006).

Early Dorset settlements are frequently located in coastal regions, where seals and walruses are easily obtained. Faunal remains suggest they continued to acquire a range of resources, however there is generally a greater reliance on marine resources than in previous periods (Darwent 1995, 2001; Murray 1996, 1999a; Nagy 1997). In the Foxe Basin region, walrus hunting appears to have intensified during the Early Dorset period, where it became the primary subsistence resource (see Murray 1996, 1999). In different locations ringed seal and harp seal dominate (see Darwent 2001), and in still other locations the abundance of caribou remains suggests specialized seasonal caribou hunting also took place (Jensen 2005). In comparison to Early Paleo-Inuit sites, Early Dorset sites appear more substantial, and there is an increased investment in the construction of dwellings (Dumond 1987; Maxwell 1985; Murray 1999a; Nagy 2000; Ryan 2003b). Structures often have mid-passages and sleeping platforms (Bielawski 1989). Some researchers have attributed the more substantial site architecture at Early Dorset sites to changing subsistence practices and the adaptation of a collector style economy (see Maxwell 1985:197; Nagy 2000). It is likely these structures were occupied during the fall, winter, or early spring, whereas tent structures were presumably occupied during the summer, and snow-houses were perhaps used during the coldest months (Maxwell 1985).

The homogeneity that has typically been associated with Early Dorset assemblages largely refers to those excavated from sites located in the ‘core area’ around Foxe Basin, and more variation is found among sites in the High Arctic where tool frequencies are also more variable (Maxwell 1985:127; Meldgaard 1962:93-95; Schledermann 1990). Nonetheless, several technological traits distinguish Early Dorset from Early Paleo-Inuit. Early Dorset people appear to have been very specific about the quality of stone used for different tools (McGhee 1996). Nephrite and slate are more frequently used, and chert appears to be preferred, along with quartz crystal, schist, and soapstone (Cox 1978). A ground and polished slate industry also developed during this period, resulting in the production of various knives (Maxwell 1985). Early Dorset endblades do not taper like those used by Early Paleo-Inuit, but instead there is an emphasis on side-notching (Jensen 2005, 2006), and burin-like tools, often made from nephrite, appear to have replaced the spalled burins used by Pre-Dorset groups (Maxwell 1985; Schledermann 1990). Early Dorset also continued to use microblades, and needles are now bi-pointed with gouged-ovate eyes. There is an increase in rectangular soapstone vessels that served as heat and light sources, and possibly for cooking (Maxwell 1984; McGhee 1978, 1996; Rowley 1940). Round fire-cracked stones are still found, but are much less numerous than they are on Early Paleo-Inuit sites (Jensen 2005, 2006). There is also an increase in lances and the appearance of the robust Dorset Parallel sliced harpoon head (Helmer 1980; Maxwell 1985), which has been associated with the hunting of walrus (Maxwell 1976; Murray 1996,1999).

4.2.2.2 Middle Dorset

The Middle Dorset period emerges around 50 BCE (2000 BP) and lasts until 750 CE (1200 BP). This period is marked by the near complete abandonment of the High Arctic and Greenland (Appelt 2003; Fitzhugh 1976a; Jensen 2005, 2006; Maxwell 1985; McGhee 1976b; Schledermann 1990) and population expansion into the Low Arctic - Quebec, Labrador, and Newfoundland (Cox 1978, 2003; Fitzhugh 1980; Harp 1976; Hodgetts et al. 2003; Jordan 1980; Le Blanc 2000; Linnamae 1975; Renouf 1999a, 2006; 2011; Tuck and Fitzhugh 1986). To date, Middle Dorset sites have been identified on Victoria Island (Friesen 2007b; McGhee 1971), Southampton Island (Collins 1957), Hudson Strait (Nagy 2000), and Baffin Island (Arundale 1976; Meldgaard 1954a, 1954b, 1960b) and neighbouring regions. Sites located in the SubArctic, however, have provided the most comprehensive information regarding this tradition thus far. It is proposed that the first manifestation of the Dorset culture in Nunavik was Middle Dorset (Desrosiers et al. 2006; Desrosiers et al. 2008). In Labrador, sites have been found north of Nain, where technological similarities and gradual changes through time (Odess 2005) throughout the Dorset period are used to suggest an *in situ* cultural continuum from the Early to Late Dorset periods (Cox 1977). Middle Dorset is the only Dorset phase identified on the island of Newfoundland, where they lasted for approximately 800 years (Cox 1978; Renouf 2011; Tuck and Fitzhugh 1986).

Middle Dorset sites are generally found in both inner and outer coastal locations (Anstey 2011; Renouf 2003; Wells 2012). They usually exhibit marine oriented economies, and in Newfoundland harp seal was of particular importance (Cox and Spiess 1980; Hodgetts et al. 2003; Howse 2002; Murray 1993; Renouf 1993, 1999b). However, Middle Dorset sites have also been identified at Iqaluktuuq, Victoria Island, where caribou and arctic char are the primary subsistence resources (Friesen 2002a).

Several researchers have suggested that during this period climatic conditions influenced the decrease in size and longevity of many Middle Dorset sites (Maxwell 1985:198). In West Greenland, paleoclimatological investigations by Moros and colleagues (Moros et al. 2006) identified a warming period between 50 BCE – 150 cal CE (2000-1800 BP). They claimed that warming climatic conditions, and an associated decrease in stable ice, led to the disappearance of the Dorset in the area, given they were predominately sea ice hunters. However, this association has recently been called into question. D’Andrea and colleagues (2011) point out that the latest Dorset site in the area dates to 250 cal BCE (Jensen 2006), two centuries prior to the warming period. Using sediment core analyses from freshwater lakes in Kangerlussuaq, D’Andrea and colleagues present a new temperature reconstruction (D’Andrea et al. 2011). These new data indicate that the Dorset disappearance in West Greenland is most likely associated with a cooling trend that began at 250 cal BCE (2200 BP). Despite this, there remains no clear evidence that this cooling trend caused the Dorset to abandon the area, as they persisted in the region during two previous cooling periods.

The exception to the small and short lived Middle Dorset sites found throughout the Arctic is the Middle Dorset site of Phillip’s Garden in Newfoundland, where over 70 possible house structures have been located (Harp 1969/70, 1976; Eastaugh and Taylor 2011; Renouf 2006). The Newfoundland Middle Dorset are generally considered to be a regional variant of Dorset, due to the isolation of the Island from the rest of the Arctic (Linnamae 1975). Newfoundland Middle Dorset developed distinctive traditions, with variations in settlement, subsistence, and artefact styles (Le Blanc 2000, 2010; Robbins 1985). They maintained extensive trade networks, as evidenced through high quantities of Ramah chert on sites from across the Island and Labrador, where the Ramah chert source is found in a single location. This chert was likely traded for other raw materials including soapstone (Archambault 1981), and possibly subsistence resources. Middle Dorset occupied coastal regions of Newfoundland from approximately 2000 to1200 BP (Cox 1978; Tuck and Fitzhugh 1986). Why Dorset left Newfoundland is unknown, although it is often suggested that they left due to a climatic warming that occurred towards the end of their occupation on the Island (Erwin et al. 2005).

Generally, Middle Dorset people constructed semi-subterranean dwellings, rectangular in shape. They typically had low berms, and often contained raised platforms (Lemoine et al. 2003). Occasionally, storage caches were built into these berms (Lemoine et al. 2003), which Renouf (2006) suggested functioned as seating. These dwellings commonly had interior hearths, and short entrance tunnels. During the warmer months, Middle Dorset are believed to have inhabited tents. Tent rings are generally smaller than the cold weather dwellings and are similar to those constructed by Early Dorset, circular in shape and anchored by stones, with an absence of interior features (LeMoine et al. 2003). A second type of tent ring is also associated with Middle Dorset, these include axial features, although there is no evidence of internal hearths (Lemoine et al. 2003).

Recently, Savelle and colleagues (Savelle et al. 2012) have suggested that in some regions Middle Dorset were also using longhouses and external hearth-rows, features that commonly date to the Late Dorset period. In Western Victoria Island, they have identified several longhouses and hearth-rows at the Woodward Point and Innirit Point sites. From these sites, newly acquired radiocarbon dates, suggest they were occupied during the Middle Dorset period (2000-1500 cal BP). Thus, Savelle and colleagues (2012) propose longhouses were being used in the western Canadian Arctic during the Middle Dorset period. In the 1960's, Meldgaard (1960b, 1962) identified two Dorset "large houses" at Alarnerk, a Paleo-Inuit site located in the Foxe Basin region. These were large rectangular semi-subterranean dwellings measuring 15 x 8 m and 12.3 x 7.8 m (Savelle et al. 2012). They are believed to be communal structures that were occupied during the winter months, and are described by some researchers as precursors to the longhouse (see Damkjar 2005; Murray 1996). However, little is known about these structures and a clear connection to the development of the longhouse cannot be clearly established. Furthermore, caribou bone recently obtained from the floor of one of these dwellings has produced a new date of 1690±15 BP (UCIAMS-53038), suggesting they were occupied during the Middle Dorset period, when longhouses were being used in other regions (Savelle et al. 2012).

Middle Dorset groups used a similar toolkit as did Early Dorset, and used burin-like tools, tip-fluted endblades, scrapers, bifaces, ice creepers, sled runners, and various harpoon head types (Desrosiers et al. 2006; Maxwell 1976, 1985; Odess 1998, 2005; Taylor 1968). Differentiating them from Early Dorset, however, are unifacial points, a variety of symmetric or asymmetric and notched or unnotched bifaces, triangular endblades that are more concave at their base, lower frequencies of microblades that appear wider than earlier forms, and sewing needles that are no longer bi-pointed (Le Blanc 2000:102). Although the bow and arrow is not considered part of the Dorset toolkit from Early, Middle or Late periods, pieces of a composite bow and a composite arrow shaft were found at Avayalik, a Middle Dorset site in northern Labrador (Jordan 1980), and at the Joss site, on western Victoria Island, McGhee (969) identified what appears to be parts of an arrowshaft. These are the only fragments of their kind found in Dorset contexts, suggesting that some Dorset groups may have been aware of this technology, but it never became fully integrated into the Dorset toolkit.

4.2.2.3 Late Dorset

Of particular interest to the current research is the Late Dorset period. This period has traditionally been considered to begin about 500 CE and terminate around 1300 CE (Friesen 2007a), with a decline in the density and frequency of sites occurring around 1000 CE (Maxwell 1985). During the Late Dorset period, there was a re-occupation of the High Arctic after 600 years of abandonment (LeMoine 2003; McGhee 1978). Late Dorset sites are found across the eastern Arctic on Victoria Island (Friesen 2002a; McGhee 1971; Savelle and Dyke 2002), on Melville Island (Taylor 1964), in the Foxe Basin region (Mary-Rousselière 1955a,b, 1976, 1979; Meldgaard 1960a,b, 1962), in the Hudson Bay region (Harp 1976), the Interior Lakes region of southern Baffin Island (Milne et al. 2012), in northern Labrador (Fitzhugh 1976b; Tuck 1976b), on northern Ellesmere Island (Schledermann 1990), and in northwest Greenland (Appelt and Gulløv 1999; Appelt et al. 1998; Darwent and Foin 2010). No Late Dorset sites have been found in south-central Labrador or Newfoundland (Tuck and Fitzhugh 1986). The development of the Late Dorset culture remains poorly understood (Helmer 1981; Tuck 1975). While it is possible that Late Dorset peoples represent new populations, archaeologists tend to believe Late Dorset developed *in situ* from resident Middle Dorset populations that occupied the ‘core area’ (McGhee 1976:37-39; Maxwell 1985:81; Meldgaard 1954 a,b, 1960 a,b, 1962; Fitzhugh 1997:406).

The Late Dorset period is marked by several important changes and developments. There appears to be a decrease in mobility with an increase in storage pits and site size (Darwent 2001; Lemoine 2003; Murray 1996), and more substantial architecture (Darwent 2001; Ryan 2003a), suggesting a more sedentary lifestyle than that of Early and Middle Dorset. Art production flourishes, and small carvings of realistic and abstract animal depictions, shamanistic paraphernalia, and depictions of humans and human-animal transformation are often found at Late Dorset sites (LeMoine et al. 1995; McGhee 1996; Sutherland 2001; Taylor and Swinton 1967).

Late Dorset tent rings appear in various forms, however, axial features or box-hearths are typically absent in favour of exterior hearths (Ryan 2003a). Late Dorset people continued to use semi-subterranean dwellings with axial features during the cold season (LeMoine 2003). These structures vary in shape, from round/oval to rectangular, and some are paved (see Ryan 2003a). These structures sometimes exhibit defined entrance passages with cold-traps, however, there are also examples with no discernible entrance passages. The use of low berms, consisting of rocks and sod, as identified in Middle Dorset structures continue to be present, and small niches, potential storage areas, were sometimes constructed into these berms (Ryan 2003a, 2009). Snow houses may also have been used during the coldest months, however evidence for this is limited.

Longhouses and hearth-rows are now quite common (Damkjar 2000, 2005; Friesen 2007a; Plumet 1982). These structures remain a poorly understood phenomenon, and as described in the previous section, are now suggested to appear in the Middle Dorset period (see Savelle et al. 2012). Generally, these longhouse sites are interpreted as centres of communal gatherings that may have served to strengthen social cohesion within different regions outside the core area (Appelt 1999: 35; Damkjar 2000: 177; Friesen 2000: 214; Maxwell 1985: 157; Murray 1999: 477; Schledermann 1996: 93, 100; for exception see Park 2003). Schledermann (1990) has linked these sites to a changing environment, communal cooking and food sharing; Appelt and Gulløv (1999) and Damkjar (2005) submit they represent an increase in spiritual or ritual activities; Damkjar (2000) also suggests they were a response to subsistence resource scarcity; Friesen (2007) proposes they represented resistance to social change that may have been occurring within Late Dorset society in the core area; and Park (2003) conjures they were an expression of a Dorset worldview based on linearity. In all likelihood, several of these scenarios are at play.

The structures themselves are formed by linear outlines of boulders or gravel, and are usually associated with hearth-rows, which consist of long rows of identical hearth features (Friesen 2007). Whether the longhouses and hearth-rows were contemporaneous is unknown, while they are sometimes associated with the same occupation (e.g., Friesen 2007), others see them as representing separate occupational episodes (e.g., Appelt and Gulløv 1999; Damkjar 2000; Savelle et al. 2012). Regardless, single and double hearth rows are found, and in the double rows the number of hearths are the same (Applet and Gulløv 1999; Park 2002; Savelle et al. 2012; Schledermann 1996). Savelle and colleagues (2012) point out that in the case of hearth row sets at the longhouse sites on western Victoria Island, strongly built and lightly built rows are paired, a pattern also found by Appelt and Gulløv (1999:33) at Hatherton Bay, Greenland, and similar to that found at Brooman Point, where a double hearth-row set contains large and small pairs. Savelle and colleagues (2012:176) posit this consistency indicates a purpose behind their use and construction that opposes the flexible fission-fusion behaviour of Early Paleo-Inuit groups and ethnographically known Inuit societies. Since the occupants were likely not residential nuclear or extended family units, it would suggest that longhouse occupations were highly socially structured, more so than earlier Paleo-Inuit groups. The widespread distribution of these sites further suggests the existence of extensive inter-regional contact and perhaps a strong symbolic element within Late Dorset society. To date, Late Dorset longhouse sites have been identified on Victoria Island (Friesen 2007; Savelle et al. 2012), Bathurst Island (Helmer 1981), Somerset Island (Damkjar 2000) the Hudson Strait/Ungava region (Plumet 1985), Ellesmere Island (McCullough and Schledermann 1988; Schledermann 1990), and northwestern Greenland (Appelt and Gulløv 1999; Gulløv and Appelt 2001). Faunal assemblages from these sites are scarce and tend to consist mainly of seal and duck bones, leading Damkjar (2000, 2005) to suggest they were primarily used during the warm season.

Late Dorset people actively hunted all locally available resources except whales, however they appear to have focused on at least one key resource, small seals, which dominate the majority of Late Dorset faunal assemblages (Damkjar 2005; Darwent 2001; Friesen 2007; Howse 2008; Maxwell 1985; Murray 1996). Walrus was generally taken when available (LeMoine and Darwent 1998), and played an important role in the economy in the Foxe Basin region where they are abundant (Murray 1999). Caribou were the primary mammal resource at the Bell site, Victoria Island (Friesen 2002b, 2004a; Howse 2008; Taylor 1967) and the Interior Lakes region of southern Baffin Island (Milne et al. 2012), and contributed significantly to sites located near Foxe Basin (Murray 1996), and at Nungavik 71, located on northern Baffin Island (Mary-Rousselière 1976). Fish infrequently appear within Late Dorset faunal assemblages, and when found comprise a small proportion of the overall identified fauna. However, the Late Dorset inhabitants of the Bell Site heavily exploited fish, specifically arctic char (Friesen 2002, 2004a; Howse 2008; Taylor 1964, 1967, 1988). The remains of arctic fox and arctic hare become more frequent during this period, particularly in the High Arctic (Darwent 2001).

In general, the Late Dorset tool kit is fairly standardized in type. It consists of small tools made of stone or metal that were hafted with organic materials including antler, ivory, bone, sinew, driftwood and blood glue (McGhee 1996). Many technologies associated with the Early and Middle Dorset tradition persist in this period, although stylistic changes and changes in form do occur (Maxwell 1985:221,227). Technologies that distinguish this period are triangular and increasingly serrated end blades with deep concave bases, triangular unfluted points with concave bases, and side-notched angular edged knives or scrapers (Maxwell 1985:217). The frequency of microblades declines, however they increase in size, as do endblades and basal spurs (Maxwell 1985:221). Ground slate technology and the tip fluting technique associated with Middle Dorset also decrease during the Late Dorset period. The use of nephrite, quartz, slate and chalcedony increases, however, chert remains the preferred raw material. Late Dorset people also begin to use metal, and worked meteoric iron and native copper have been identified at sites on Little Cornwallis Island (Helmer 1996), Devon Island (McGhee 1981b), Ellesmere Island (Schledermann 1990), and northwest Greenland (Appelt et al. 1998). They also continued to use soapstone lamps, which tend to be round or oval in shape (Maxwell 1985). Additionally, Late Dorset sites tend to produce a variety of tools associated with sea-ice hunting, along with a variety of domestic tools. New harpoon head attributes appear at this time, including the double line hole and the use of metal endblades, however the Dorset Parallel harpoon head continues to be used (Meldgaard 1977). Fishing technologies are infrequently found at Late Dorset sites and include only a few fish spears and tridents. A description of Late Dorset hunting practices that accompanied their various technologies can be found in Chapter 5.

The disappearance of Late Dorset in the archaeological record has perplexed Arctic researchers for decades. Park (1993; 2000) has proposed that Late Dorset people disappeared prior to 800 CE, however radiocarbon dates from sites on Victoria Island, suggest that at least in some Arctic regions, this group occupied the eastern Arctic until the 13th century CE and likely later (Friesen 2004a). In the past, the cause of the Dorset disappearance has been attributed to environmental changes, specifically the Mediaeval Warming Period (MWP) which occurred between approximately 800-1400 CE (1150-550 BP; Barry et al. 1977: 200; Dekin 1972). Researchers suggest an increase in Arctic temperatures disrupted the predictability of key resources such as the ringed seal (Barry et al. 1977). This change in the availability of key resources would have placed stress on the Dorset people who some believed to be insufficiently adapted to terrestrial hunting, ultimately contributing to their demise (Barry et al. 1977). Today, the more favoured explanation regarding why the Late Dorset did not persist is because of the arrival in the eastern Arctic of a new people, the Thule Inuit, the ancestors of modern day Inuit. It is likely that the Thule out-competed the Late Dorset for key resources, which would have led to Late Dorset starvation, or the Thule eradicated the Late Dorset through violence (Bielawski 1979: 106, Friesen 2000; Maxwell 1984: 368, 1985: 240; McGhee 1978: 72-73, 1996: 220-221; Morrison 1992: 59).

4.3 Early Inuit

The second population to make a major migration into the eastern Arctic from Alaska was the Thule Inuit, who were genetically and culturally distinct from the Paleo-Inuit (see Raghavan et al. 2014). After dispersing throughout the eastern Arctic, Thule people developed locally into the diverse Inuit societies known from the 19th century. Although important differences exist amongst Inuit today, historic Inuit, and those who initially settled the eastern Arctic, it is equally important to note they all developed from a single culture that changed and adapted through time. In order to highlight the Thule relationship with historic and extant Inuit populations, they are referred to throughout this dissertation as Thule Inuit. “Early Inuit” is used here to refer to pre-contact, including Thule Inuit, and historic Inuit societies.

The Thule culture was first defined in 1922 by Therkel Mathiassen (1927a,b), a Danish archaeologist, cartographer, and ethnographer, after he conducted excavations at the Naujan site, located on the northwestern margin of Hudson Bay. From this site he recovered the remnants of a society that hunted large baleen whales. The finds were very similar to what had previously been found by members of the Second Thule Expedition, in Thule, Greenland, and so Mathiassen designated them as belonging to the Thule culture (Mathiassen 1927a:89). Because whale hunting would have required an abundance of wood for the construction of boats, Mathiassen suggested that the Thule culture did not originate in the central Arctic, where trees are absent, but must have originated farther west in Siberia or Alaska. Today, these claims are consistent with our understanding of the Thule culture. Although Paleo-Inuit archaeology monopolized the decades following Mathiassen’s work (Hood 1998; Maxwell 1985), since the mid 1970’s much research has focused on understanding Thule culture development, and the timing and reasons for their eastward migration (e.g., Grønnow 2009; McCartney 1979; McCullough 1989).

Thule culture roots have now been traced to the Bering Strait region of Siberia and Alaska, where along with the Old Bering Sea, Punuk and Birnirk cultures, they once formed what is sometimes called the Northern Maritime tradition (Friesen 2013b; Stenton 1989). This tradition first appeared around 200 CE (1750 BP), or possibly earlier (Mason 2009), and is ancestral to all modern Inuit, Inuvialuit, and Iñupiat. Researchers investigating Thule Inuit harpoon head styles and attributes were first to suggest strong links between the Thule culture and the Birnirk (Ford 1959; Stanford 1976; Whitridge 1999a; Yamaura 1979) and Punuk cultures of Alaska (Collins 1952; Schledermann and McCullough 1980; Sheehan 1995; Stanford 1976; Yamaura 1979). More recently, Hollinger and colleagues (2009) have suggested Thule culture affinities to another early Alaskan culture, the Ipiutak. Their study (Hollinger et al. 2009), which incorporated archaeological data and cranio-metrics, has illuminated what was a complex family tree where the various 19th century Inuit groups seem to have had different ancestor-descendent relationships to earlier Alaskan cultures. For instance, Hollinger and colleagues (2009) posit that Birnirk groups have direct ancestor-descendent relationships with 19th century Greenland

Inuit groups, but do not have this relationship with Inuit populations who later occupied the Point Hope and Barrow areas. Instead, based on cranio-metrics the 19th century Inuit populations of northern Alaska are suggested to have been the descendants of the Ipiutak culture (Hollinger et al. 2009). Additionally, after investigating whale cults in early Thule Inuit society in the Canadian Arctic Savelle and Vadnais (2011) have also suggested that these societies originated in various regions in Alaska and they deduced the existence of two or more pioneering Thule populations. McCullough (1989), however, was the first to demonstrate the likelihood of multiple origins of the Thule Inuit eastern migration. Her identification of various archaeological characteristics, including architecture, harpoon heads, art motifs, various artefact styles, and radiocarbon dates from her excavations on the Bache Peninsula provided her with a convincing scenario. All of these sources support Morrison's (1999) claim that the "Thule migration was not a single unified event, but a complex series of small-scale population movements, originating ultimately from several locations in north and west Alaska" (see also Schledermann and McCullough 1980).

Initially, however, the Thule Inuit migration was thought to have occurred as a single rapid event that occurred approximately between 1000 and 1100 CE (950 and 850 BP). This time frame was first proposed in 1927 by Mathiassen, based on the elevation of the Naujan site above sea level. In subsequent years, radiocarbon dates from additional Thule Inuit sites seemed to confirm this date (e.g., Maxwell 1985; McCartney 1977; Morrison 1989; see Park 1994; Taylor 1963). However, the issue was not settled, and Maxwell (1985), noting radiocarbon dates from known Thule Inuit sites presented by Savelle (1980), raised questions about its validity. An 11th century migration was further questioned by McGhee (2000), as Norse historical records (Holtved 1944a) and dendrochronology from Alaska placed the first Thule occupations in Greenland as late as the 13th century. After examining the entire corpus of then available radiocarbon dates from Thule Inuit sites in the eastern Arctic, McGhee suggested that the range of dates was too great to reflect Thule chronology accurately. McGhee (2000) argued that some of the earlier dates were not reliable as a result of the dated materials. For instance, many dates were obtained from sea mammals and driftwood, both of which produce dates that tend to be older than the archaeological context itself. Park (2000) has presented a similar position. Beyond this, Park (1994) has highlighted several uncertainties regarding the harpoon head seriations of Mathiassen (1927a), Ford (1959), Collins (1937) and other researchers, which has further confounded Thule site chronology in the eastern Arctic. More recently, Friesen and Arnold (2008) have helped resolve the problems surrounding the timing of the Thule Inuit migration by re-dating Thule Inuit Sites from the Beaufort Sea/Amundsen Gulf region, an area which Thule Inuit must have travelled through in order to reach the eastern Arctic. This research has now securely placed the eastward Thule Inuit migration well into the 13th century. Similar dates obtained from sites in the western Canadian Arctic to Greenland suggest this migration was rapid and occurred in as little as a few decades (Friesen and Arnold 2008; McGhee 2000). Morrison (2009) now agrees that the main Thule migration was likely a 13th century event based on the distribution, architecture and harpoon head style, subsistence practices, and size of early Thule sites. Notably, several artefacts are consistently identified at Thule sites that have been reliably dated to the 13th century (McGhee 2000; Friesen and Arnold 2008). These include "Sicco" and "Natchuk" harpoon heads as well as a distinctive form of antler arrowhead (Morrison 1999).

There has been much discussion about why Thule Inuit first left Alaska (e.g., Friesen and Arnold 2008). Initially, it was suggested that Thule migrated into the eastern Arctic in pursuit of bowhead whales (Mathiassen 1927a), which would have been widely available during the Medieval Warming Period (MWP) when an increase in temperatures resulted in a reduction of sea ice (McGhee 1969/1970). The extension of ice-free waters into the Canadian Arctic Archipelago was initially thought to have expanded the migration range of bowhead whales. Though whether or not Pacific and Atlantic bowhead populations ever met has been questioned (Dyke et al. 1996), recent studies of bowhead DNA appear to confirm it did (Givens et al. 2010; Heide-Jørgensen et al. 2010b). Either way, bowhead whale as an important motivation for the move east, has remained popular among researchers (Morrison 1999, 2000). However, this explanation is less harmonious since recent research has shown that the Thule Inuit migration occurred some 200 years after the initial increase in temperatures and bowhead whale populations in the eastern Arctic. McGhee (1984a) proposes a very different explanation, suggesting Thule Inuit left Alaska in search of meteoritic iron, later revised to include the desire for Norse metal, and other goods (Gulløv and McGhee 2006; McGhee 2000, 2004). In this scenario, during the early 11th century Thule Inuit are believed to have travelled into the Beaufort Sea/Amundsen Gulf area where they learned the location of metal sources further north, perhaps from the local Dorset inhabitants, and then later during the 12th or 13th century they migrated further, into these areas (McGhee 2005). This fits with Morrison's (1999) proposal that there were several Thule migrations and that they occurred over several centuries. Morrison (1999:142) claimed the first eastward Thule migration occurred during the 11th century, based on a single radiocarbon date falling between 1090-1330 cal CE at 2 sigma (740 ± 60 BP; BETA-111668) obtained from a caribou bone artefact from the Mitimatalk site in northern Baffin Island, and that a later 13th century migration occurred when Thule Inuit moved into the Smith Sound region (see also Morrison 2009). McCullough's (1989) research in the Smith Sound region also supports the idea of a rapid migration. From the Skraeling Island site, she (1989) obtained 15 radiocarbon dates on a variety of materials, leading her to propose the area was first occupied during the 12th and early 13th centuries. Furthermore, pottery recovered from the Skraeling Island site appears to have been manufactured in Alaska, implying the site's occupants were recent migrants who rapidly migrated from the central Arctic. Yet another explanation for the eastward migration of Thule Inuit has also been proposed. This explanation claims that within Alaska internal constraints including population increase, competition for resources, warfare, and available eastern Arctic resources, including unexploited bowhead whale populations and iron, encouraged populations to migrate eastwards (Arnold and McCullough 1990; Friesen and Arnold 2008; Stevenson 1997; Whitridge 1999a). Overall, it is difficult to assess the importance of the various explanations, since they would leave similar archaeological traces. It is most likely that a number of factors motivated the Thule Inuit to expand into the eastern Arctic, who in all probability were in search of a new place where they could replicate the economic, social and ideological structures of their homeland (Friesen 2013b).

Researchers use various terms to refer to the different phases of early Inuit culture (see Morrison 1989). In the eastern Canadian Arctic, it is commonplace for archaeologists to refer to three major Inuit chronological subdivisions: Pioneering/Classic Thule, Modified or Transitional or Developed Thule, and Historic (McGhee 2009a; Sabo 1981; Whitridge 2001). For the purposes of this dissertation, which focuses on the entire eastern Arctic including Greenland where Classic Thule sites are not found, and, in order to highlight the Inuit culture continuum, these subdivisions are slightly amended to include the following: Thule Inuit, Modified Thule Inuit, and historic Inuit. A complete discussion of the numerous historic Inuit societies falls outside the realm of the current research, however I present a brief discussion in order to highlight the various changes that occurred within Inuit society during and after the contact period. The many issues with the radiocarbon dates from Thule Inuit sites instils little confidence in the current ascribed timing of Thule Inuit cultural phases, thus, approximate dates are given but should not be considered exact.

4.3.1 Thule Inuit

The first Thule Inuit to have left Alaska are generally referred to as "pioneering" or "Early" Thule Inuit (McGhee 2009b; Schledermann and McCullough 1980; Whitridge 1999a, 2001). However, Classic Thule is the earliest Thule culture horizon to occupy large parts of the eastern Arctic (Friesen and Arnold 2008; Maxwell 1985; McCartney 1977; McGhee 1984b), with sites dating between 1250 and 1500 CE (McGhee 2009a). Their sites are found in two major concentrations: throughout the Beaufort Sea/Amundsen Gulf area in the western Canadian Arctic (e.g., Arnold 1994; Arnold and McCullough 1990; Le Mouel and Le Mouel 2002; Morrison 1983b,c, 2009), and from the central Canadian Arctic to northwest Greenland (e.g., McCartney 1977, 1979; McCartney and Savelle 1985; McGhee 1984b; Park 1989; Savelle and McCartney 1994; Taylor and McGhee 1979; Whitridge 1999a). Generally, these sites average between five and six houses per site, and are suggested to represent communities averaging no more than 25-30 people, and a maximum of 60 (McCartney 1980; Morrison 2009). In the central Arctic, however, very large sites have also been found at Qariaraqyuk (Whitridge 1999) and Cape Garry (McCartney and Savelle 1985). These large sites have been interpreted by some as continuous winter occupations, lasting for approximately two centuries, by communities that ranged between 200 and 300 people (Whitridge 1999). Ultimately, estimating past Thule Inuit populations based on the number of houses per site is problematic because of the difficulty in determining house contemporaneity. McGhee (1984:78-81) believes Thule Inuit populations were much lower than what Whitridge (1999) suggested and based on his work at Brooman Point argued that the large and expansive site represented the work of no more than a half dozen families over a generation of occupation. However, in regions where site density is greater than at Brooman Point, for example in the Hazard Inlet region in the central Canadian Arctic, population estimates are higher ranging between 150-250 persons (Savelle 1987). Recently, McGhee (2009a) has offered additional estimates of the initial Thule Inuit population and growth over time. His estimates are based on an inventory of known Thule winter houses, and the assumptions that houses generally sheltered five occupants and were occupied for an average of five years. Using these parameters, he suggests that at around 1250 CE the Thule Inuit population was between 100 and 200 people across the eastern Arctic, and that over time populations grew to a maximum of between 600 and 1200 people (McGhee 2009a:86). While McGhee's estimate seems reasonable, it assumes a great deal of consistency in Thule Inuit house occupation. However, the amount of artefacts and bone material excavated from their houses is not always consistent (Park 1989), and some houses have multiple living floors. If these floors were not constructed every year, his maximum population may in fact be a significant underestimation of the number Thule Inuit who occupied the eastern Arctic.

In order to reach the rest of the eastern Arctic from Alaska, populations must pass through the Beaufort Sea/Amundsen Gulf area, making it one of the most important locations for understanding the Thule Inuit migration. In this region, Thule Inuit sites appear less substantial and tend to have thin midden accumulations (Morrison 2009). At these sites, Thule Inuit appear to have primarily subsisted on ringed seal. Caribou and fox bones are abundant at a few sites, although they are generally found in low frequencies along with the remains of musk oxen, bear, dog/wolf, waterfowl, and bearded seal (Arnold and McCullough 1990; Friesen and Arnold 1995; Le Mouel and Le Mouel 2002; Moody and Hodgetts 2013; Morrison 1997, 2009). Low frequencies of bowhead bones have been identified in the region, however, with the possible exception of Nelson River, whaling does not appear to have been a major activity. Faunal analyses of sites in this area are limited with the exception of a recent study by Moody and Hodgetts (2013), who present a detailed discussion of faunal remains excavated from House 5 at Tiktalik, located on the southern shore of the Amundsen Gulf. This faunal assemblage is similar to those identified from additional Thule Inuit sites in the region; bowhead bones are rare and ringed or small seal remains are most prevalent. However, at Tiktalik ringed seals form a much higher proportion of the identified specimens. Moody and Hodgetts (2013) suggest a heavy reliance on ringed seal is related to the colonization process that involved the tendency to rely on the must abundant and easily harvested local resource. Notably, no dog remains were found and gnaw marks were present in low frequencies (Moody and Hodgetts 2013). This is contrary to the high frequencies of dog bones found at Nelson River (Arnold 1987), leading the authors to suggest pioneering Thule groups who passed through this region may have had very different experiences.

In the central and High Arctic region, Thule Inuit sites are most dense in areas where large sea mammals, particularly bowhead whales and walrus, are abundant (McCartney 1979; Savelle and McCartney 1988). Hunting these large sea mammals appears to have shaped daily life and overall social organization (Mathiassen 1927a; Patton and Savelle 2006; Whitridge 1999b); this was true even in areas where whales were not hunted, as an inter-regional exchange network was greatly dependent on whaling surpluses (Whitridge 1999b). Bowhead hunting is ethnographically known to be labour intensive, and would have required a great deal of preparation and organization. This includes the manufacture of boats and hunting equipment, acquiring food stores for the hunting period, and ritual activity (Whitridge 2001). Despite this, small seal bones continue to be most frequent at Thule Inuit sites throughout the eastern Arctic (see Darwent and Foin 2010; Mathiassen 1927; McCullough 1989; Park 1989; Sabo 1981; Taylor 1972; Whitridge 1992). Unlike the Beaufort Sea/Amundsen Gulf region, in the central and High Arctic region bowhead bones are abundant (McCartney 1980). However, determining the number of whales harvested and the degree to which they were depended upon for food is not a simple matter (Betts and Friesen 2013), since bowhead bones were frequently conserved as building materials (Park 1989), and due to their large size they are generally not removed from the field site for further analysis. Recently, Savelle (2010) put forward a new model in order to gain a better understanding of Thule Inuit bowhead use. The application of this model, which involves the recounting of bowhead bones at Thule Inuit sites, has thus far suggested that Thule Inuit whale harvesting was likely higher in some regions than previously thought.

In the past, however, there was much debate over the extent to which bowhead whale hunting played an important role within Thule Inuit society, and some researchers questioned whether Thule people were in fact actively hunting these large creatures versus scavenging their carcasses for meat and bones (e.g., Freeman 1979). Several studies by McCartney (1980) and Savelle (Savelle and McCartney 1988) have since provided multiple lines of evidence indicating that in many regions Thule Inuit were active whale hunters. The remains of a variety of resources are generally found at Classic Thule sites, although scheduling conflicts appear to have decreased a heavy reliance on some resources. For instance, in both the central and High Arctic, bowheads are generally available during August and September (Moore and Reeves 1993), and hence overlapped with the upstream char run (Whitridge 2001). Although the less productive downstream run of char during early June to mid–July would not have been interrupted by bowhead hunting, it would have conflicted with preparations for the whale hunt, and with hunting seals on the sea ice. For this reason, it is suggested that fishing was not of primary importance to Thule Inuit. However, Thule Inuit were not all bowhead hunters; their sites have also been identified in areas where large sea mammals were infrequent or not available, along southern Baffin Island and southeast Victoria Island. In these locations, caribou and/or fish were the primary resources (Norman 2009; Norman and Friesen 2010; Savelle 1987; Stenton 1989; Taylor 1972).

It is generally assumed that Thule Inuit acquired the majority of their food during the spring or summer and cached meat to be used during the dark winter months when animals were less easily acquired (Mathiassen 1927a; McCartney 1977). This practice of obtaining large quantities of food and storing it for later use is a type of "delayed return" economy (Woodburn 1980). Regardless of the primary resource, in all regions storage was a critical part of the Thule economy (Savelle 1987). However, during the first few winters when Thule Inuit first entered the eastern Arctic, they were perhaps relying more heavily on winter hunting in this unfamiliar environment. Of the Thule who first passed along the Beaufort Sea/Amundsen Gulf area, Morrison (2009:175) has suggested they lived "more hand to mouth than might have been preferred". But once they located bowhead whale migration routes they were able to harvest enough meat to survive the winter months.

Much of our knowledge regarding Classic Thule comes from excavations of their large semi-subterranean winter house structures made from bowhead bones, sod, driftwood, and stone (Maxwell 1985; Sabo 1981; Savelle and McCartney 1999; Whitridge 2002). Throughout the eastern Arctic, whalebone house structures were oval to round in shape, contrasting with the square dwellings that incorporated greater amounts of driftwood found in the Beaufort Sea/Amundsen Gulf region (Le Mouel and Le Mouel 2002; Morrison 1983b,c, 2009) and Alaska. These houses tended to have sunken entrance passages, and the interiors typically incorporated raised rear sleeping platforms, paved floors, stone lamp stands, and sometimes a small annex, a room extended from the main living area via a tunnel, would also be found. Although it is possible these structures were also occupied during warmer weather (see Nagy 1994), it is likely Thule Inuit moved into tents or *qarmats* when temperatures increased; the remains of *qarmats* are often located in close proximity to their winter sites (see Park 1989).

Qarmats are more substantial than tent structures and were insulated with sod and roofed with animal skins. Many sites also included communal structures known as *kariyit*, that were used throughout the year (Friesen 2012).

Of relevance to the current research is one of the "pioneering" Thule culture horizons known as the Ruin Island phase, with sites dating to the 13th century (McCullough 1989:240). Eric Holtved (1944a) defined this phase after excavating several Thule sites located on the Greenland side of Smith Sound, including those on Ruin Island. The remains from these sites were very similar to those excavated from Alaskan Thule sites, including harpoon head types and a house plan where a separate kitchen was accessed by a tunnel that ran adjacent the main entrance tunnel (Holtved 1944a; Schledermann 1978b). Peter Schledermann and Karen McCullough uncovered several of these sites on the east coast of Ellesmere Island (McCullough 1989; Schldermann 1978; Schldermann and McCullough 1980), including the Skraeling Island site from which faunal samples were analyzed for this study. Recently, McGhee (2009:82) proposed that the differences between this phase and other early Thule phases are "what might be expected from near-contemporaneous arrivals from the same Alaskan community, or from closely related adjacent communities". Apart from the Alaskan traits that distinguish this phase, Ruin Island sites are generally similar to Classic Thule sites, and comprise the semi-subterranean winter house structures, in addition to tent rings, kayak and *umiak* supports, and food caches.

Thule Inuit had an elaborate and specialized toolkit, contrasting with the multipurpose tools utilized by Paleo-Inuit groups, and throughout the Arctic artefact form is virtually identical (Friesen 2012). They used the bow and arrow, with various types of arrows intended for different prey (Morrison 1983a). Their hunting gear also included lances, bird darts, bolas, and hooks, (Maxwell 1985), three-pronged fish spears known as *kakivaks*, fishing lures, prongs (Morrison 1983c), and possibly fishing harpoon heads (Mathiassen 1927b). Fish netting gear, however, is generally considered absent from the eastern Arctic prehistorically (Morrison 1990:62-63), although bone and antler objects have tentatively been identified as net sinkers from Brooman Point (McGhee 1984) and Talaguak (Sabo 1991). For most of the year, Thule Inuit travelled and hunted using dog-pulled sleds, known as *qamun* or *uniapaq* in north Alaska and *komatik* in much of the eastern Arctic (Friesen 2012). Harpoons with fixed foreshafts were used to hunt seals at the ice edge and breathing holes, and a variety of tools were used to hunt animals on the open water including harpoons with detachable foreshafts, bladder and seal skin floats, kayaks, and larger boats known as *umiaks* (Maxwell 1985).

Thule Inuit used numerous types of harpoon heads including self-bladed and those with separate endblades, and varying in form and style. This also includes a very large harpoon head type for hunting whales. They used several types of knives, including men's knives and woman's knives referred to as *ulus,* flensing knives, and snow knives (McGhee 1984b). Other artefacts include mattocks, needles, needle cases, ivory or antler combs, ice creepers, dog trace buckles and toggles, float plugs, and toys. Their tools were made of metal, stone, skin, baleen, bone, antler, horn, ivory, and wood. Objects such as endblades were often made from slate, and blades were also sometimes made from copper or iron. They also used soapstone lamps and pots. Wood was another important material resource for early Thule Inuit, and was frequently used in the construction of houses and tents, for the frames of sleds, *umiaks*, and kayaks*,* and for constructing hunting technologies and tools used in everyday activities. Wooden objects are prevalent on Thule Inuit sites, especially those located in the Western Canadian Arctic (Arnold 1994; Maxwell 1985; Taylor and McGhee 1979). The larger number of wood artefacts from sites nearer Alaska is likely related to the proximity to this resource, whereas along the treeless coasts of the central and eastern Arctic driftwood sources are not always renewed on a regular basis (Alix 2009a), which created a greater dependence on other materials such as animal bone.

Thule Inuit art differed somewhat from that found on Dorset sites, since in addition to portable carvings they created incised scenes carved on antler, bone, and ivory, depicting hunting scenes, camp scenes, and human and animal figures (McCullough 1989). Although designs are sometimes found on Dorset harpoon heads (see Murray 1996), they are far more common on Thule Inuit objects and generally found on harpoon heads and a range of utilitarian objects including combs, needle cases, and buttons (McGhee 2005).

4.3.2 Modified Thule Inuit

Approximately 100-200 years after Thule Inuit people entered the eastern Arctic several changes occurred: winter whale bone houses fell out of wide use, whale hunting declined and ceased in some areas, settlement patterns and demographic patterns altered, and a more diversified economy emerged (Maxwell 1985; McGhee 2005; Sabo 1981). McCartney (1977) referred to these populations as Modified Thule and many researchers followed his lead (Le Mouel and Le Mouel 2002; Stenton 1991; Whitridge 2001, 2008; Woollett 2007). However, this period has been referred to by several names, including, but not limited to, the Developed Thule culture phase (Sabo 1981), the Post Classic Modification (Maxwell 1985), the Intermediate period (McGhee 1972), Transitional Thule (McGhee 2009a), and in the western Arctic in corresponds with the Late Prehistoric period (Whitridge 2001). Some researchers prefer the more general term Pre-contact Inuit (Betts and Friesen 2013).

Although Thule Inuit society did not change simultaneously throughout the Arctic, in many regions Arctic archaeologists associate the changes that occurred during this period with the deteriorating climate beginning some time before, and culminating during, the Little Ice Age (Maxwell 1985; Sabo 1981; Schledermann 1975, 1976a). Prior to the re-dating of Thule Inuit sites, McCartney (1977) suggested this period dated between 1200-1600 CE, and Morrison (1983:17) proposed its beginning at approximately 1300 CE. Later, it seemed the Classic Thule Inuit period came to an abrupt end around 1400 CE (Morrison 1989). Based on current information, the Modified Thule Inuit period began sometime during the 15th century. During this period, the occupation of the central and High Arctic decreased and Inuit groups began to move farther into Low Arctic regions, including the Barren grounds, Ungava, Labrador, and southern Greenland (Maxwell 1960, 1985; Whitridge 2001). By the late 15th century, Inuit were occupying the Labrador coast, where they established permanent settlements in a number of fiord systems (Kaplan 1983; Ramsden and Rankin 2013; Schledermann 1976a).

Researchers tend to agree that the climatic shift that occurred during the Little Ice Age altered the reliability and abundance of various animal resources. This included a decrease in the availability of whales in the central and High Arctic (Dyke et al. 1996), forcing groups to rely more heavily on other animals (McCartney 1977; McGhee 1969/1970, 1972; Savelle 1987). As such, fishing, which does not seem to be of great importance during the early Thule Inuit phase, now becomes a significant activity throughout the year, and was of major importance during the productive late summer/early fall upstream runs (Whitridge 2001). Schledermann (1975) suggests that once the climate began to change groups would have had to choose either to adapt to the changing resource base of their local region, or move east and south where the effects of the cooling climate were less pronounced, allowing continuation of their whale hunting lifestyle. He proposes that a decrease in profitable whaling in the High Arctic at approximately 1400 CE caused an influx of people into the Cumberland Sound region, where whale populations persisted until approximately 1600 CE. When whaling was no longer sustainable in these more southerly locations, groups would rely more heavily on seal hunting, reorganizing into larger groups to maximize success with breathing hole hunting during the winter (Schledermann 1976a).

Population movements during this period are thought to have greatly impacted the homogenous material remains characteristic of early Thule Inuit. Whitridge (1999b) posits that once whale populations in the central Arctic began to decrease and groups began to move to more southerly locations, the Thule Inuit interaction sphere began to break down. More specifically, a decreasing Inuit population in the central Arctic severed the connection between the societies occupying Low Arctic regions and those in the High Arctic and Greenland. At the same time, as Inuit moved out of the Amundsen Gulf area, connections with societies in the Mackenzie Delta region also deteriorated. He suggests that this breakdown in inter-regional interaction can be seen in the progressive decrease of material culture homogeneity during this time period (Whitridge 1999b), in addition to a decrease in long distance trade (Morrison 1991).

Modified Thule Inuit sites often exhibit small assemblages of artefacts, but are understood to have shared the same basic technologies as the early Thule Inuit, albeit with stylistic variations in harpoon heads (Sabo 1981). Many of these style variations continued to be used by historic Inuit populations, allowing for few diagnostic artefacts dating to this period (Maxwell 1985).

4.3.3 Historic Inuit

“Historic Inuit” generally refers to the Inuit groups who met the early European Explorers that traversed the Arctic between the 17th and 20th centuries. The degree of contact between Inuit and Europeans varied from region to region and increased throughout this period, which is defined by cooling temperatures in addition to Inuit use of European goods. Generally, Historic Inuit continued to use the technologies used by Thule Inuit (McCartney 1977), although there are several instances where historic groups appear to lose technologies (see Chapter 5, section 5.2 for further discussion). In comparison to earlier groups, Historic Inuit used greater frequencies of European materials such as smelted iron, copper, tin, hardwood and other objects obtained through trade or acquired from abandoned ships and caches (Savelle 1987). As contact with Europeans increased and trade networks were established, additional goods were introduced such as glass bottles, canvas tents, tobacco, and perhaps most importantly, rifles and ammunition.

By the historic period, the different local ecosystems and various social and historic factors had led to the development of distinct regional Inuit identities (McGhee 1990). Settlement and subsistent practices differed greatly from one region to another. In some cases, seasonal settlement was more mobile than that characteristic of Thule Inuit. In the Central Arctic, during the winter large groups of up to 100 people would subsist on cached resources and on seals hunted at breathing holes (Morrison 1983b; Savelle 1987). These Inuit tended to occupy one location until the local seal population was depleted, and then the group would move and rebuild their snow houses in at another location (Stefansson 1914:160-170). During this period, multi-family house structures became widely adopted (Jenness 1922; Mathiassen 1928b; Schledermann 1976a). In Labrador and Greenland, the winter house structure had the basic components of the Thule Inuit house, but the floor area was now much larger, and incorporated multiple or partitioned sleeping platforms, multiple lamp stands and internal cooking areas (Auger 1993; Bird 1945; Gulløv 1997a; Jordan 1974, 1977; Kaplan 1983; Petersen 1974-75; Schledermann 1975, 1976b). These houses were occupied by multiple families and had as many as 35 inhabitants (Petersen 1974-75; Taylor 1974). Large winter houses with multiple lobe-shaped chambers were also built in Greenland in the 16th century (Mathiassen 1936), and during the 19th century on southern Baffin Island (Schledermann 1975).

Once trading networks with Europeans were established, Inuit subsistence and settlement practices were radically transformed. Resource availability and subsistence activities no longer structured Inuit lifeways as strongly, since now Inuit participated in many different economic activities. For instance, some Inuit worked on European whaling boats as harpooners or oarsman or focused their efforts on trapping foxes for trade, and others began to mine materials such as mica for Europeans (Maxwell 1985). Gradually, a cash economy superseded the primary subsistence economy that characterized Arctic life until the historic period.

4.4 Conclusion

The archaeological data reviewed in this chapter have demonstrated the complex history of the groups who inhabited the eastern Arctic, our knowledge of whom continues to evolve. The diverse material cultures of eastern Arctic societies suggest multiple adaptive strategies were used to navigate this northern landscape. Narrowing the discussion to Late Dorset and Thule Inuit, the following chapter presents a more detailed overview of their hunting technologies, and particular attention is given to the disparities. Inuit ethnographic information and oral histories are then used to situate how these technologies would have been used in the Arctic environment and to further illuminate how Late Dorset and Thule Inuit interacted with animals in a similar environment.

Chapter 5
Late Dorset and Thule Hunting Technologies and Practices

5.1 Introduction

In order to best understand the impacts of variable hunting technologies on everyday life in Late Dorset and Thule Inuit societies it is necessary not only to examine technological differences, but also to explore the hunting practices they involve. This chapter presents a brief discussion of the use of ethnographic sources when interpreting Arctic prehistory and hunting practices, and provides a detailed description of Late Dorset and Thule Inuit tool kits.

5.2 Interpreting Hunting Practices in Arctic Prehistory

Late Dorset and Thule Inuit hunting practices are largely inferred from the archaeological record. Ethnographic records and Inuit oral histories also provide analogous scenarios that allow valuable insight into past hunting practices (Friesen 2012). Information from these sources can be useful when attempting to decipher archaeological patterns, especially those that result from practices or technologies that are not always visible within the archaeological record. However, how this type of information is used to interpret the past differs greatly for the two traditions (Friesen 2002).

The use of Inuit ethnographic information and oral histories in the interpretation of early Inuit archaeology, including that of Thule Inuit, is widespread and often successfully employed (e.g., Grier and Savelle 1994; Patton and Savelle 2006; Savelle 2002; Savelle and Vadnais 2011; Savelle and Wenzel 2003; Whitridge 1999a, 2002, 2004). The justification for this direct historical approach is primarily based on cultural continuity between Thule Inuit and modern Inuit, in addition to the existence of high-resolution ethnographic studies, and the fact that in many Arctic communities elders, who grew up ‘on the land’, still survive and can provide valuable traditional knowledge (Friesen 2002).

Despite this, ethnographic sources should not be seen to directly mirror the prehistoric past, since Inuit hunting practices were, and are, not static; over time, they have adjusted to changing social and environmental circumstances (see Henshaw 2000). For instance, along the coasts of Coronation Gulf, Thule Inuit frequently built their sod houses in coastal locations during the winter, and hunted seals at the ice edge. Historically, however, Inuit occupying the same region spent the winter in snow-houses on the ice and hunted seals at breathing holes (Morrison 1983c). Technologies have also been lost over time. For example, when European and American explorers first made contact with the Inughuit of northwest Greenland, the Inughuit lacked several technologies utilized by Inuit of the eastern Arctic and more southern Greenlanders, including kayaks, fishing leisters or *kakivaks*, and the bow and arrow (Kane 1856). These examples also suggest that when interpreting prehistoric Inuit behaviour, the local historic Inuit practices are not necessarily the best fit (Friesen 2012). Generally, when interpreting Thule Inuit archaeology, archaeologists rely heavily upon ethnographic studies of Alaskan Inuit groups (e.g., McCartney 1991; Whitridge 1999a), specifically Northwest Alaskan Iñupiat (Friesen 2012). This is primarily due to two reasons: first, these societies, who occupied coastal and near interior regions, also hunted bowheads; and second, northwest Alaska is proposed to be the homeland of the initial Thule Inuit who migrated into the eastern Arctic (Friesen and Arnold 2008; Gulløv and McGhee 2006; Hollinger et al. 2009; Mason and Bowers 2009; McCullough 1989; McGhee 2000, 2009b). Arguably, there is greater continuity between Thule Inuit societies of the eastern Arctic and the historic groups of northwest Alaska, who continued to focus on bowhead hunting, than there is between Thule Inuit and the historic Inuit societies of the eastern Arctic, who had for centuries been adapting to a varying landscape very different to what their ancestors first encountered when they left Alaska (Friesen 2002a). Thus, depending on the resource structure of the local environment, Northwest Alaskan Iñupiat ethnographic sources may offer the best analogies for how Thule Inuit interacted with animals.

In general, however, throughout the Arctic early Inuit societies employed similar technologies; variations were primarily seen in style, but form and function remained stable over time. Thus, prior to the introduction of European technologies, Inuit societies were largely capable of similar hunting practices. With this in mind, but taking into consideration the fluidity of human behaviour, ethnographic and ethnohistoric accounts of Inuit from across North America serve as useful comparisons for explaining Thule Inuit hunting behaviour.

A very different situation arises when using ethnographic analogies to interpret Paleo-Inuit archaeology, since there is no direct connection between Inuit and Paleo-Inuit societies. Not only are there a number of cultural differences between Inuit and Paleo-Inuit traditions (see Chapter 4), but their development is separated by a minimum of 3000 years (see e.g., Friesen 2002; Maxwell 1985). However, researchers have used historic Inuit ethnographic sources to interpret the archaeological record of earlier Arctic groups with some success (see Renouf 2000), including that of Late Dorset (see Murray 1996). Although some caution should be taken to avoid interpreting Paleo-Inuit behaviours through the lens of Inuit practices, ethnographic studies potentially provide a powerful source of information for how people existed in the same environment (Friesen 2002). To avoid issues of transference, Inuit ethnographic information is best used in conjunction with other sources of inference, including contextual information, cross-cultural generalizations of hunter-gatherer behaviour, and links to environmental and ecological variables (Friesen 2002).

Inuit ethnographic sources are utilized in order to provide a generalized picture of hunting practices in the Arctic environment, with the understanding that some details will vary from context to context. This approach frames the following sections that outline and discuss Late Dorset and Thule Inuit hunting technologies and practices. It is further used in Chapter 6,which presents the expected zooarchaeological correlates, and in Chapters 7 through 10, when the zooarchaeological data are interpreted.

5.3 The Material Evidence of Late Dorset and Thule Inuit Technologies

As discussed in Chapter 2, a society’s hunting technologies directly impact subsistence practices. They not only help determine when and where hunting occurs, but also influence decisions regarding butchery and carcass transport (Binford 1978). There are significant differences between Late Dorset and Thule Inuit technologies. Unlike Thule Inuit who utilized specialized technologies for acquiring most resources, the Late Dorset tool kit was much more generalized, wherein similar technologies were used to hunt different species or perform different tasks (McGhee 1996). The following discussion begins by reviewing the evidence for differences in hunting transportation, and is then organized according to the type of animal hunted. Key differences between Late Dorset and Thule Inuit hunting technologies are presented in Table 1.

5.3.1 Transportation Technologies integral to hunting

Archaeological evidence, or the lack thereof, suggests that for Late Dorset the primary mode of transportation was by foot. Fragments of what would have been small hand-drawn sleds have been found at Late Dorset sites across the Arctic (Mary-Rousselière 1979; Maxwell 1985; McGhee 1981b, 1996), but there is no evidence these sleds were pulled by dogs (Morey and Aaris-Sørensen 2002). Dog bones and artefacts relating to dog domestication, such as harnesses or trace buckles, are absent from all known Late Dorset sites (Maxwell 1985), and dog bones have not been identified at sites that date within the Dorset period with exception of a single skull from the Nanook site on Baffin Island, which dates to the Early Dorset period (Cleland 1973). In contrast to Late Dorset society, there is abundant evidence that dogs formed a central part of Thule Inuit lifeways. Trace buckles, which were historically used by Inuit to harness dogs for dog sledding, and whip handles, are found on their sites across the eastern Arctic (Glob 1935; Larsen 1934; Mathiassen 1930, 1931, 1933; Mathiassen et al. 1936; McGhee 1984b; Schledermann 1975; Taylor and McGhee 1979). Fragments of large dog-pulled sleds (Mathiassen 1928b, 1930; Pitul'ko and Kasparov 1996; Savelle and Dyke 2014b; Schledermann 1975), toy sleds (Collins 1952; Holtved 1944a; McGhee 1984b), and dog bones (e.g., McCullough 1989; Park 1987, 1989) are also common finds on Thule Inuit sites. In some cases, sites have yielded dog bones with skull pathologies indicative of traumatic injuries suggesting that dogs were likely subject to severe discipline, which was a common practice historically in Inuit society (Park 1987).

Whether or not Late Dorset people used boats remains unclear. Across the eastern Arctic, and for the entire Paleo-Inuit period, there is little archaeological evidence of boat technology (Maxwell 1985). The few finds include a kayak rib identified at Qeqertasussuk, a Saqqaq site in Greenland (Meldgaard 2004), and parts of a kayak that were excavated from a Dorset structure from Nunguvik, northern Baffin Island (Mary-Rousselière 1979). Possible model/toy kayaks carved from wood were also recovered in two Dorset structures at Nunguvik, one of which dates to the Late Dorset period (H71). Similar pieces were excavated nearby from Button Point, but in dubious context (Mary-Rousselière 1979). These finds, however, are rare and similar objects have not been found elsewhere, leading some researchers (e.g., McGhee 1996) to suggest Dorset boat use was tenuous, if in fact it existed. Our understanding of Late Dorset boat use is further confounded by Inuit oral history that includes stories describing '*Tunit*' (the Inuktitut word for Dorset) using kayaks, and by early Norse records that refer to '*Skraelings*' as using kayak-like watercraft (Arima 1975; Mathiassen 1928a). Furthermore, the location of various hard to reach coastal sites would suggest some sort of watercraft was used to access the sites (e.g., Jensen 2006), but whether or not boat use was widespread cannot be certain. The absence of additional open water hunting technologies (see below) seems to suggest boats were not an integral part of Late Dorset hunting practices.

To the contrary, there are multiple lines of evidence for Thule Inuit boat use, suggesting boats were an important part of Thule Inuit society. Fragments of kayaks have been identified at several sites across the eastern Arctic (e.g., Holtved 1944b; Park 1983). These fragments once formed wooden kayaks that were constructed in a similar manner as those used historically (Walls 2012), however based on the current finds, evaluation of their performance or style is not possible (Walls 2014). Thule Inuit also used *umiat* (singular *umiak),* large open skin boats with very large carrying capacities that were beneficial for transporting goods and hunting large sea mammals (Maxwell 1985). A complete *umiak* frame has been excavated from a Thule Inuit site in northern Greenland (Knuth 1952). These boats were constructed from locally available material including driftwood, antler, bone, sinew, and skins. Boat rests or stands, which are constructed of stone set to support the boat, are commonplace at Thule Inuit sites (Darwent et al. 2007; Grønnow 1986; Lethbridge 1939; Mathiassen 1928a; McCullough 1989; Savelle 1997; Stenton 1987; Stenton and Rigby 1995), and fragments of oars have also been recovered (Gulløv 1997a; Maxwell 1983). Additionally, model/toy kayaks (Gulløv 1997a; Lethbridge 1939; McCartney 1977; Park 1983; Stanford 1976; Thomsen 1917) and incised scenes carved on antler depicting kayaks and *umiat* are common Thule Inuit finds (Maxwell 1983; McCartney 1980; McCullough 1989; Savelle and Habu 2004; Whitridge 1999a, 2004).

5.3.2 Sea mammal hunting technologies

Late Dorset hunters captured sea mammals, including seals and walrus, using a standard harpoon with a typical form. Although Late Dorset used a variety of harpoon head styles (see Park and Stenton 1994), the majority of Dorset harpoons had fixed foreshafts, a technological element beneficial to hunting seals at the ice edge and at breathing holes (Maxwell 1985). The fixed foreshaft is made typically of a long, flat, piece of caribou bone with a gouged hole near the proximal end where it is tied to the wooden shaft with a line that is wedged into a small split in the shaft. This foreshaft is slightly bent so that on impact the foreshaft slides backward along the 25° angle of the shaft, and the harpoon head slips off and becomes embedded in the animal and the line loosens but remains tethered to the shaft (Arnold 1989). In comparison to harpoon heads, harpoon foreshafts are not commonly found at Dorset sites, a fact attributed to the durability of foreshafts and the more delicate harpoon head form that tend to have broken sockets (Rowley 1940). Maxwell (1985:135) notes that harpoons with detachable foreshafts, which are more suitable for open water hunting but could conceivably be used hunting from the ice edge, are also found in Dorset contexts, primarily at Late Dorset sites. Maxwell (1985:222) describes these foreshafts as having "a hole placed well up the piece near one lateral margin… [and].. are rectangular bars, usually of ivory, square at both ends and designed, I suspect to be bound to the harpoon line and to slip from the shaft as the head does". This "loose" foreshaft type, however, is much less frequent than the fixed variety (Maxwell 1985:135). In order to determine which foreshaft type was most frequent at Late Dorset sites, and possibly most frequently used, I attempted to quantify the number of fixed foreshafts versus loose foreshafts. However, several factors impeded any further insights, including the fact that harpoon foreshafts are uncommon archaeologically, and that foreshaft 'type' (fixed vs. loose) is not typically listed in publications (see Harp 1964 for exception). Until a more detailed analysis can be conducted, our understanding remains limited.

In contrast, our understanding of Thule Inuit harpoon technology is more complete and their harpoons were less standardized. Thule Inuit used various harpoon types; they used a variety of harpoon heads, and fixed and loose foreshafts were common. This suggests they were efficient at hunting sea mammals on the ice, at the ice edge, and from boats in open water (Morrison 1983c). Thule Inuit also used bladder darts (e.g., Morrison 1983c; Park 1989; Sabo and Jacobs 1980), a smaller harpoon with a detachable foreshaft that was thrown using a throwing board, and was historically used to kill small seals in open water (Ford 1959). Large whaling harpoon heads, averaging 20 cm in length (Park and Stenton 1998), designed to penetrate the thick skin of large whales, are also typical on Thule Inuit sites (McCartney 1979). Another essential component of Thule Inuit sea mammal hunting were floats, constructed from sealskins or bladders. Unfortunately, they do not often survive, or are difficult to distinguish in the archeological record, however the small nozzles and plugs, made of bone or ivory, that served to inflate the float and keep the float inflated, are quite common on Thule Inuit sites (Park 2010). Notably, these artefacts are absent from all Dorset sites suggesting Late Dorset people did not use float technology.

5.3.3 Large Terrestrial mammal hunting technologies

There is also no evidence that Late Dorset used the bow and arrow (Maxwell 1985), or atlatls (spear-throwers; Friesen 2013a). Instead, Late Dorset primarily used thrusting lances and spears with chipped stone or metal points when hunting large terrestrial mammals, and in some regions Late Dorset likely used caribou drive systems (Friesen 2013a; see section 5.4.1 for further discussion). Although dating drive systems is quite difficult, because they are often devoid of material remains and surface finds may be associated with a different group than those who originally constructed the system (Brink 2005), for multiple reasons some are believed to have been constructed by Dorset. These reasons include their construction, which differs with drive systems associated with historic Inuit, their proximity to large Dorset sites, and their presence in Inuit oral history, which describes them as being built by "Tunit" (Balikci 1964). Dorset drives are generally V-shaped, consisting of lines that begin at the ends as *inuksuit*, but become low continuous walls near their vertices (Friesen 2013a). They are associated with robust, deep *taluit* (hunting blinds with adjacent shallow depressions), or large boulders (see Fitzhugh 1981), either of which would serve to conceal the hunter. These drives usually measured a maximum of 90°, the walls of which are punctured with narrow gaps, less than 10 m in width (Friesen 2013a). These drive systems have been identified at Williams Harbour, Labrador (Fitzhugh 1981), as well as at Oxford Bay and Iqaluktuuq, Victoria Island (Friesen 2013a).

There is ample evidence that Thule Inuit used the bow and arrow, as pieces of these tools are frequently excavated from their sites (Maxwell 1985). Thule bows were small composite tools often constructed of wood or antler and reinforced with sinew (Mathiassen 1927a). Arrowheads recovered from Thule Inuit sites were usually made of antler with various forms of tang and shoulder, barbing, blading, and fletching, and generally fall into different functional classes for hunting different species (Maxwell 1985). On occasion, Thule Inuit arrowheads display ownership marks (Yorga 1980), however this is considered rare in the eastern Arctic (Morrison 1983a). Composite lances and spears, constructed of wood, antler, and ivory were also used to hunt terrestrial species such as caribou, muskox, and bear (Maxwell 1985). Assuming Thule Inuit used caribou drive systems resembling those known ethnographically, their drives consisted of rows of individual cairns, or *inuksuit*, that varied in size, and would converge in a shallow, obtuse angle on a gap around 30 m wide (Friesen 2013a). The gaps are associated with *taluit*, which varied in depth and had a scooped bowl shape. This type of drive system has been identified at Iqaluktuuq (Brink 2005; Taylor 1972), and is one of the largest recorded in the eastern Arctic, measuring over 3 km, including over 1500 *inuksut* and 70 *talu* (Friesen 2013a).

5.3.4 Small game hunting and fishing technologies

There is no evidence Late Dorset used specialized technologies to capture small game, although small mammals, bird, and fish are commonly found on Late Dorset sites (e.g., Bendix 1998, 2000a, b; Darwent 2001). It is possible small mammals, such as fox, were captured using stone traps, since several fox traps have been identified near Late Dorset sites in northwest Greenland (Appelt and Gulløv 1999), however there are no radiocarbon dates that confirm this, making it possible they were built by later groups. Late Dorset captured fish using fish spears (Maxwell 1985), possibly small harpoon heads (Meldgaard n.d.; Taylor 1967), and fish weirs. At Iqaluktuuq, small harpoons, possibly used for fishing, are prevalent on the Early and Middle Dorset sites, however they have not been found amongst existing large Late Dorset artefact collections (Friesen pers. com.). In addition, from sites across the Arctic, there are no identified Late Dorset artefacts associated with ice fishing. Specialized bird hunting technology is also absent from Late Dorset sites. Instead, they likely used stones, darts (Schledermann 1990), and spears to hunt birds.

Thule Inuit used several specialized technologies to hunt small game. The bow and arrow and stone traps were used to capture small mammals such as fox. Again, there are no radiocarbon dates confirming Thule Inuit used fox traps, but they are found at Thule Inuit sites across the eastern Arctic (e.g., Grønnow and Jensen 2009; Le Mouel and Le Mouel 2002; Stenton 1989). *Kakivaks* (which are three pronged fish spears/leisters), various forms of lures and hooks, and fishing rods were used to catch fish. These items were constructed from bone, ivory, or antler, and lines were made from sinew or baleen (Jenness 1922:153). Stone weirs were also used in rivers, lakes and ponds, to trap fish during their seasonal runs. Additionally, hand-held ice picks and ice scoops were used for ice fishing (Whitridge 2001). Few fishing harpoon heads, and small foreshafts, presumably used for fishing, have also been found on Thule Inuit sites (Mathiassen 1927a; Vanstone 1962), and although Mathiassen (1927) reported fish traps and nets made from baleen, the identification of these latter items is not generally accepted (Whitridge 2001). Birds were hunted using bolas, sticks with hooks, bird spears, arrows, and possibly nets. Bolas were constructed of various materials, including stone, bone, and less commonly, ivory, tied together with a cord (Maxwell 1985). Sharpened pieces of antler, ivory, or bone were used for hooks, and spears were constructed with chipped stone or metal points. Thule Inuit also used blunt arrows to kill birds. These arrows are relatively rare on sites in the eastern Arctic, unlike in Alaska where they are common, but specimens have been identified at the Clachan Site in western Coronation Gulf, (Morrison 1983a) and at the Naujan site and other sites on northern Baffin Island (Mathiassen 1927a,b).

5.3.5 Summarizing Differences in Late Dorset and Thule Inuit Technologies

The differences between Late Dorset and Thule Inuit technologies are critical to understanding related differences in resource exploitation. The key technological differences between Late Dorset and Thule Inuit that shaped their respective hunting practices are presented in Table 5.1.

Table 5.1. Key differences between Late Dorset and Thule Inuit hunting technologies.

Late Dorset Technologies	**Thule Inuit Technologies**
sleds, no dogs	dog sleds
lance, spear	bow and arrow, lance, spear
no float technology	float technology
watercraft?	kayaks and *umiaks*
no whale hunting technology	whale hunting technology
fish spears	*kakivaks* (fish spears), lures, hooks and line
no specialized bird hunting technology?	bolas, hooked sticks, bird spears, nets?

5.4 Arctic Hunting Practices

Undoubtedly, choosing a particular hunting practice was a complex process that related to a plethora of factors. In addition to technological capabilities, the physical environment and the distribution, biology, and behaviour of prey would have been of fundamental importance to this process. A general overview of the Arctic ecosystems and animal species was presented in Chapter 3, and the local environment of each study region is presented in Chapters 7-9. As outlined in Chapter 4, Thule Inuit and historic Inuit groups used many of the same technologies, and conceivably used similar hunting practices. While it is evident that across the Arctic early Inuit procurement strategies, and their scheduling, did vary (e.g., Sabo and Jacobs 1980; Savelle 1987), the purpose of the following discussion is to outline the variety of techniques these technologies allowed. The following discussion describes several Arctic hunting practices, and the various social factors they entailed, including labour requirements, mobility and scheduling. Inuit ethnographic sources are used to help reconstruct Late Dorset and Thule Inuit hunting practices and identify how hunting may have differed for these two groups.

5.4.1 Transportation Technologies and Hunting Practices

Historically, boats were used throughout the year for hunting and transporting goods. During this period, the *umiak* was propelled by paddles, oars or sails, and more recently by gasoline engines (Chapelle 1983); however, there is no evidence Thule Inuit used anything other than paddles. These boats had a large capacity, capable of transporting families and gear long distances, and, were ideal for hunting large whales (Burch 2006). Kayaks were more suited for travelling shorter distances and were primarily used for hunting. Kayakers could work together to catch their prey, or a kayaker could hunt alone (see Arima 1987). Hunting from boats was highly beneficial as it granted access during the summer months to sea mammals that provided large quantities of valuable material resources, such as blubber, ivory, skins, and meat. Additionally, boats allowed hunters to easily travel a great distance from their home camp to exploit other resources. However, hunting on the open sea could be very difficult and dangerous, risking both the hunter's safety and the community's livelihood. For example, when hunting from a kayak it is essential that the harpoon and float are thrown well away from the boat; if the harpoon line became entangled with the boat a struggling animal could tip the kayak and possibly drown the hunter (Walls 2011). Hunting on the open water, from kayaks in particular, requires a high degree of skill in addition to physical strength, social skills, and extensive environmental knowledge (Walls 2012, 2014). Walls (2012) has recently explored the importance of kayak games and hunting enskilment amongst past Inuit groups of Greenland, explaining that successful kayak hunting was dependent upon the skills learned through experience. This experience was gained only through years of training with practice realized through games and sports. The lengthy process involved in developing these skills speaks to the difficulty of this type of hunting, and to the importance of training in order to tip the balance from danger to the reward of a successful hunt.

During the winter months, dog sleds were used to transport people and goods, and similar to *umiat* they were capable of travelling long distances (Burch 2006:288). During the summer, when sledding was no longer feasible, dogs would have continued to aide in hunting, and they could also serve as pack animals when travelling. Throughout the eastern Arctic, however, the abundance, and use, of dogs was variable (Morey and Aaris-Sørensen 2002). In west Greenland, large dog sleds, pulled by an average of seven animals that were suitable for pulling up to 100 kg for 75 km per day, were commonplace (Kleivan 1984). In the Central Arctic region dog sleds were frequently smaller and hauled by one to three dogs (Damas 1984), whereas the frequent use of large dog sleds was restricted to the Igloolik region (Mary-Rousselière 1984). On the other hand, Inuinnait (also referred to as Copper Inuit) relied little on dog traction, and few animals were capable of hauling sleds (see Jenness 1922).

For the Thule Inuit of the eastern Arctic, the distance travelled, and ease of movement, by *umiat* would have been somewhat different from the Iñupiaq of northwest Alaska (Friesen 2012). In Alaska, navigable rivers and flat beaches were beneficial to travel, and open-water seasons tended to be longer. However, in the eastern Arctic suitable travel routes would have been much more variable, and for the initial Thule Inuit migrants, the unknown environment would have made travelling long distances much more difficult. Furthermore, in Alaska bowheads were hunted in the spring or fall, whereas in the eastern Arctic bowheads were hunted in the summer, posing a scheduling conflict with long-distance travel during the open-water season (Friesen 2012). However, these large boats would have allowed Thule Inuit to hunt bowheads, and easily travel and transport their prey shorter distances. Kayaks would have allowed for similar hunting excursions from a home base, as would dog sleds; and the use of dogs as pack animals would have been beneficial during the summer months.

Without the use of large boats and dog traction, Late Dorset would have travelled mostly by foot to exploit resources and to move seasonal home camps. As a result, Late Dorset would have had greater constraints, in comparison to Thule Inuit, on transporting meat and other animal resources over significant distances. Thus, the distance travelled from home camp to hunt and gather resources was likely often much shorter than that travelled by Thule Inuit. Historically, groups of northwestern Alaska also travelled by foot, although it was done less frequently and for much shorter distances than travel by boats or sleds (Burch 2006). Typically this was done for family hunting trips, and when small groups of men travelled to summer caribou-hunting grounds or to raid neighbouring nations (Burch 2006). Very little was taken when travelling this way, primarily just the basic equipment and provisions. Conceivably, foot travel was similar for Late Dorset people, who would have been forced to be more efficient without the use of dogs as pack animals.

5.4.2 Sea Mammal Hunting Practices

Marine animals formed the core of many past arctic economies. Hunting at sea took place throughout the year, as hunting strategies were adapted to the seasonally variable landscape. The physical environment and variable elements, including ice, water, wind, temperature, and fog, influenced the success and manner of a hunt, but ultimately, these practices and their success were reliant upon the collective knowledge of the hunters involved (see Wenzel 1991).

5.4.2.1 Open water hunting

Historically, Inuit hunted whales, walruses, and seals from *umiat* and kayaks; although large whales were largely hunted from *umiat* (Birket-Smith 1924; Burch 2006; Nelson 1900; Spencer 1959). Throwing harpoons, with detachable foreshafts, were perhaps the most important hunting technology used to hunt on the open water. When this type of harpoon struck an animal, the harpoon head was embedded in the animal's flesh and the harpoon head was fixed in the animal via pointed barbs or basal spurs, which caused it to toggle (Maxwell 1985; Park 2010). Both the harpoon head and the foreshaft would disengage from the shaft, but remain attached to the harpoon line with a cord, or, it was lashed to the shaft (Vanstone 1989). The detachable foreshaft disengages from the shaft upon impact with the animal, providing the flexibility needed if an animal struggled. A float, made from a bladder or a seal skin, was attached to the shaft and served as a drag to tire the animal and keep it from sinking so the hunter could get close enough to make the final blow (Nelson 1900).

In addition to the throwing harpoon, Alaskan hunters also used a harpoon known as a seal spear, or seal dart (Nelson 1900), in addition to bladder darts (Fitzhugh and Kaplan 1982; Murdoch 1892; Nelson 1900) to kill seals, and these were also used by Thule Inuit (see Ford 1959; Mathiassen 1927a; Morrison 1983a,c; Park 1989; Sabo and Jacobs 1980; Sabo 1980). Unlike the typical throwing harpoon, the seal spear did not incorporate float technology. These light weight spears had shafts made from a single piece of rounded wood, ranging from one to almost one and half metres. Feathers were often affixed to the butt end of the shaft, which was propelled with a throwing board (Nelson 1900:136-137), and it incorporated a non-toggling, barbed harpoon head. When the spear struck the animal it would detach from the shaft, which was tethered by a cord. As the animal retreated, the cord that wrapped around the shaft would unwind, and the shaft itself would serve as a float and drag. The hunter would then follow the floating shaft and retrieve their prey. If Late Dorset hunted seals from boats it is likely they used a similar technology that operated without floats, however dart-like harpoons have not been identified at Late Dorset sites thus far.

Bladder darts consist of a short shaft with a socket piece at the end, made from ivory or bone (Fitzhugh and Kaplan 1982; Holtved 1962; Murdoch 1892; Nelson 1900; Vebœk 2006). A barbed harpoon head fit into the socket and is attached to the shaft with a cord. A throwing board, in which the end of the dart hooks, was used to propel the dart. A bladder float, often made from seal intestine was attached to the shaft of the dart, and had the same function of the float used with the throwing harpoon (Fitzhugh and Kaplan 1982). The hunter would kill the animal using a braining stone, which is a stone attached to rope, to hit the animal in the head, or strike it with a lance. The bladder darts used by Inuit of Baffin Island and Foxe Basin were slightly different than those found in Alaska and Greenland. Their bladder darts were essentially smaller replicas of the throwing harpoons, with detachable foreshafts and toggling harpoon heads, with the addition of a bladder attached to the shaft (Boas 1888; Parry 1824). The bladder darts from Thule sites throughout the eastern Arctic and Alaska (Ford 1959; Mathiassen 1927a; Morrison 1983a; Park 1989; Sabo 1980), were similar to those found in Alaska and Greenland (Morrison 1983b), where they were likely employed in a similar manner.

Hunting from boats was especially dangerous when facing aggressive prey such as walrus, as well as bearded and hooded seals that are also known to attack boats. As a result, historically, hunting these animals tended to involve the cooperation of two or more hunters. In order to decrease risk, Inuit groups from northern Baffin Island would tie their kayaks together in order to avoid being capsized (Mary-Rousselière 1984). In northern Quebec, hunters would occasionally use their kayaks to drive walruses into shallow water where they would harpoon them (Saladin d'Anglure 1984). Unlike in the eastern Arctic, in Point Barrow, walrus were hunted from *umiat* (Murdoch 1892). From these boats, swimming walrus would be harpooned using a darting harpoon or a throwing harpoon, and chased until a fatal strike could be made. When hunting large sea mammals like walrus, large floats made of entire seal skins and float boards, a piece of wood that serves as a drag, were used to help impede the prey's movements (Nelson 1900). In northern Quebec, walruses were sometimes hunted where they rested on small rocky islands, in this case hunters would sneak up on their prey and harpoon them before they could escape into the water (Saladin d'Anglure 1984).

Similar to walrus hunting, hunting the large bowhead whale was also a cooperative endeavour, which required planning and preparation. In various north Alaskan communities, bowhead hunting involved formal whaling crews who would work together during the hunt. Each crew had a leader, the *umialik* (Sheehan 1985), and consisted of six to nine oarsman, in addition to the *umialik* and a harpooner (Burch 1981; Nelson 1969; Rainey 1947; Spencer 1959; Vanstone

1962); women would occasionally paddle if men were not available (Murdoch 1892:273). Bowhead hunts took place during the spring or fall. During the spring, when the sea ice was still stable, dog sleds could be used to haul the large skin boats over the ice to the water's edge. Once the hunt began, and a whale was spotted, the boat would get as close to the animal as possible so that the harpooner could strike (Murdoch 1892:274). Floats were used to drag the animal once it attempted to flee; if other boats were nearby they too would join in the hunt and help chase the animal until a fatal strike could be made. In northwest Alaska, hunting large whales using skin boats relies upon the presence of thick and stable shorefast ice, on which the animal can be pulled out of the water and butchered (Druckenmiller et al. 2010). Identifying this area would occur prior to the commencement of the hunt. Thus, when the struggle was over, the whale was towed to the water's edge and dragged onto the ice or beach where butchering would commence (Murdoch 1892:274).

In several regions, Thule Inuit, particularly Classic Thule Inuit, relied heavily on hunting bowhead whales, as indicated by the large number of bowhead bones found at their sites (see e.g., McCartney 1980; Savelle and McCartney 1988). However, unlike in Alaska, this hunt took place in the summer months. Thus, identifying coastal areas suitable for dragging the animal to shore, and butchering them, would have been essential. The analysis of bowhead skeletons from Thule Inuit sites throughout the Arctic Archipelago indicate they concentrated most of their effort on hunting younger, smaller whales, likely yearlings (Savelle and McCartney 1999). Measurements taken on the elements of bowhead bones from Thule Inuit sites indicate that on average hunters selected young whales measuring 8.5 m in length (McCartney 1995:85), which weighed up to 12,000 kg (Savelle and McCartney 1999). Savelle and McCartney (1999) have suggested this focus on yearlings resulted from the fact that they were less dangerous to hunt and easier to tow and butcher in comparison to older, larger individuals. In fact, using data from the western Arctic and Subarctic, McCartney (1995) has suggested that Inuit did not begin to regularly hunt larger adult whales until the late 19th century and the introduction of modern technologies, including bomb darts, guns, and block and tackle. A similar study investigating whale size preferences by ancient hunter-gatherer groups of the Chuckchi Peninsula also found that younger individuals, such as calves and juveniles, were selected over larger adults (Stoker and Krupnik 1993). Generally, Thule Inuit sites are largest in regions where bowhead were abundant and predictable (Savelle and McCartney 1994); as a result in these locations the caches used to store the whale meat and blubber occur in great number (Whitridge 1999a). Assuming these sites represent large populations, bowhead hunts could have been undertaken by members of a single community. In areas where bowheads were less predictable, and sites were smaller, it is suggested that several nearby communities would work together for the harvest (McGhee 1984b; Savelle 1987).

Historically, hunting smaller whales, such as beluga, in open water also tended to involve the cooperation of many hunters. In northern Quebec, the Mackenzie Delta region, and various locations in northern Alaska, beluga were hunted by organized groups of kayakers (Saladin d'Anglure 1984). When beluga were found in large pods they were often driven into shallow water where they were easily killed (Friesen 1999). The groups who inhabited the south central shores of the Choris Peninsula would also catch beluga in nets. Thule Inuit likely operated in a similar manner.

5.4.2.2 Hunting on the sea ice

Across the Arctic, the sea ice begins to form during fall. As the weather gets colder the sea ice extends and grows in thickness but in many regions is broken by frequent storms until January or February (Jeffries et al. 2012). Once open leads close and the sea ice is thick, a stable platform of ice forms and adult seals can be hunted through breathing holes (Smith et al. 1991).

During the winter, Central Arctic Inuit would often situate their settlements in locations suitable for hunting at breathing holes (Boas 1888; Wenzel 1991). Many Inuit groups used dogs to locate the breathing holes of seals on the sea ice. Once located, the hunter may wait for hours for the seal to return (Boas 1888), thus to be successful a great deal of effort and patience is required. Historically, thrusting harpoons with fixed foreshafts were used to capture seals at breathing holes (Birket-Smith 1929). Plugs were sometimes used to close the animal's wound. Central Arctic Inuit tended to make a hole under the animal's jaw through which a line was passed and used to drag the seal, and a toggle was used to prevent the line from slipping (Boas 1888:69-73). Once dragged onto the sled, the seal would be transported back to camp where it would be processed. Historically, individual hunters or small groups of two or three men would hunt this way. Generally, a ringed seal keeps open 6-12 breathing holes, therefore when hunting in groups it was most beneficial if hunters dispersed, to increase the chance of a successful hunt

(Boas 1888). Hunting the larger bearded seal was best done with the cooperation of more than one hunter. Since these animals do not tire as easily and the struggle could be quite severe, if caught by a lone hunter, the harpoon shaft would sometimes break or the hunter would be forced to let go of the harpoon (Stefansson 1914). These larger species tended to be butchered beside the breathing hole (Jenness 1922:113). Thule Inuit likely had similar practices, depending on the distance between the kill site and home camp. However, without the use of dog-sleds Late Dorset people may have also processed ringed seals near the kill site in order to reduce their load.

Typically, polar bears were hunted on the sea ice where the bears could be found hunting seals at lairs or breathing holes. Dogs were used to chase the bears and keep them from escaping so the hunter could take aim (Wenzel 1983). Historically, bears were hunted with the bow and arrow. Thule Inuit and Late Dorset would have also hunted bears on the sea ice. Killing these animals would have been more dangerous for Late Dorset, without the use of dogs and the bow and arrow, and likely involved the cooperation of two or more hunters so that one hunter could help corral or distract the animal while another made the kill. It is unclear, however, if Late Dorset actively hunted polar bears, or if they were only killed when they were encountered.

Similar to various Historic Inuit, in some regions, Late Dorset people would have been ideally positioned for hunting seals at their breathing holes since it is presumed they often spent the winter in snow houses on the sea ice (see Chapter 4; Fitzhugh 1980; McGhee 1976b). Without the use of dogs, Late Dorset hunters would have had to rely on alternative methods to locate breathing holes. These likely resembled those used by Inuit hunters of Arctic Bay who located lairs through several indicators, including: a depression in a snow drift, sunlight reflection off a snow drift that was particularly high, the presence of arctic fox urine or feces on a drift, disturbance in a snowdrift from a bear or fox, or a melted roof (Furgal et al. 2002). Although traditionally Inuit used their dogs to locate breathing holes, more recently, Inuit of Clyde River will hunt seals this way traveling by snowmobiles without the help of dogs (Wenzel 1991:85-87). Using a snowmobile, hunters would examine the terrain using visual cues to identify the presence of breathing holes. This method was most effective with the cooperation of many hunters, although it was also practiced alone or in pairs (Wenzel 1991). When smooth ice appeared, which was favorable for breathing holes, the hunters would crisscross the area in a somewhat random fashion until a breathing hole was found. Efforts are concentrated towards areas where ice fractures occur, where seals may create breathing holes more easily (Wenzel 1991:86). Late Dorset likely operated in a similar manner. Although the use of dogs would likely have shortened the time it took to locate breathing holes, in general, hunting this way would likely have been similar for Thule Inuit and Late Dorset.

In late spring, seals, and in some locations walrus, were commonly killed while basking on the sea ice. Hunters would creep across the ice and sneak up on their prey (Stefansson 1914), or they would pose as another seal until they were close enough to the animal to make their strike (Boas 1888:76). In some regions, women would also hunt seals on the sea ice, often using small clubs to strike the seal on the nose (Rae 1850:170). Using this method hunters would catch several seals a day, occasionally between 10-15, this was much more profitable than the one or two seals typically killed during a day at breathing holes (Boas 1888). Although ringed seals of all ages would haul out on the ice, immature and juvenile seals were less wary than adult seals, and therefore more easily killed.

In northern Quebec, Inuit hunted walrus on ice floes working in groups of three or four hunters in order to prevent a wounded animal from escaping, and from potentially dragging a hunter under the water (Fay et al. 1994:369; Saladin d'Anglure 1984:489). Along the coast of the Melville Peninsula, walrus were hunted on the moving ice packs, where they abounded in the spring (Parry 1824). This region is known for its particular ice conditions where ocean currents and winds would bring the floating ice, which were host to large numbers of walrus, close to the landfast ice where hunters would make their kills (Aporta 2010). This way of hunting was highly dependent upon knowledge of sea ice movements, for when the currents changed the ice packs would drift back out to sea, potentially bringing a hunter with them (Aporta 2010). Thule Inuit, and likely Late Dorset, would have also hunted seals and walrus in a similar manner.

5.4.2.3 Hunting at the ice edge

For most of the year, seals could be taken at the ice edge, and in some regions, so could walrus and small whales . In the case of seals, the hunter would strike the animal with a harpoon and hold the harpoon line until the animal tired and could be dragged on the ice and killed. In northern Alaska, hunters would frequently build blinds of snow or ice, so they would be hidden from the seal (Nelson 1969). When a seal was spotted the hunter would move to the edge of the ice floe and harpoon the seal, and then run further back on the ice dragging the seal ashore, where the hunter would kill it with a club (Nelson 1969).

Hunting at the ice edge could be very dangerous, especially when larger seals or walruses were the targets. For instance, when an animal is harpooned from the ice edge, the harpoon line, often held by the hunter, directly ties him to the animal. If this line became entangled with the hunter, and the animal struggled and dove, there was danger of the hunter being dragged into the ocean to his death (see Jenness 1922:113). In the central Arctic, hunting walruses at the ice edge typically involved the cooperation of at least two hunters. One hunter would strike the animal and then both hunters would hold the harpoon line. When the rope was nearly run out, the end of the spear shaft would be passed through the loop at the end of the line and then fixed into the ice, creating strong leverage (Gilder 1881). When the animal tired, or was struck again and killed, several hunters would work together dragging it onto the ice (Boas 1907: 479).

Thule Inuit and Late Dorset would have been equally equipped to hunt animals at the ice edge, with the use of harpoons. The analyses of Late Dorset archaeofaunas suggest Late Dorset hunted seals and walrus at the ice edge in various arctic regions (Cox and Spiess 1980; Murray 1996; Murray 1999b).

5.4.3 Hunting Large Terrestrial Mammals

With few exceptions, caribou are by far the most important terrestrial mammal for Arctic hunters of the past and present. The hunting strategies used to capture caribou were largely dependent upon the animal's biological cycle (for further discussion see Chapter 3, section 3.3.2). During the fall, the animal's meat and fat content are at their highest, and their skins are in ideal condition for making clothing (Balikci 1970). Generally, it is also when caribou form large herds, as they make their southern migration. During these large migrations, communal effort and the use of drive systems was the most productive hunting method (Blehr 1990). These drives were composed of lines formed by individual *inuksuit*, and were used to direct the caribou towards hunters waiting in *taluit* (Jenness 1922). Ethnographic descriptions suggest women and children would take part in the hunt, and imitate animal calls from afar in order to help scare the animals towards the hunters (see Jenness 1922; Balikci 1970). From the *taluit*, hunters would shoot the animals with their bows and arrows. Commonly, although this was not the predominant method at Iqaluktuuq (Brink 2005; Friesen 2013a), drives were used to direct the caribou into lakes or rivers where hunters would spear them from kayaks (Balikci 1970; Birket-Smith 1929; Blehr 1990; Boas 1888; Gordon 1990; Spiess 1979). At other times of the year, stalking caribou was more common (Balikci 1970). Hunting this way could be very efficient, however this was ultimately dependent upon the skill of the hunter. On Victoria Island, Stefansson (1914) recorded hunters hitting their prey from over 75 metres away. Describing hunters from the Central Arctic, Parry (1824) states that they generally hit their target within 40 or 45 metres. However, Jenness (1922:146) notes that amongst the Copper Inuit he visited during the summer of 1915, marksmanship was quite poor, with few hunters being able to hit their target especially if it was moving.

Thule Inuit would have hunted caribou in a similar manner to historic Inuit. Recently, Friesen (2013a) has compared Inuit and Dorset caribou drive systems. He posits that the differences in their construction (see section 5.3.3) are primarily the result of technological differences between these groups, specifically, the use of the bow and arrow by Inuit. Because Dorset did not use the bow and arrow but instead used lances, they needed to be in closer proximity to their prey to make a kill. Thus, the narrow gaps in the Dorset drive systems would force the animals closer to the hunters who would throw their lances from behind the *taluit*, or leap out and thrust the spear directly into the animal (Friesen 2013a). Technological differences, as well as caribou behaviour, also contributed to additional differences between the Dorset and Inuit drive systems, and also affected how they were used (Friesen 2013a). The main differences in the construction of the drives include the continuous low walls of the Dorset drives versus the individual *inuksuit* associated with the Inuit drives, the V-shape of the Dorset drives versus the straight lines of the Inuit drives, and the more robust *taluit* associated with the Dorset drives. Friesen (2013a) suggests that when using the Inuit type drive, caribou were kept moving along the *inuksuit* at a quick pace, encouraged by women or children but not enough to cause panic. The rows of individual *inuksuit* would have kept the animals from veering away from the hunters. When the animals reached the large gap the hunters would make their kills using their bows and arrows. The Dorset drive system initially functioned similarly, however in order to force the caribou through a narrow gap the animals would have to be panicked. Thus, the continuous stone walls, which may have been elaborated with sods, lines, and poles (Fitzhugh 1981), would discourage caribou from crossing them while they were in full flight, and kept them moving towards the hunters. Furthermore, the deeper *taluit* of the Dorset drives would have served to conceal the hunters when caribou were close (Friesen 2013a).

Jenness (1922:150) notes that the Inuit of southern Victoria Island also hunted muskoxen using drive systems, although he never witnessed them himself. Unlike caribou, muskoxen do not flee when threatened, and when charged they will form a defensive ring. Relative to caribou this makes them an easier target. Dogs were an important part of hunting muskoxen and would charge and encircle the animals, keeping them in their formation until they could be shot with arrows (Steensby 1917).

In general, the use of the bow and arrow, and dogs, afforded Thule Inuit several advantages when hunting on land. The use of the bow and arrow would have allowed them to keep some distance from their prey, unlike Late Dorset who would have had to be in close proximity to an animal to make a kill. Similar to hunting polar bear on the sea ice, this likely made hunting on land more dangerous for Late Dorset, especially when hunting male caribou during their rut when they are known to attack (Henshaw 1970). For Thule Inuit, dogs would have provided some protection when hunting and likely made single person hunting easier, since dogs could be used to help corral prey. These factors may have encouraged Late Dorset people to stalk caribou and hunt muskoxen in pairs, which was perhaps safer and more successful.

5.4.4 Hunting small game and fishing

Historically, Inuit killed hares and fox with snares, traps, nets, and the bow and arrow (Parry 1824; Rink 1877; Stefansson 1914). During the 20th century, fox trapping became an important economic activity for Inuit, and steel leg-hold traps were most common (Stenton 1989). Ethnographic accounts include descriptions of several types of fox traps being used, including ice deadfalls, boulder traps, and box traps (Spencer 1959). Hunting these animals would have been similar for Thule Inuit, and although Late Dorset did not capture small game with the bow and arrow, they may have also captured fox using snares or traps.

At sea, Inuit hunted birds during the summer, including ducks, geese, murres, and other sea birds during their molt, using bird spears/darts and throwing boards, and nets. Boas (1888:87) has described bird spears as approximately one metre in length and flattened at the piercing end. Baffinland Inuit used an iron prong as their point, whereas Inuit from Igloolik used spears with two points of unequal length and double barbs (Boas 1888:87). A throwing board was used to throw the spear (Boas 1888). Inuit used variations of this type of spear across the Arctic. Darts were also commonly used to hunt ducks or geese on the water, particularly during their molt (Murdoch 1982). On land, nets, nooses, the bow and arrow, hooks, and bolas were used to capture birds. The practice varied depending on the season and the target species. During the spring, in Point Barrow, hunters would use decoys and small snares constructed of sinew to catch ptarmigan, and once they begin to migrate at the beginning of winter they were often captured by two or three hunters using large fishing nets (Nelson 1900). These hunters would also use barbs or hooks to hunt gulls. Gorges were made of antler or bone, and were inserted into fish, which were then placed floating in the water. Attached to these gorges was a long cord, so when a gull ate the fish it would be caught (Nelson 1900:133). In northwest Greenland, near large sea bird colonies, little auks were easily captured using baleen nets on long handles (Kane 1877). Generally, duck hunting was most frequent in spring, when they first appear in the Arctic after their winter hiatus; and, men, women, and children would hunt these birds using bolas (Murdoch 1892:277). The bow and special blunt arrows for small fowl were also commonly used (Stenton 1989).

With similar technologies, Thule Inuit likely captured birds in a similar manner, depending on the local resource structure. However, without the specialized equipment to hunt birds, it is likely Late Dorset focused their attention towards capturing birds during their molt, when it would be more difficult for them to escape (Maxwell 1985).

During the spring or early summer, Inuit would fish for Polar or Greenlandic cod (Damas 1969; Jenness 1922; Brice Bennett1976). In the central Arctic, holes were dug in the sea ice in locations known to be good fishing areas, and large barbless hooks with bone sinkers were used to jig for cod (Boas 1888:86). The fishing line was constructed of braided sinew attached to a piece of curved antler (Boas 1999:86). All community members practiced cod fishing, and Boas (1888:86) notes that it was common for boys to jig for cod near camp. During late summer/early fall when char run upriver, Inuit groups would often construct stone weirs to form a sort of dam across rivers (see Brice-Bennet 1976; Mathiassen 1928b). Using leisters, hunters would spear the trapped fish. Along the Mackenzie River and in northern Alaska, fishnets were frequently used. However, the Copper Inuit of Victoria Island did not use nets, instead they used spears and weirs during the late summer char runs, and fished from kayaks with rods during the summer (Jenness 1922:152-156). During the winter, families would often fish on lakes and ponds through ice cracks, or holes, using the hook and line (Jenness 1922:152-153). Lines were kept jigging in order to snare the large trout or char who would otherwise eat the bait and escape. Four to five holes would be dug per day, since they usually became exhausted after an hour when the fish would become cautious (Jenness 1922:154).

Fishing for char and trout in rivers during the char runs would have been similar for both Thule Inuit and Late Dorset people, using weirs and fish spears. Similar to historic Inuit groups, Thule Inuit would have also been able to jig for cod at sea, and capture char and trout on the rivers and lakes throughout the year, using hooks and lures and line and rod (Maxwell 1985). Although small fishing harpoon heads have been identified on Early and Middle Dorset sites, their absence on Late Dorset sites suggests they likely focused their fishing activity on the large char runs that took place in late fall, and possibly during the smaller runs that occur during the spring (Friesen pers. com.).

5.4.5 Summarizing Late Dorset and Thule Inuit Hunting practices

The differences between Late Dorset and Thule Inuit hunting technologies were both directly and indirectly related to various social factors that characterized their respective hunting practices. First, differences in transportation technologies greatly impacted mobility and the size of each group’s catchment area. For instance, boats and dog-traction would have allowed Thule Inuit to travel further from home camp to target resources, whereas Late Dorset likely did not venture as far, but instead spent their time targeting the locally available fauna. Second, differences in open-water hunting technologies likely resulted in differences in the scheduling of hunting practices. Assuming Late Dorset did not frequently hunt in open water, during the summer months they would have been forced to spend most of their time hunting caribou (Damkjar 2005), and perhaps muskox, fox and hare. Although some variability is expected, in the summer months, in areas where bowhead occurred, Thule Inuit likely directed their attention towards hunting on the open water capturing walruses, seals, birds, and fish, in addition to whales. And, third, the absence of the bow and arrow and dogs likely created differences in everyday hunting practices. For instance, hunting with spears required Late Dorset to be in much closer proximity to their prey in order to make a fatal blow, in comparison to Thule Inuit using the bow and arrow, who could shoot their prey at some distance. Thule Inuit would have also had the help of dogs, who could corral animals and provide protection. Thus, to mitigate the danger of a hunt, and to increase success, Late Dorset likely hunted in pairs or small groups, spending less time hunting individually.

5.6 Conclusions

Using ethnographic information, this chapter has described the hunting practices that may have been used by Late Dorset and Thule Inuit hunters. The disparate Late Dorset and Thule Inuit technologies would have resulted in several differences in hunting activities. These differences include how and when animals were captured, and perhaps the number of prey able to be caught at one time. The following chapter uses these differences, as well as animal behaviour that was outlined in Chapter 3, to predict the zoological correlates for these activities.

Chapter 6

Zooarchaeological Expectations

6.1 Introduction

Late Dorset and Thule Inuit hunting technologies and associated practices described in the previous chapter and the behaviour of prey species outlined in Chapter 3 provide the potential for a more nuanced understanding of the interrelationships among hunting technologies, strategies, prey choice, prey demography, and the distribution of skeletal elements on archaeological sites. In this chapter, these factors are used to formulate twelve zooarchaeological expectations, which are also informed by previous research demonstrating relationships between hunting technologies, techniques, and archaeofaunas (outlined in Chapter 2, section 2.3). Seasonality is a key variable relating to these expectations, since animals exhibit seasonally distinctive behaviour, and because physiographic features vary throughout the year (e.g., the absence of snow and sea ice during the summer); and, thus it is included within each of the scenarios discussed below. Resources are ranked based on the number of calories used in their pursuit and processing and how many calories they provide (Bettinger 1991). Following Jochim (1972, 1976), high-ranked prey is determined by a resource's weight, density, aggregation size, mobility, fat content, and non-food yields.

The archaeofaunas analyzed from each of the three study regions (see Chapters 7-9) are used to test these expectations and the results will be presented in Chapter 10. If the analyzed data demonstrate the expected patterns then it follows that Late Dorset and Thule Inuit technological differences were important enough to impact archaeofaunas in significant and predictable ways. Human-animal interactions would therefore be considered heavily influenced by technology. If the results do not match the expectations, it would suggest factors other than technology, including taphonomy, seasonality, social organization, or, worldview were influencing factors; and these factors will be further investigated in Chapter 10. While variation in local ecology undoubtedly impacted the hunting strategies of both Late Dorset and Thule Inuit society in each region, how these differences manifest in the zooarchaeological record will be carefully evaluated. If none of the expectations are met, with few discrepancies between Late Dorset and

Thule Inuit archaeofaunas in a study region, it would suggest that ecology largely shaped human-animal interactions within Late Dorset and Thule Inuit societies.

6.2 Expectations

Technological Factor A: Thule Inuit used dog traction; Late Dorset did not.

Behavioural Implications: For most of the year, dog sleds would have allowed Thule Inuit to carry heavier loads in comparison to Late Dorset who are assumed to have travelled primarily by foot, pushing or pulling their sleds (e.g., Maxwell 1985). Dog sleds would have also allowed for quick movement across the land, allowing Thule Inuit to more easily hunt animals a greater distance from their sites, including species that are not locally abundant or available, and easily transport them back to camp. Because of the lack of dog traction and the greater difficulty of traveling by foot, Late Dorset likely exploited local resources more intensely before moving to a new campsite (Darwent 2001). How easily prey is transported has also been shown to influence whether or not animal parts are left at the kill site or not (see O'Connell et al.1990). Research has shown that when transport costs are eased, for instance by using boats, carcasses are generally brought back to sites whole (Ames 2002). Assuming dog-pulled sleds similarly eased transport costs for Thule Inuit, largely complete carcasses were likely frequently transported back to the campsite. In comparison, when hunting similar sized prey without the use of dog traction, Late Dorset would have had higher transport costs. Therefore, for Late Dorset primary butchery likely more frequently occurred at the kill site where elements of low food utility were left for ease of transportation (e.g., Binford 1978; Metcalfe and Jones 1988).

Zooarchaeological Correlate #1 At Late Dorset campsites high food utility elements are expected to be most abundant. Thule Inuit contexts should feature high and low utility elements in more equal ratios.

Zooarchaeological Correlate #2 Late Dorset archaeofaunas should reflect lower frequencies of species not abundant or available in the local environment, which is here considered to be the 20 km radius surrounding each study site; in comparison, the Thule Inuit archaeofaunas should have larger proportions of species not available or abundant in the local environment.

Technological Factor B: Thule Inuit used harpoon float technology, detachable harpoon foreshafts, and boats, but Late Dorset lacked float technology, detachable foreshafts are uncommon, and evidence of boat use is rare.

Behavioural Implications: Both Late Dorset and Thule Inuit are believed to have hunted ringed seals at breathing holes and at the ice edge (e.g., Maxwell 1985; McGhee 1996). Thule Inuit also hunted seals in open water. The absence of float technology, the uncommon recovery of detachable harpoon foreshafts, and the lack of frequent evidence for boat use at Late Dorset sites, however, suggests that hunting seals in open water was rare (Damkjar 2005; Maxwell 1985), if it occurred at all. As a result, Late Dorset would have been forced to primarily acquire seals on the sea ice or at the ice edge, during winter or spring. In contrast, Thule Inuit would have been able to acquire seals year-round. Because seal hunting would have been seasonally restricted for Late Dorset, spring hunting was likely particularly important since animals are more easily hunted as they bask on the ice in the spring in comparison to the more time-consuming breathing-hole sealing practiced throughout the winter (see Boas 1888:76). Thus, Late Dorset likely captured a higher frequency of young seals, since ringed seals give birth to pups in the spring that are much less wary than adult seals and are more easily captured, particularly in their early weeks (see Boas 1888). Although spring seal hunting would have also been important for Thule Inuit, they were not constrained to the sea ice or ice edge like Late Dorset, but instead were able to take seals throughout the year, at breathing holes, on the sea ice, and in open water, which likely allowed them to acquire higher frequencies of seals and focus on hunting adult seals, which have higher blubber and meat content.

Zooarchaeological Correlate #3 The Late Dorset faunal assemblages are expected to have a lower proportion of seals in comparison to the Thule Inuit assemblages.

Zooarchaeological Correlate #4 Because the spring hunt was particularly important to Late Dorset, a higher frequency of seal yearlings is expected in the Late Dorset faunal assemblages. Adult specimens, however, should be more frequent in the Thule Inuit archaeofaunas.

Technological Factor C: Thule Inuit used whale-hunting technologies (e.g., *umiaks*, large harpoon heads), however Late Dorset did not.

Behavioural Implications: A lack of whale hunting technologies at Late Dorset sites suggests they did not hunt whales. At locales where whales were prominent, Thule Inuit likely directed most of their time towards preparing for the whale hunt (Whitridge 2001), and participating in the whale hunt during August and September when bowhead are generally available in the central and High Arctic (Moore and Reeves 1993). During these months, little time was devoted to hunting other species (see Whitridge 2001). This would have caused a drastic difference in resource scheduling between Thule Inuit and Late Dorset. In this instance, preparations for the whale hunt would have overlapped with the spring seal hunt on the sea ice, and the hunt itself would have conflicted with the large upstream char run (Whitridge 2001). Therefore, Thule Inuit would have focused their efforts on few species other than whales. Conversely, capturing non-whale species was essential for Late Dorset, since they did not have the technologies to hunt large whales; and, their economy would have been more generalized, and a greater variety of species were likely actively targeted.

Zooarchaeological Correlate #5 Whalebones are expected to be rare on Late Dorset sites. At Thule Inuit sites, especially in coastal locations, whale elements should be frequent.

Zooarchaeological Correlate #6 In locations where bowhead hunting was prominent, Thule Inuit archaeofaunas are expected to have lower taxonomic richness, and a less even distribution of species. Late Dorset archaeofaunas should have a higher taxonomic richness, and higher frequencies of non-focal species, resulting in a more generalized economy or a more even distribution of animal species.

Technological Factor D: Thule Inuit used the bow and arrow, but Late Dorset used spears and lances to hunt caribou.

Behavioural Implications: Since lances are not as effective as the bow and arrow (Maxwell 1985:138; Reeves 1990; Spiess 1979), Thule Inuit are expected to have had a higher success rate when hunting caribou. Using lances, Late Dorset would have been more reliant upon physiographic features that aid in the capture of an animal (see Chatters 1993), and success would be limited to specific circumstances; thus they likely acquired lower frequencies of caribou. The presence and absence of bow and arrow technology also likely affected the sex and age ratios of prey species, particularly caribou. Sex or age selection is expected to be less of an option for Late Dorset using the lance than for Thule Inuit using the bow and arrow (Maxwell 1985; Spiess 1979). With the lance, it would be more difficult to target individuals of specific age and sex since animals were likely taken as they were encountered. Slower, and perhaps smaller, young caribou, however, are less wary and more easily caught in comparison to adults (Spiess 1979), thus they were likely captured frequently my Late Dorset. Using the bow and arrow, Thule Inuit had the ability to more easily focus on capturing specific animals, likely adult males that, for most of the year, yield the highest meat return and a large amount of non-food utility resources (see Spiess 1979).

Zooarchaeological Correlate #7 Higher proportions of caribou are expected to be found in the Thule Inuit archaeofaunas in comparison to the Late Dorset archaeofaunas.

Zooarchaeological Correlate #8 Late Dorset archaeofaunas are expected to more evenly include males and females and higher frequencies of young individuals. Thule Inuit archaeofaunas should exhibit caribou age and sex profiles reflecting a higher frequency of adult males.

Technological Factor E: Though both Thule Inuit and Late Dorset likely used weirs to capture fish, fishing technologies used by Thule Inuit were generally more specialized, and include *kakivaks* (fish spears), fish lures, hooks, and occasionally small harpoon heads; however Late Dorset people primarily used fish spears and possibly small harpoon heads.

Behavioural Implications: The *kakivaks* used by Thule Inuit are considered to be more efficient then Late Dorset fish spears or harpoon heads (Maxwell 1985), suggesting their fish harvests were more productive than those of Late Dorset. Due to resource-scheduling conflicts, however, this would likely only apply in regions where Thule Inuit were not hunting bowheads or other higher-ranked resources during optimal fishing seasons (see Whitridge 2001). Also, since the use of lures, hooks, and line would allow access to fish throughout the year (e.g., ice fishing), Thule Inuit likely captured a greater variety of species. The use of fish spears and possibly fishing harpoons by Late Dorset likely decreased the efficiency of fishing when large fish runs were not occurring, and therefore fishing activities were likely focused on anadromous species, such as char, that are plentiful at predictable times of the year.

Zooarchaeological Correlate #9 In locations where whales were not prominent and therefore whaling activities did not overlap with large fish runs, Thule Inuit archaeofaunas are expected to yield higher frequencies of fish in comparison to Late Dorset archaeofaunas (Maxwell 1985).

Zooarchaeological Correlate #10 Thule Inuit archaeofaunas are expected to have a greater richness of fish species in comparison to Late Dorset.

Technological Factor F: Thule Inuit used specialized bird hunting equipment, including bolas, hooked sticks, and bird spears, that are not found on Late Dorset sites.

Behavioural Implications: The specialized bird-hunting technologies used by Thule Inuit, and the absence of these technologies at Late Dorset sites, suggest Thule Inuit could more easily capture higher numbers of birds than Late Dorset. Thule Inuit, however, would have spent most of their time hunting high-ranked prey such as whale, seals, and caribou; therefore, hunting lower ranked prey like bird would not yield a large enough return to be worth the effort unless many were taken at once (see Munro 2007). In the eastern Arctic, birds are generally not found in high densities throughout the year, and are most abundant during the spring and summer when migrants return from the south. Thus, while Thule Inuit likely captured birds throughout the year, they perhaps primarily targeted birds during the spring and summer when they are most prevalent and many could be taken at once providing a greater return for their effort. Late Dorset would have also hunted birds throughout the year; however without specialized equipment their largest harvest of birds was likely of ducks and geese during their molt when they are easily captured (Maxwell 1985). The specialized technologies used by Thule Inuit would have also made them better equipped to capture a variety of bird species, in comparison to Late Dorset.

Zooarchaeological Correlate #11 When archaeofaunas represent spring and summer occupations, Thule Inuit assemblages are expected to have a higher proportion of bird remains in comparison to the Late Dorset assemblages that are expected to exhibit a lower proportion of bird remains.

Zooarchaeological Correlate #12 Thule Inuit archaefaunas are expected to have a greater richness of bird species in comparison to Late Dorset.

6.2 Summary

To summarize, the major expected differences between Late Dorset and Thule Inuit archaeofaunas are related to the Thule Inuit use of boats, the dog-pulled sled, the bow and arrow, harpoon float technologies, the throwing harpoon, whale hunting technologies, fish technology, and bird hunting technology (Table 6.1).

Table 6.1 The predicted zooarchaeological correlates of Late Dorset and Thule Inuit disparate hunting technologies.

Expectation	Late Dorset	Thule Inuit
1	Primarily high-food utility elements found at campsite	More equal ratio of high and low-food utility elements found at campsite
2	Lower frequencies of species not available or not abundant locally	Higher frequencies of species found outside the local area
3	Lower frequencies of seals	Higher frequencies of seals
4	Ringed seal age at death profiles to include higher frequencies of yearlings	Ringed seal age at death profiles primarily focused on adults
5	Lower frequencies of whale bones	Higher frequencies of whale bones
6	Higher species richness, where whales are abundant	Lower species richness, where whales are abundant
7	Lower frequencies of caribou	Higher frequencies of caribou
8	Caribou sex and age at death profiles to reflect a more equal distribution of males and females, and higher frequencies of immature individuals	Caribou sex and age at death profiles demonstrate selection of adult males
9	Lower frequencies of fish bones, where whales are not abundant	Higher frequencies of fish bones, where whales are not abundant
10	Lower richness of fish species	Greater richness of fish species
11	Lower frequencies of bird bones	Higher frequencies of bird bones
12	Lower richness of bird species	Greater richness of bird species

Chapter 7

Iqaluktuuq, Victoria Island-The Bell Site

7.1 Introduction

The archaeofaunas analyzed from Iqaluktuuq, southeastern Victoria Island (Figure 7.1), were excavated from the Late Dorset and Thule Inuit occupations at the Bell Site (NiNg-2). Iqaluktuuq is the most western and southern of the three study regions, and is a rare context in which both Late Dorset and Thule Inuit relied primarily on caribou and arctic char, as opposed to marine mammals. This chapter is divided into four sections: first, a detailed description of the region's physical environment and ecosystem are presented; second, the history of archaeological research at Iqaluktuuq is discussed; third, the organization of the Bell site, the relevant Late Dorset and Thule Inuit archaeological features and corresponding archaeofaunas are presented consecutively; and fourth, the results of the zooarchaeological analyses of the Late Dorset and Thule Inuit archaeofaunas are compared.

Figure 7.1 Map of Iqaluktuuq, southeastern Victoria Island, Nunavut.

7.2 The Physical Environment and Ecology of Iqaluktuuq

Iqaluktuuq, which means 'place of many char', is located on the southeastern coast of Victoria Island approximately 50 km northwest of the community of Cambridge Bay. The area spans a 3 km length along the Ekalluk River that connects Ferguson Lake to Wellington Bay. The topography is relatively flat, yet eskers, moraines, and drumlins do occur (DFO 2004). Iqaluktuuq is part of the Victoria Lowland that forms part of the Western Arctic Lowlands (Bostock 1970; Kristofferson 2002). This physiographic region is mantled with drumlinoid ridges that are composed of unconsolidated glacial till of quartz and quartzite that is underlain by limestone, dolomite, and sandstone (DFO 2004; Dyke 2004; Fyles 1963). Various ponds and lakes are found throughout the area (Bostock 1970). At Iqaluktuuq, the Middle and Low Arctic vegetation zones meet. (Tedrow 1977). The Middle Arctic zone is considered a transitional zone between the High Arctic polar desert and the Low Arctic tundra, where plant diversity begins to increase and vegetation cover is nearly continuous (Gajewski 2012). Today, Iqaluktuuq is vegetated predominantly by sedges, grasses, and lichens (Porinchu et al. 2009).

The region is characterized by a Low Arctic climate. Between 1971 and 2000 the average July temperature was 8.4° C, the winter mean was -28.5° C, and the annual precipitation varied between 100 and 200 mm (Environment Canada). According to The Atlas of Canada (n.d) and Canadian Ice Services (n.d.), between 1971 and 2000 Wellington Bay was frozen for approximately nine months of the year. Ice breakup generally begins sometime during early or mid-July and sea ice disappears by the end of July (Riewe 1992). The sea remains ice-free until mid-October when the ice begins to form again, and by late October the sea ice is stable and reaches its full extent. In this part of Victoria Island, the sun does not rise for 42 days of the year and for an equal duration the sun does not set.

Marine mammal resources are infrequent in Wellington Bay, and historically Inuit have favoured the Cambridge Bay location for hunting seals since the ice conditions provide better access by boat and for hunting on the sea ice (Taylor 1972). However, both ringed (*Pusa hispida*) and bearded seals (*Erignathus barbatus*) do inhabit Wellington Bay

(Riewe 1992). Walrus (*Odobenus rosmarus*) and large whales are not found in Wellington Bay, and beluga whales (*Delphinapterus leucas*) are rare (Banfield 1974).

Although polar bears (*Ursus maritimus*) are a terrestrial species, they spend most of their life in the marine environment. Iqaluktuuq is outside the typical range of polar bears, however, a solitary polar bear was sighted at Ferguson Lake in 1978, suggesting they sometimes visited the area, albeit rarely (Riewe 1992). While not a native species to Victoria Island, grizzly bears (*Ursus arctos horribilis*) are now frequent visitors since they have begun to move northward from the mainland (Doupe et al. 2007), and have recently been observed at Iqaluktuuq (Friesen pers. comm.).

Additional terrestrial and freshwater resources are seasonally abundant at Iqaluktuuq. The Ekalluk River supports a large arctic char (*Salvelinus alpinus*) population and has been the home to a large commercial char fishery intermittently since 1962 (Barlishen and Webber 1973). An arctic char run occurs in the spring at Ekalluk, when the fish leave the lake and river to enter the ocean, however the more important run occurs in late August, when the fish return to the freshwater ecosystem (DFO 2004). Lake trout (*Salvelinus namaycush*) are present year-round in lakes and streams (Pielou 1994), and white fish (*Coregonus clupeaformis*) and sculpin (Cottidae sp.), while not as abundant, are also occasionally taken (e.g., Norman and Friesen 2010).

The caribou population that moves through Iqaluktuuq is the Dolphin and Union caribou herd (*Rangifer tarandus groenlandicus x pearyi*), a sub-population of the barren-land caribou, and the larger of the two caribou herds found on Victoria Island (COSEWIC 2004a; Gunn and Fournier 1996; Manning 1960). This herd migrates through Iqaluktuuq twice a year. In the spring, they move northward from the mainland for summer foraging grounds on Victoria Island, where cows generally give birth to calves during mid-June (Nishi 2000). The second migration occurs during the fall when they return south, however, stragglers can be found crossing the area throughout the year (Jakimchuk and Carruthers 1980; Jenness 1922; Kelsall 1968). This herd crosses to the mainland at various points along the southern coast of Victoria Island, depending upon the sea-ice conditions (Poole et al. 2010). As many as 100,000 caribou are estimated to have summered on Victoria Island prior to the 1920's when the population crashed (Manning 1960).

The second, and much smaller, herd on Victoria Island is the Minto Inlet caribou herd, which includes approximately 3500 individuals (Gunn and Fournier 2000). This herd is comprised of the genetically distinct Peary caribou (*Rangifer tarandus pearyi*) (Manning 1960). These caribou are smaller in size than those belonging to the Dolphin and Union herd, and have a lighter-colour pelage. The Minto Inlet herd is generally restricted to the northwest portion of the Island and does not make the seasonal migrations south that are made by the Dolphin and Union herd. Although the Dolphin and Union caribou have been recorded in the Minto Inlet territory (Gunn 2005), it is not clear whether or not these two herds intermix. The caribou in both herds have light grey antler velvet and although they differ in size they both have similar body and skull proportions, distinguishing them from the barren-ground caribou herds (*Rangifer tarandus groenlandicus*) on the mainland (Manning 1960).

During the early 20th century the commercial muskox fur trade led to the extermination of muskox (*Ovibos moschatus*) on this part of the island, forcing hunters to northern Victoria Island to obtain their quota (Barr 1991). After the decline of the industry, muskox populations recolonized southeastern Victoria Island where today their populations are increasing (Barr 1991; Dumond 2006; Jingfors 1984). Muskoxen can be found near Iqaluktuuq year-round in small groups, numbering from 2-34 individuals (Jingfors 1984). However, during July and August group size is smaller, averaging seven individuals, and lone males are more frequent (Jingfors 1984:12).

Additional terrestrial resources found in the area include arctic wolf (*Canis lupus*), arctic fox (*Alopex lagopus*), arctic hare (*Lepus arcticus*), and wolverine (*Gulo gulo*). Small mammals including arctic ground squirrels (*Spermophilus parryii*), lemmings (Dicrostonyx sp.), and ermine (*Mustela erminea*) are also found but appear to have contributed very little, if at all, to traditional subsistence economies.

Although the large number or diversity of bird species known from some other eastern Arctic regions are not found at Iqaluktuuq, there are several species of geese (e.g., Canada geese, *Branta canadensis*, snow geese, *Chen caerulescens*), duck (e.g., Common eider, *Somateria mollissima*, king eider, *Somateria spectablilis*, and long-tailed duck, *Clangula hyemelis*), and gulls (e.g., glaucous gull, *Larus hyperboreus*, and Thayer's gull, *Larus thayeri*), that visit the region between May and August (Parmalee et al. 1967). Other avian visitors include sandhill cranes (*Grus canadensis canadensis*), arctic loons (*Gavia arctica*), and various jaeger species (pomarine, *Stercorarius pomarinus*, parasitic, *S. parasiticus*, and long-tailed, *S. longicaudus*). Year-round residents include common ravens (*Corvus corax*), and both willow (*Lagopus lagopus*) and rock ptarmigan (*Lagopus mutus*) (Parmalee et al. 1967).

7.3 The History of Archaeological Research at Iqaluktuuq

Southern Victoria Island remained relatively isolated from European contact until the early twentieth century. From 1913-1916, Diamond Jenness travelled the area extensively, conducting ethnographic research with the Copper Inuit who inhabited the Southern region of Victoria Island (Jenness 1922). He did not visit Iqaluktuuq himself, however locals informed him of Iqaluktuuq's abundant animal resources. In 1917, Vilhjalmur Stefansson, an explorer and ethnologist, and Dr. Rudolph Anderson, an American zoologist, explored the area recording details of Inuit life and surveying the natural environment (Stefansson 1914). Southern Victoria Island was also explored during the Fifth Thule Expedition in 1921, led by the Danish-Greenlandic explorer and ethnographer Knud Rasmussen (Rasmussen 1930). However, no first hand accounts of life at Iqaluktuuq were recorded.

William E. Taylor was the first to undertake archaeological investigations at Iqaluktuuq in 1963, when he surveyed the area and conducted excavations (Taylor 1967, 1972). Diamond Jenness referred Taylor to the region, as he took the area's rich resource base to suggest a high potential for archaeology (Taylor 1972). Furthermore, Dr. J. Keith Fraser of the Geographical Branch, Department of Mines and Technical Surveys, reported at least two house ruins in the area (Taylor 1972). The 1963 surveys by Taylor and a small crew confirmed the presence of archaeological sites at Iqaluktuuq, including the remains of Thule, Dorset, and Pre-Dorset occupations. During this field season, small-scale excavations were focused on three sites: Bell, Buchanan, and Ballantine. Taylor and a crew returned to Iqaluktuuq and the surrounding area in 1965 and 1988, where they undertook further excavations and identified several new sites (Taylor 1967, 1988). During these field seasons, Taylor identified a dense collection of substantial archaeological sites, a total of 28 along the three kilometer stretch of the Ekalluk River. In addition, Taylor identified a Late Dorset longhouse, and recorded a large caribou drive system located on the north shore of the river (Brink 2005; Taylor 1967, 1972). Taylor's work firmly established the importance of this area, identifying components dating to all major time periods, representing a nearly complete sequence of occupation since the Pre-Dorset period.

In 2000, Iqaluktuuq became the focus of a long-term research project, the Iqaluktuuq Project, under the direction of Max Friesen (Friesen 2002a, 2003, 2004b). The Iqaluktuuq project was formed in collaboration with the Kitikmeot Heritage Society (KHS) of Cambridge Bay, an oral history society focused on the collection and preservation of Inuit traditional knowledge. The project aimed to reconstruct the prehistory and history of the region (Friesen 2002a). An important part of the Iqaluktuuq Project included interviewing local elders out on the land, where elders would comment on various aspects of their childhood and the local archaeological features. The Iqaluktuuq project spanned ten years, during which intensive excavations were undertaken at various sites throughout Iqaluktuuq, and a number of additional surveys, by foot and helicopter, were conducted. These sites have produced a suite of radiocarbon dates, thoroughly establishing Iqaluktuuq as an area of significant occupation throughout prehistorical and historical periods. In addition, radiocarbon dates now show that Late Dorset in this region persisted well into the 13th Century, and possibly later (Friesen 2002a, 2004a). The Iqaluktuuq Project excavations have contributed material for several graduate student research projects (Howse 2005; Riddle 2011; Ryan 2009), including the present study, and have resulted in numerous publications (Friesen 2002a, 2004a, 2007a, 2013a; Howse 2008; Ryan 2003a,b). Today, Iqaluktuuq represents one of the most extensively studied areas in the eastern Arctic.

7.4 The Bell Site

The Bell site (NiNg-2) is located on the south side of the Ekalluk River, where the waters of Ferguson Lake enter the river (Figure 7.1). It is a relatively large, multi-component, site containing evidence of occupations dating from Early/Middle and Late Dorset, Thule Inuit and Recent Inuit (Friesen 2002a). This includes a minimum of ten semi-subterranean Dorset houses and six Thule houses, in addition to a large number of tent rings, caches, and unidentified features that cover the entire site (Figure 7.2).

For the purposes of this study, faunal samples excavated from two houses and four middens were examined. The Late Dorset faunal samples were excavated from House 6 (H6), a semi-subterranean house, and the associated midden deposit (H6 midden), which are located at the southern end of the site (Figure 7.2). These faunal samples were initially analyzed for my Masters research, and were subsequently published (Howse 2008). A faunal sample from a second Late Dorset midden, Test Pit 4 (TP4), which is located near the north end of the site, is also included for analysis in the current study (Figure 9.3). The Thule Inuit faunal samples were drawn from a $1m^2$ test pit at the rear of Feature 56 (H56), a semi-subterranean house, and two midden features, and Test Pits 2 (TP2) and 3 (TP3), both of which are located in front of Thule House 7 (Figure 7.2).

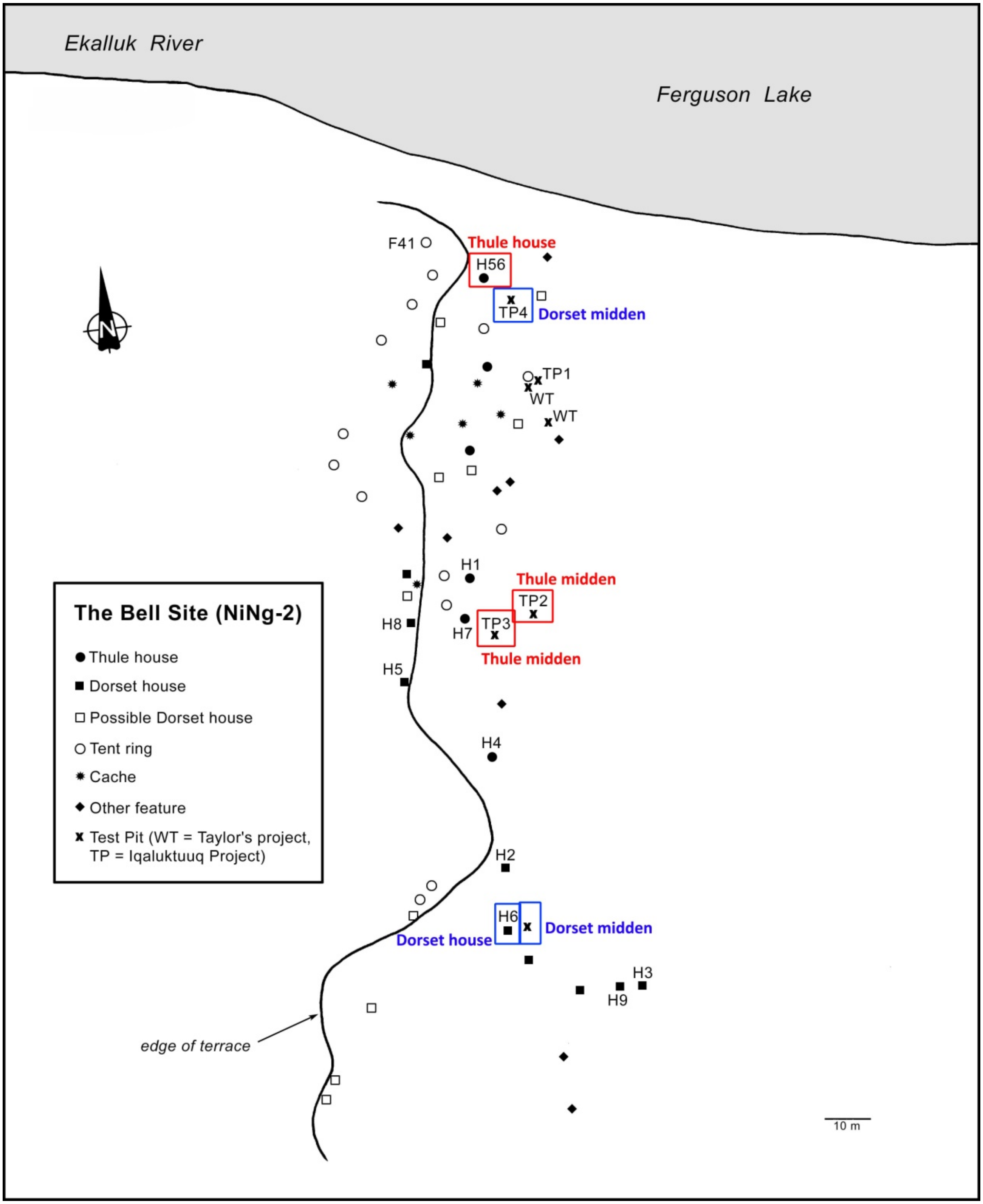


Figure 7.2 The distribution of features at the Bell Site (Courtesy of Max Friesen).

7.4.1 Late Dorset Archaeological Features

House 6 was excavated with extreme care under the supervision of Karen Ryan in 2002 (Ryan 2003a). The aim of the excavation was to achieve a high-resolution view of how the structure was built as part of a larger study focusing on architectural variability within the Late Dorset Period (Ryan 2003a,b, 2009). A total of 33 square metres were excavated from the house and the surrounding area (Figure 7.3). The structure was sub-rectangular in shape and measured 5.75 x 4.5 metres with the long axis running northwest-southeast, with the eastern portion of the structure oriented towards Ferguson Lake (Ryan 2003a). The structure abutted a natural depression, with the northern portion of the structure positioned against the slope of a natural embankment. The walls and the interior of the structure were not well defined, with the exception of the northwest corner where a thick cultural deposit and several vertical stones, flagstones, flat paving stones, and sod deposits were identified. The deposit in this area was “greasy and pungent” leading Ryan to suggest it was associated with cooking activities (Ryan 2003a:104). Further excavations along the northern portion of the house (Figure 7.3), as well as the house interior, revealed a deposit where the soil was much looser and more mottled than that identified in the rest of the structure (Ryan 2009). On the re-examination of field notes and field maps recorded during Taylor’s 1988 excavations it became clear that this portion of the structure had been the location of earlier test pits. Thus, the backfilling of these test pits, the location of which are outlined in Figure 7.3, accounted for the change in soil composition. In the southwest corner of the structure were several post holes, as well as several flat and rounded stones in no patterned arrangement. The central living area included a few flat stones, though again, in no obvious pattern (Ryan 2003a). This area revealed a rather thin cultural deposit, which was relatively hard and compact in comparison to the rest of the structure. This led Ryan (2003a) to suggest the likely use of floorcoverings, in what was presumably a main activity area within the structure. The eastern portion of the structure extended from the central living area, where a natural deposit helped form the northern wall. This was identified as the entrance based on the absence of a stone border and a relatively deep depression, measuring 10 cm below the floor of the central living area (Ryan 2003a, 2009). The construction of the entrance would have reduced the severity of drafts entering the structure, and is referred to as a rudimentary cold trap (Ryan 2009). However, cold traps are most commonly associated with Thule houses, where they appear more fully developed (see Chapter 4).

Six stratigraphic layers were identified within the structure. Level 4 was identified as the Late Dorset occupational level (Ryan 2003a, 2009). This level was a dark brown/black greasy deposit that varied in depth, reaching a maximum of 15 cm in the northwest corner, and measured less than 5 cm deep toward the eastern wall (Ryan 2003a). Radiocarbon dates are not available from the 2002 excavation of the house, however on a caribou bone from Taylor's 1988 excavations a radiocarbon date of cal 915± 125 CE (1035 ± 125 BP) was obtained (CARD). In addition, almost all the artefacts identified within H6 were of Late Dorset origin (see Ryan 2009).

In 2004, a 1m^2 unit was excavated from the H6 midden (Friesen 2004b). This midden is located 7 metres directly in front of the entrance of H6, making it plausibly related to the house occupation. The midden was excavated in largely arbitrary levels, a total of ten were defined (Figure 7.4). There were no major changes in the deposit throughout the level sequence, suggesting there were no major periods of disuse (Friesen 2004b). The majority of the artefacts excavated were of Dorset origin. Three harpoon heads were found *in situ*, representing each phase of the Dorset period. However, this harpoon chronology does not correlate with their stratigraphic placement. The location of a number of other Late Dorset artefacts including two antler box parts and a wooden Dorset bear carving, suggest the majority of the layers date to the Late Dorset period (Friesen 2004a). Thus, it is possible that the Early Dorset harpoon head was acquired and discarded in the midden by Late Dorset people, potentially related to activities that occurred during the construction of H6 (Friesen 2004a). Radiocarbon dates from the midden support this explanation (Friesen pers. com.), indicating the midden was largely formed during the early part of the site's Late Dorset occupation, between 1000-1200 cal CE.

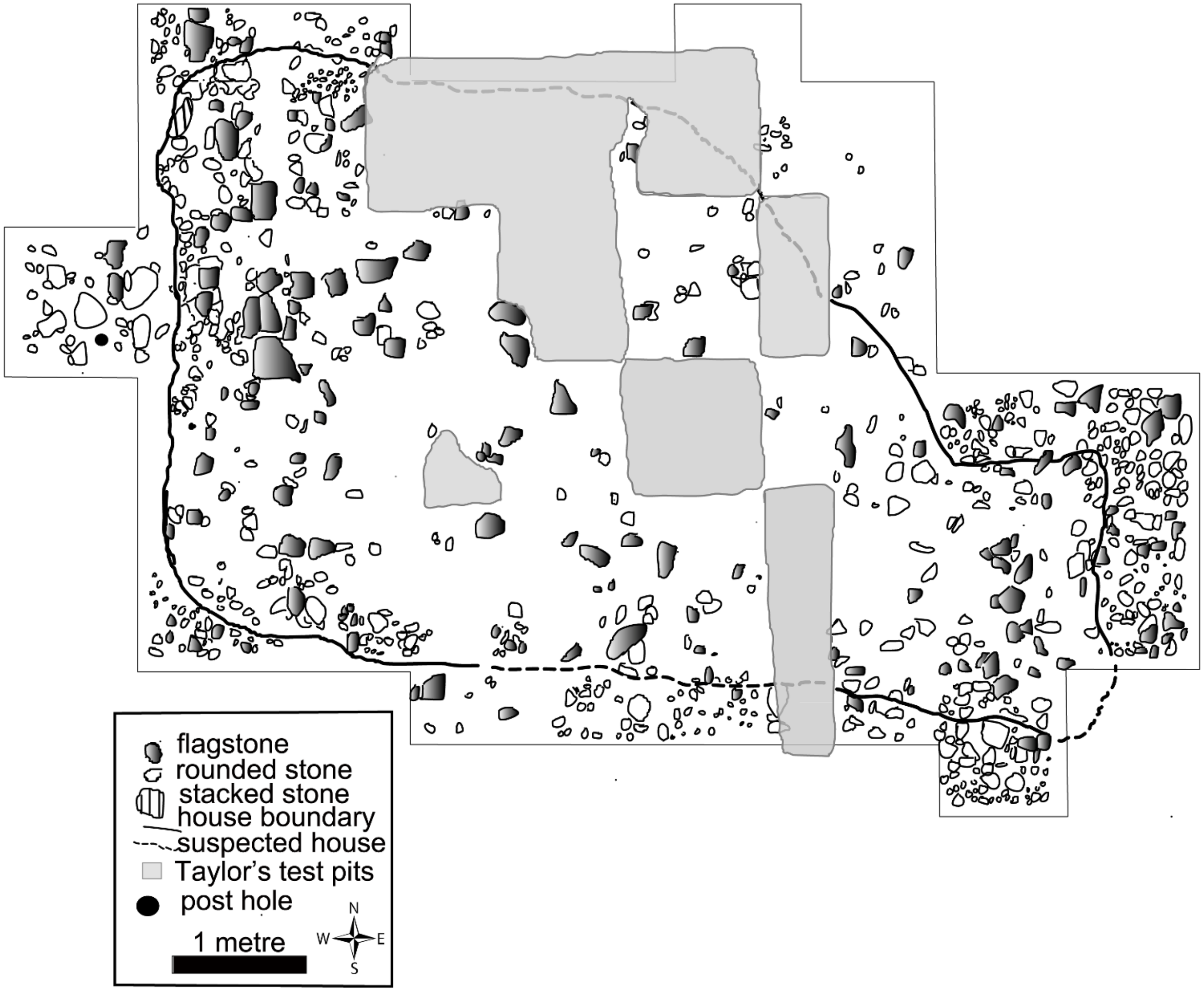


Figure 7.3 Map of House 6, the Bell Site (after Ryan 2009:244)

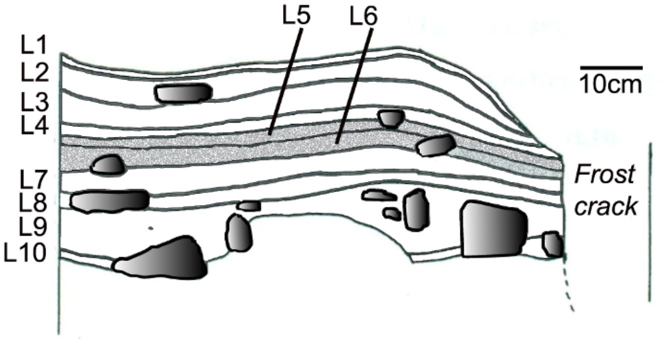


Figure 7.4 Profile of H6 midden, the Bell Site (after Friesen 2004b).

A 1m^2 unit was excavated from the Test Pit 4 midden in 2007 (Figure 7.5), however due to permafrost conditions the unit's excavation was not completed until 2010, when the Iqaluktuuq Project resumed work in the area (Friesen 2007b, 2010). The unit was initially chosen in order to expand faunal samples associated with the site's Thule occupation and was positioned directly in front of the a semi-subterranean Thule structure, Feature 56, however the midden produced no definite Thule artefacts and even the uppermost levels appeared to date to the Dorset period. The midden was quite deep reaching 60 cm, with a total of seven levels (Friesen 2010). A complete polar bear skull, including mandibles, which exhibited red staining on the pre-maxilla and part of the left maxilla, was found in the lowest level. The artefacts excavated from the midden are largely indicative of a Late Dorset occupation, however two Tyara Sliced type harpoon heads, associated with Early Dorset were found (Friesen 2007b). Radiocarbon dates were obtained from three levels within the midden, and indicate deposition occurred during the latter part of the Late Dorset period from about 1150-1300 cal CE (Friesen pers. com.).

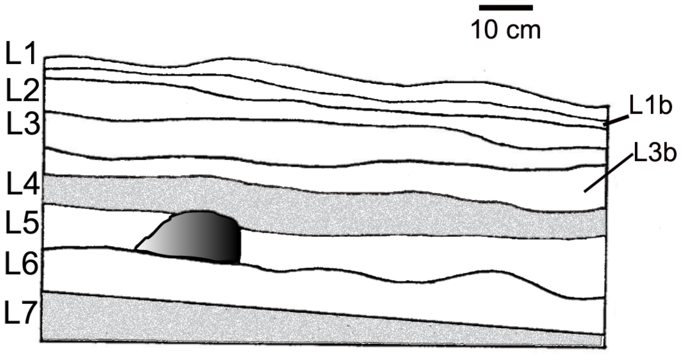


Figure 7.5 Profile drawing of Test Pit 4, the Bell Site (after Friesen 2010).

7.4.2 Faunal Samples

All contexts were excavated by trowel and the material was screened through 3 mm (1/8”) mesh (Friesen 2004b; Ryan 2003a). In order to obtain samples that represent each area of the house, H6 was divided into four arbitrary contexts: the northwest corner, southwest corner, central floor and entrance; each context contained four one metre square units. Two square units from each of the four different contexts were selected for analysis based on a table of random numbers (Howse 2008). The H6 faunal sample comprises the faunal material excavated from Level 4, the Late Dorset occupational level, from the selected eight square metre units. The faunal material excavated from Levels 5 and 6 from the $1m^2$ unit associated midden deposit comprises the H6 midden faunal. The TP4 faunal sample includes the faunal material excavated from Levels 4 and 7 of the $1m^2$ unit.

7.4.3 Zooarchaeological Analysis

The faunal samples discussed here total 16,240 bone specimens, 59% (n=9609) of which have been identified to at least class (Table 7.1). The bone specimens from each context were generally well preserved, with the majority of specimens indicating early stages of weathering (Stages 1-3; Behrensmeyer 1978).

7.4.3.1 Taxonomic Frequencies

Class distribution is quite variable throughout the different features (Figure 7.6). Mammal bones are most frequent in H6 and in TP4, where they contribute 59.5% and 71.7%, respectively, of the identified fauna. In the H6 midden mammal bones were less numerous and comprised 46.9%. Fish specimens were most frequent in the H6 midden where they comprise 49.3% of the identified fauna. In H6 fish specimens comprise 32.2% of the identified fauna and in TP4 they comprise 26.6%. Bird specimens were most significant in H6 where they contribute 8.3%, whereas in the two midden features they contribute less than 5% of the identified fauna.

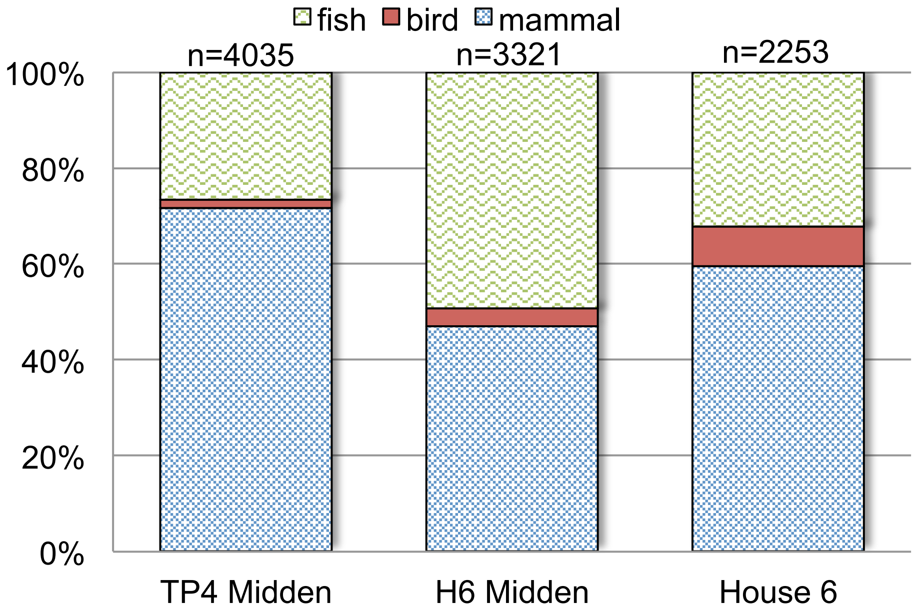


Figure 7.6 Class frequencies in the Late Dorset archaeofaunas from the Bell Site expressed as %NISP.

Table 7.1 Taxonomic frequencies from TP4, H6 Midden, and H6 at the Bell Site.

Taxon	**TP4 Midden**		**H6Midden**		**House 6**		**Total**	
	NISP	%[1]	NISP	%	NISP	%	NISP	%
Arctic char	13	2.6	59	12.4	28	15.6	100	8.7
Lake trout	0	0	19	4.0	9	5.0	28	2.4
Arctic char/ lake trout	480	97.4	399	83.6	142	79.3	1021	8.9
Indeterminate fish	579		1161		546		2286	
Total Fish[2]	1072	26.6	1638	49.3	725	32.2	3435	
Canada goose	8	17.4	5	7.9	7	10.0	20	11.2
Goose	15	32.6	30	47.6	13	18.6	58	32.4
Long-tailed duck	0		1	1.6	2	2.9	3	1.7
Common Eider	0		4	6.3	5	7.1	9	5.0
King Eider	0		5	7.9	12	17.1	17	9.5
Eider	0		0		4	5.7	4	2.0
Pintail	0		2	3.2	2	2.9	4	2.0
Duck	0		3	4.8	0		3	1.7
Trumpter swan	0		2	3.2	2	2.9	4	2.0
Swan	2	4.3	0		0		2	1.1
Glaucous gull	0		3	4.8	4	5.7	7	3.9
Herring gull	1	2.2	0		0		1	0.6
Iceland gull	0		3	4.8	2	2.9	5	2.8
Medium gull	0		0		1	1.4	1	0.6
Small gull	0		1	1.6	0		1	0.6
Gull	3	6.5	3	4.8	2	2.9	8	4.5
Jaeger	0		0		1	1.4	1	0.6
Arctic tern	0		0		2	2.9	2	1.1
Sandhill-crane	0		1	1.6	0		1	0.6
Ptarmigan	17	37	0		11	15.7	28	15.6
Bird indeterminate	26		61		117		204	
Total Bird[2]	72	1.8	124	3.7	187	8.3	385	
Wolverine	14	0.9	1	0.1	0		15	0.5
Dog/Wolf	4		0		0		4	0.1
Arctic fox	505	32.7	190	25.2	103	16.2	798	27.2
Arctic hare	3	0.2	2	0.3	0		5	0.2
Polar bear	4	0.3	0		0		4	0.1
Bearded seal	2	0.1	9	1.2	4	0.6	15	0.5
Ringed seal	76	5	59	7.9	16	2.5	151	5.1
Caribou	892	57.7	486	64.5	509	80.3	1887	64.3
Muskox	45	2.9	7	0.9	2	0.3	54	1.8
Large sea mammal[3]	2		0		0		2	
Large terrestrial mammal[4]	282		211		173		666	
Large mammal	21		0		0		21	
Mammal indeterminate	1041		594		534		2169	
Total Mammal[2]	2891	71.7	1559	46.9	1341	59.5	5791	
Indeterminate	4741		1093		797		6631	
Total	8776		4414		3050		16240	

[1] %NISP's are calculated by class, not by total sample.

[2] Class percentages are calculated using the total sample.

[3] Large sea mammal includes large seal, walrus, and whale species.

[4] Large terrestrial mammal includes caribou, muskox, and bear.

7.4.3.1.1 Fish

The fish specimens identified in the three features are exclusively arctic char and lake trout (Table 7.1). Few fish elements distinguish these species, and frequently the distinguishing feature of an element is missing; therefore the majority of specimens could not be identified below genus *Salvelinus*. However, specimens identified as arctic char were approximately three times as frequent than lake trout in H6 and the H6 midden, and no fish bones from TP4 were identified as lake trout (Table 7.1).

7.4.3.1.2 Bird

High frequencies of goose specimens were identified in each context, and goose is the most abundant bird identified in H6 and the H6 midden (Table 7.1; Howse 2008). Various duck species comprised a substantial portion of the identified bird specimens in H6 (35.7%) and the H6 midden (23.8%) features, yet were absent in TP4. Gull species were also quite frequent in H6 (15.8%) and the H6 midden (16%), and were slightly less frequent in TP4 (8.7%). Ptarmigan, a year-round Arctic resident, is the most frequent bird species identified in TP4 (37%). It also comprised a moderate portion of the identified bird specimens from H6 (15%), however no ptarmigan specimens were identified in the H6 midden. Additional bird species, including swan, sandhill crane, and jaegers, were identified within the features yet contributed less then 5% of the identified bird specimens.

7.4.3.1.3 Mammal

Caribou is the most frequent mammal species in all features. A particularly large proportion of caribou bones was identified in H6, where they comprise 80.3% of the identified mammal specimens (Table 7.1). High frequencies of arctic fox are also identified in each feature, comprising 32.7% of the mammal specimens in TP4, 25.2% in the H6 midden, and 16.2% in H6. The only seal species known to inhabit Wellington Bay are ringed and bearded seals. Although various seal specimens cannot be confidently distinguished to species (e.g., vertebrae and phalanges), those identified at the site are likely to represent these species, which are quite different in size. Ringed seal bones are consistently more frequent than bearded seal bones across the features. In general, seal bones comprise a greater proportion of the identified mammal specimens in the two midden contexts, contributing 5% in TP4 and 9% in the H6 midden, whereas in the house seal bones contribute 3.1%. Low frequencies of muskox bones were found in each feature, but were most frequent in the two middens. A range of additional mammal species, although found in small frequencies, were also identified in the two middens but were absent from the house, including arctic hare and wolverine, and in TP4, dog/wolf and polar bear. The greater range of mammal species identified in the two midden features are potentially related to house cleaning activities, additional species may have been processed in the house but their remains were removed and discarded in the midden. Alternatively, it could suggest animals were primarily processed outside the house, and that the bones of some species were not brought into the house.

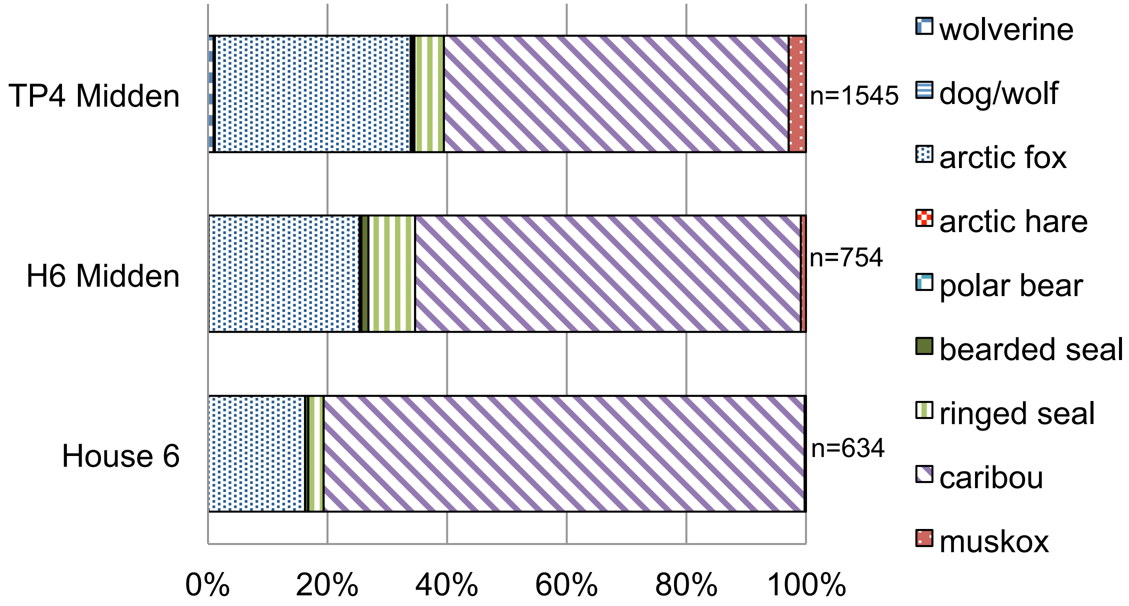


Figure 7.7 Distribution of mammals in the Late Dorset archaeofaunas from the Bell Site, expressed as %NISP.

7.4.3.2 Animal Element Distributions

The presence and distribution of animal skeletal elements can indicate how the animal was killed and transported, what the animal was used for, and how it was butchered, consumed, and disposed (Binford 1978; Lyman 2008; see Chapter 2 for further discussion). This section presents a detailed discussion of the skeletal element distributions of fish, caribou, and arctic fox. A general discussion of element distribution for other species is also included. All data discussed in this section, including *Minimal Animal Units* (MAU's) and the *Minimum Number of Elements* (MNE's), can be found in Appendix A. The various indices that are applied can be found in Chapter 2.

7.4.3.2.1 Fish

The fish specimens discussed in this section include those identified to the genus *Salvelinus*. Figure 7.8 presents the distribution of different parts of the fish skeleton based on %MAU, illustrating which elements are more frequent within each sample. Cranial and vertebral column elements and fins have all been identified in each context, however their distribution is somewhat variable. In the H6 sample, elements belonging to the vertebral column are much less frequent than in the two midden samples. Although taphonomic factors have variable impacts on house and midden samples, for example house contexts are frequently subject to a greater degree of trampling, they do not appear to be responsible for the fish distribution within the study samples. Bone density measures are currently unavailable for arctic char or lake trout skeletal elements, but they have been recorded for chinook salmon (*Oncorhynchus tshawytscha*), another salmonid species with similar skeletal element morphology (Butler and Chatters 1994). In this species, elements belonging to the vertebral column, vertebrae in particular, are denser than other parts of the skeleton and should resist density-mediated destruction better than most cranial bones (Butler and Chatters 1994). Thus, density-mediated attrition would not have caused the fish element distribution identified in H6. In addition, scavenging activities by carnivores would not explain the under-representation of the vertebral column. It seems most plausible that the low frequency of fish post-cranial elements in the house resulted from processing and depositional processes. As discussed earlier, fish specimens are more frequent within the middens than in the house, thus it is likely that fish, perhaps like mammals, were primarily processed outside the structure where the vertebral column was frequently removed and deposited in the midden. Historically, when fish were dried for later consumption they were split down the middle, the spine was removed, and the tail was left intact so the fish could be hung to dry (e.g., Nelson 1900:267; Jenness 1922:157). Therefore it is plausible that fish drying activities account for the general low frequencies of post-cranial elements at the site. Although vertebral column elements are relatively abundant in TP4, this is largely due to the high frequency of hypurals, which are found in the tail of the fish, thus the element distribution in this sample is still consistent with fish drying activities.

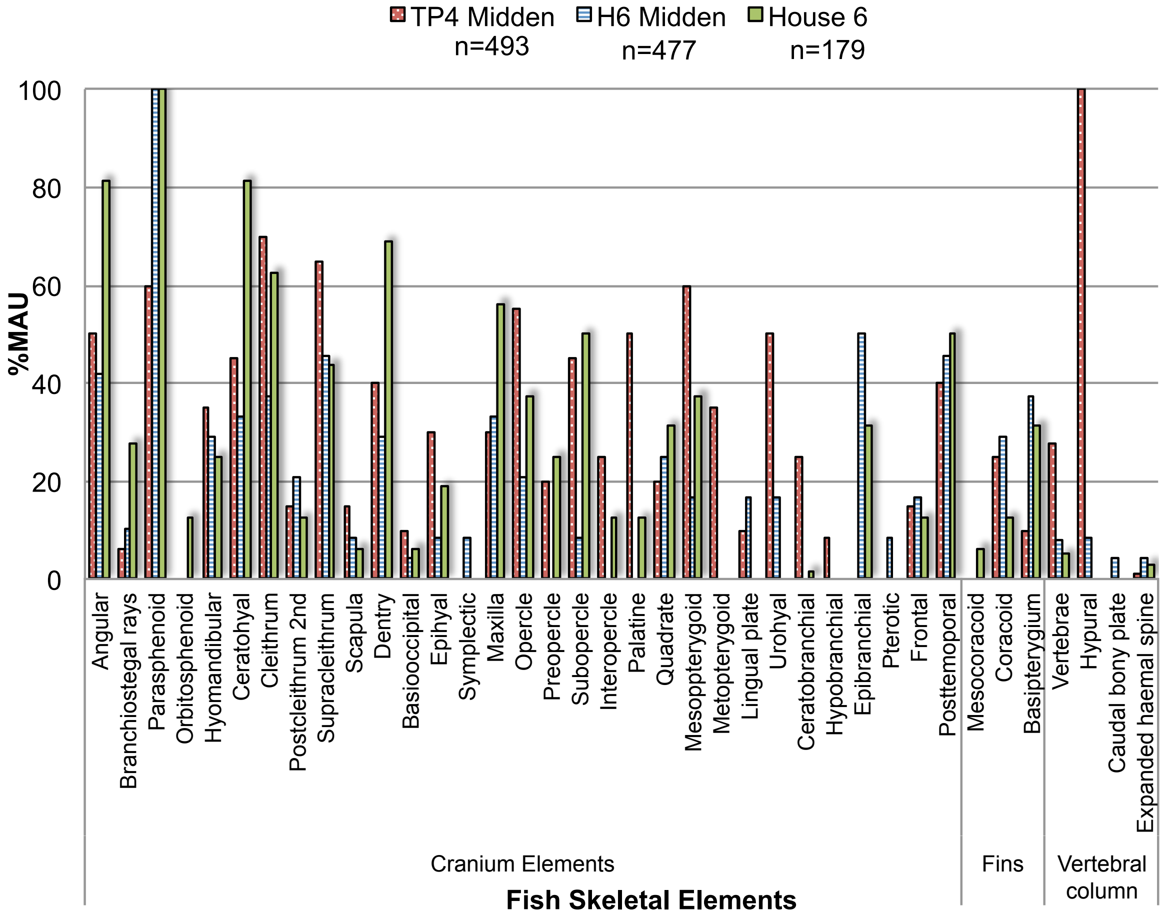


Figure 7.8 The distribution of fish skeletal elements identified to the genus *Salvelinus* in the Late Dorset archaeofaunas from the Bell Site, expressed as %MAU.

7.4.3.2.2 Caribou

Caribou element distribution is quantified as %MAU's, which standardizes the number of times a skeletal part appears in an individual and allows questions regarding element survivability, transport of preferred parts, and how the carcass was used to be addressed (see Binford 1978; Lyman 2008). Throughout all of the features analyzed the distribution of caribou element frequencies remains fairly consistent, with the entire carcass being represented (Figure 7.10). Migrating herds of caribou are known to pass through Iqaluktuuq, and based on the distribution of caribou drive systems in the area, it is likely that most caribou hunting would have occurred within a few kilometers of the site. Thus, caribou carcasses would have been subject to a limited degree of culling to reduce weight for transport. When caribou element %MAU's are compared to the caribou Food Utility Index (Metcalfe and Jones 1988), no significant relationship exists (TP4 r_s =0.25, p=0.248; H6 midden r_s =0.19, p=0.311; H6 r_s=0.24, p=0.204), indicating that elements are not preferentially present, or absent, based on the amount of meat attached to them. However, within all features the distributions of caribou elements are positively and strongly correlated (TP4 r_s =0.77, p≤0.001; H6 midden r_s =0.75, p≤0.001; H6 r_s =0.84, p≤0.001) with the caribou Density Index (Lam et al. 1999a), suggesting that bone density played some role in the distribution of caribou elements at the site. In addition, all features (TP4= r_s =-0.74, p≤0.001; H6 midden r_s =-0.84, p≤0.001; H6 r_s =-0.72, p≤0.001) had element distributions with negative but strongly significant relationships with the Meat Drying Index (MDI). The MDI used (Friesen 2001), is similar to Binford's (1978) Drying Utility Index, and helps determine whether dried meat was consumed and discarded at the site . The negative relationship between the caribou element %MAU's and the MDI is not consistent with dried meat having been consumed and discarded at the site, as elements associated with dried meat are not found in significant numbers in any context. The strong and significant negative relationship between the caribou element %MAU's and MDI, however, may suggest that caribou meat was dried at the site, and then transported elsewhere for consumption (see Howse 2008). Caribou element %MAU's were also compared with the caribou Unsaturated Marrow Index (UMI) (Morin 2007). The UMI helps determine whether marrow processing, that favours unsaturated fats, occurred at the site. The caribou element MAU's within each feature have a positive and significant relationship with the caribou UMI (TP4 r_s =0.64,p=0.03;H6 midden r_s =0.88, p≤0.001; H6 r_s =0.84; p≤0.001), suggesting marrow processing favouring the rendering of unsaturated fats did occur at the site (see Appendix A).

Since the DI, the MDI, and the UMI correlate significantly with caribou element distribution within each context, it is difficult to discern which of these factors had greater impact on the faunal sample composition. The caribou element profile at the site appears to indicate that dried meat was produced at the site and removed for consumption elsewhere. However, thoracic and lumbar vertebrae, ribs, and innominates, which are the best elements for meat drying, are found at the site, although in varying frequencies amongst the features. In all probability, this is a result of both dried caribou meat and fresh caribou meat being consumed at the site. Although density mediated attrition likely played some role in the distribution of caribou elements, the inverse relationship between DI and MDI does not allow a clearer understanding of its relative importance (see Friesen and Stewart 2013). Marrow processing for unsaturated fats also appears to have impacted the distribution of caribou elements at the site. There is not a huge discrepancy, however, between the long bone frequencies overall, again making it difficult to assess the impact of this activity and suggesting other activities also played a role, like those just mentioned.

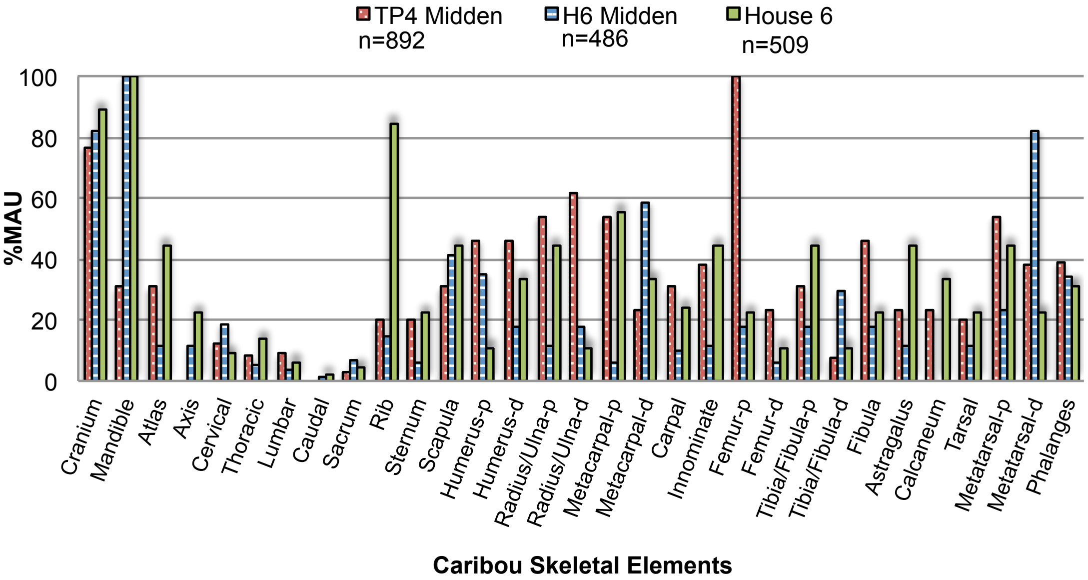


Figure 7.9 Distribution of caribou skeletal elements in the Late Dorset archaeofaunas from the Bell Site, expressed as %MAU's. The ends of long bones were tailed separately (p=proximal end, d=distal end).

7.4.3.2.3 Arctic fox

Arctic fox bones were prevalent at the site (n=798), although their distribution is quite variable throughout the features (TP4= 32.7%, H6M=25.2%, H6=16.2% of identified mammal). Crania are well represented in all contexts (Figure 7.11). The small size of arctic fox makes it unlikely that the differential transportation of skeletal elements played a major role in the distribution of fox elements, as their carcasses could have easily been transported whole (Novecosky and Popkin 2005). The distribution of fox elements, however, could be related to taphonomic factors, differences in the utilization of skeletal elements, and disposal practices. Thus, the distributions of arctic fox elements have been tallied as MAU's. However, when Bone Mineral Density (BMD) values recorded for red fox (*Vulpes vulpes*) by Novecosky and Popkin 2005 and the MAU of arctic fox elements are compared, no significant relationship is found in either the middens (TP4 r_s=-0.09,p=0.68; H6 midden r_s=-0.18,p=0.42) or H6 (r_s=-0.004,p=0.99), indicating density-mediated attrition did not play a role in the distribution of arctic fox elements at the site. Thus, the distribution is likely the result of cultural activity, though no obvious patterns are recognized.

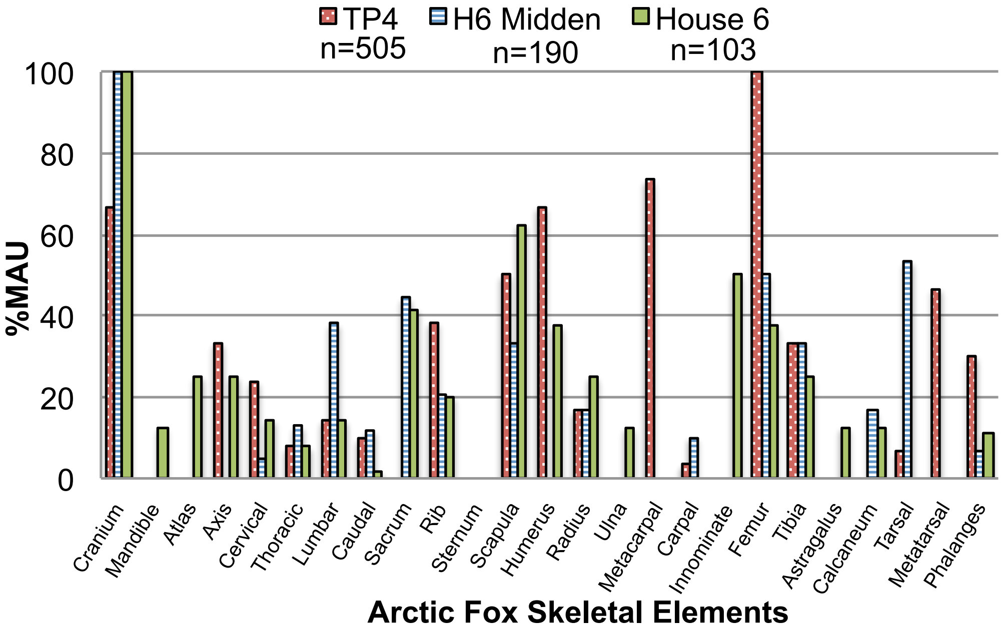


Figure 7.10 Distribution of arctic fox skeletal elements in the Late Dorset archaeofaunas from the Bell Site, expressed as %MAU's.

7.4.3.2.4 Other Species

In each context, all parts of the Anatidae skeleton are present, although crania and ribs were absent in the H6 midden (see Appendix A). The most frequent Anatidae skeletal part varied from feature to feature. There is also no discernible pattern in the distribution of ptarmigan skeletal elements, although crania, vertebrae, and ribs are absent in TP4 and H6. Seal skeletal elements are similarly distributed in all contexts, and the entire skeleton is represented (see Appendix A). No significant correlations were found between the distribution of seal elements and either the small seal Food Utility index (Lyman et al. 2002) or seal Bone Mineral Density values recorded by Lyman (1994). Muskox specimens are most frequent in TP4, where the majority of the skeleton is represented, however in H6 and in the H6 midden muskox specimens were limited to part of an ulna and a tibia, respectively. Various wolverine elements, dog/wolf rib fragments, an arctic hare scapula and radius, and a complete polar bear cranium, mandible, and phalanx were identified in the TP4 sample.

7.4.3.3 Modification Frequencies

In order to have a clear understanding of the taphonomic processes that impacted the samples discussed here, all modifications found on the bone specimens were recorded. These include cut marks, burning, gnaw marks, and fragmentation (Table 7.2). Fragmentation rates, including the portion of the sample representing fragmented elements, and fragmentation intensity, referring to the number or size of pieces an element was fragmented into, were also calculated following Lyman (2008). This section focuses on bone specimens identified as mammal, and excludes the less robust fish and bird bones.

Table 7.2 Modification frequencies on mammal bones from Late Dorset contexts at the Bell Site.

Modification[1]	**TP4**	**H6 Midden**	**House 6**	**Total**
Cut marks	22	18	46	86
% cut marks	0.5%	1.2%	3.4%	1.1%
Gnaw marks	6	19	50	75
% gnaw marks	0.1%	1.2%	3.7%	1.6%
Burn marks	207	28	43	278
% burn marks	4.4%	1.8%	3.2%	3.6%
%fragmentary	38.2%	62.7%	76.3	66.4%
Fragmentation (NISP:MNE)[2]	2.5	2.1	2.2	2.3
NISP[3]	1545	754	634	2933
MNE	955	502	375	1832
Whole elements	554	281	150	985

[1] Percentages are calculated using total mammal NISP for each sample see Table 7.1.

[2] Whole elements are excluded from this calculation.

[3] This NISP is used for calculating fragmentation and excludes mammal bone specimens that could not be identified beyond class.

Cut marks are found on all mammal species, but are present on a small proportion of the identified mammal bones (Table 7.2). They are more than twice as frequent in the house than in the midden, which could suggest the house was the focus of consumption practices (see Howse 2008). Gnaw marks on all mammal specimens appear as puncture marks that range from 2-3mm in diametre suggesting they were inflicted by arctic fox. While gnaw marks are generally not frequent, they are more prevalent in the house than in the midden features. This pattern is likely the result of depositional processes, whereas the gnaw marks in the house were likely the result of scavenger activities that took place after the house was abandoned. Although the midden features would seem more vulnerable to scavenger activities, it is likely that the rapid deposition of middens protected lower levels from being gnawed (see Howse 2008). Burn marks were quite variable throughout the features, and were most frequent on the mammal bones identified from the TP4 midden. However, burn marks are more frequent on the specimens from H6 than from the H6 midden, suggesting burnt bone was not systematically removed from the house and re-deposited in the midden. The percentage of fragmentary bone varied from feature to feature and while the H6 and H6 midden mammal samples are largely formed by fragmented bone specimens (62.7% plus), that from TP4 mainly consists of whole elements. The intensity of fragmentation (NISP:MNE) is calculated following Lyman 2008 (p.251-252), and excludes whole elements (see Chapter 2) since the index is used to identify how many pieces an element has been broken into on average, and/or to identify the proportion of bones that have been broken from the original element into smaller pieces. Across the features, the intensity of fragmentation is consistently low, indicating mammal bones were fragmented into a similar number and size of pieces across the site. While the fragmentation rates suggest trampling did not have a greater impact on the specimens from within H6, higher frequencies of gnaw marks and burning indicate H6 was generally more affected by taphonomic processes than the H6 midden, and TP4. However, the modification frequencies in all contexts are generally low, with burn marks on 4.4% of the TP4 specimens being the most frequent bone modification identified.

Taken together the modification frequencies indicate each sample had a unique taphonomic history. Burn marks are most frequent in the middens, however gnaw marks are found on a greater proportion of the bone from H6. The TP4 sample largely represents whole elements; whereas H6 and its associated midden samples largely represent fragmented bones. This further suggests that TP4 accumulated rapidly, and that upper layers served to protect lower levels from activities that would have resulted in bone breakage.

7.4.3.4 Seasonal indicators and prey demography

The faunal list provides some indication of which season(s) the animals were killed in and when Late Dorset people may have occupied the site. Summer migrants including goose, duck, gull, and bird species are present in each feature (Table 7.1). However, the year-round resident ptarmigan accounts for 15.6% of the identified bird specimens. The large proportions of caribou and fish found in the samples indicate that Late Dorset likely took advantage of the region’s productive upstream late summer arctic char run, as well as the early fall caribou migration. However, it is not possible to conclude whether or not Late Dorset were present during other seasons based on the faunal list alone. Thus, the age distributions of prey species were considered, with specific attention given to immature individuals, which generally have the greatest probability of yielding accurate season of death estimates.

Immature birds were found in each of the contexts. A minimum of one immature goose contributed to the bird bones identified in TP4, at least two immature geese, one immature duck, and one immature swan were found in the H6 midden, and at least two immature geese were identified in H6. These specimens suggest Late Dorset were at the site sometime during late July/August. In addition, a femur of one goose from TP4 exhibited significant deposits of medullary bone, indicating it was getting ready to lay eggs. Since goose eggs are generally laid during late May and hatch sometime between mid/late June, this specimen suggests Late Dorset were present at some point in May.

The fusion sequence of seals was considered to help assess the age of death of these animals (Table 7.3). Research on modern small seal populations involving the use of a large collection of known-age specimens at the Swedish Museum of National History, indicates the fusion of various skeletal elements occurs in a predictable sequence, allowing for a rough estimate of age at death (Storå 2002). Using this method specimens are categorized into four skeletal age groups: yearlings, killed in the first year of life; juveniles, killed between the age of one and four years; young adults, killed between four and seven; and, old adults that are at least seven and a half when they are killed (Storå 2002). Whether an element was unfused, fusing, or fused is recorded and the proportion of unfused elements is calculated in order to determine the percentage of elements that represent the given age category. Elements that fuse in the first year of life do so before the animal's sixth month, providing the best way to narrow the season during which an animal was killed. Table 7.3 presents the fusion data recorded for each age group, assuming the people who contributed to both samples were the same people the H6 and H6 midden samples have been combined. At least one fetal or newborn was identified, based on a small, very porous pelvis with an unfused acetabulum, placing its death sometime between March and May. A MNI of two yearlings was also identified, based on scapulae with unfused supraglenoid tubercles, indicating they were killed sometime between April and September. All specimens assessed were unfused; and, the absence of fused or fusing elements make it impossible to determine whether any of the specimens represent animals that had lived beyond their first year of life. However, this pattern is likely partially the result of a small sample of specimens, since not all the seal specimens in each feature include the element portion assessed for fusion. As a result, the absence of fused of fusing elements does not necessarily indicate only young seals were captured.

Table 7.3 Seal element fusion data from the Late Dorset contexts at the Bell Site expressed as MNE's.

	TP4 Midden				**H6 Total**			
Age Fusion Sequence	unfused	fusing	fused	total	unfused	fusing	fused	total
Y: metatarsal 1, distal	0	0	0	0	0	0	0	0
Y: pelvis, acetabulum	0	0	0	0	1	0	0	1
Y: scapula, supraglenoid	1	0	0	1	2	0	0	2
Total	1	0	0	1	3	0	0	3
% unfused	100%				100%			
J: femur, proximal	1	0	0	1	0	0	0	0
J: radius, proximal	0	0	0	0	3	0	0	3
J: humerus, distal	2	0	0	2	1	0	0	1
Total	3	0	0	3	4	0	0	4
% unfused	100%				100%			
YA: femur, distal	1	0	0	1	0	0	0	0
YA: humerus, proximal	2	0	0	2	3	0	0	3
YA: ulna, proximal	0	0	0	0	1	0	0	1
YA: tibia/fibula, proximal	0	0	0	0	0	0	0	0
Total	3	0	0	3	4	0	0	4
% unfused	100%				100%			
OA: ulna, distal	0	0	0	0	2	0	0	2
OA: metatarsal 1,	0	0	0	0	0	0		
OA: radius, distal	2	0	0	2	0	0	0	0
OA: tibia/fibula, distal	0	0	0	0	0	0	0	0
Total	2	0	0	2	2	0	0	2
% unfused	100%				100%			

Y=yearling, J=juvenile, YA=young adult, OA=old adult

The epiphyseal fusion sequence for caribou elements was also considered. The majority of caribou skeletal elements fuse before the end of the fourth year of life (Hufthammer 1995). Table 7.4 exhibits the MNE frequencies of element fusion for TP4 and the H6 total sample, respectively. The analysis indicates a MNI of five calves aged between two and six months (three unfused right tuber scapulae from TP4 and two right from the H6 samples) were killed sometime between August and December. Another four were aged between four and ten months (three right unfused radii from TP4, one right from the H6 sample), placing their death between October and April. While these data do not translate directly into prey demography, the elements fused within the middle and late fusing stages suggest adult animals were also taken. When the available fusion data from all contexts are considered together, it appears that 46% (n=121) of the sample represents caribou that were killed before they reached four and a half years of age; and, individuals younger than 18 months represent 21.3% (n=56) of the specimens assessed (n=263). An attempt was made to assess caribou sex distribution by recording several measurements on adult caribou mandibles and metapodia; however, the very small sample size does not allow for a reliable reconstruction.

Caribou tooth eruption sequences were also considered based on the sequence of tooth eruption recorded for barren-ground caribou by Miller (1974). Table 7.5 presents the data recorded from all mandibles with teeth *in situ*, loose teeth were not included. Mandibles from two calves exhibiting the first molar erupting indicate they were killed between September and November. Another mandible, from the H6 midden, exhibiting an erupted M1and absent M2, belonged to an individual that would have been killed between December and April. A mandible was also identified exhibiting an erupted M1 and M2 with deciduous pre-molars (PM), indicating it was killed between October and March.

Table 7.4 Unfused caribou element frequencies from the Late Dorset contexts at the Bell Site expressed as MNE's.

		TP4				**House 6 Total**			
Caribou element	Age (in months)	unfused	fusing	fused	total	unfused	fusing	fused	total
Early Fusing									
tuber scapulae	2-6	3	-	4	7	2	-	3	5
radius p*	4-10	4	-	3	7	2	-	7	9
humerus d*	6-15	4	-	2	6	2	-	3	5
phalanx 1 p	6-18	7	-	19	26	15	-	11	26
phalanx 2 p	6-18	-	-	-	-	16	1	18	35
Total		18	-	28	46	37	1	42	80
%unfused		39%				47.5%			
Middle Fusing									
tibia d	18-30	-	-	2	2	4	-	10	14
metacarpus d	18-30	2	-	3	5	6	-	6	12
metatarsus d	18-30	3		3	6	3	-	9	12
calcaneus	18-42	1		2	3	1	-	2	3
Total		6		10	16	14	-	27	41
%unfused		37.5%				34%			
Late Fusing									
radius d	36-48	2	-	5	7	4	-	5	9
femur p		10	-	2	12	3	1	3	7
femur d		2	-	1	3	2	-	3	6
tibia p		4	-	2	6	1	-	4	5
ulna p	42-48	4	-	1	5	6	-	1	7
humerus p	42-54	6	-	0	6	2	-	5	7
Total		26		11	39	18	1	21	41
%unfused		66%				46.3%			
%unfused all groups		**46%**							

*p=proximal, d=distal

Table 7.5 Tooth eruption data based on Miller (1974) from the Late Dorset contexts at the Bell Site.

Tooth eruption	Ages	TP4 Midden	H6 Total	Total
M1 absent	0-2 months	-	-	-
M1 erupting	3-5 months	1	1	2
M1 erupted, M2 absent	6-9 months	-	1	1
M2 erupting	10-15 months	-	-	-
M2 erupted, deciduous PM	16-21 months	1	-	1
PM erupting	22-29 months	-	-	-

M=molar, PM=pre-molar

Additional immature mammals were also identified at the site. A muskox mandible containing all three deciduous premolars (PM2-PM4) with little wear and an erupting M1 was identified in TP4. If tooth eruption sequences for the mandible are similar to that recorded by Tener (1965) for the maxilla, this mandible represents an individual killed around six months of age, sometime during November or December. Although the timing of epiphyseal fusion is not available for arctic fox, Harris (1978:111-112) has recorded the sequence for red fox (*Vulpes vulpes*). At least three immature arctic fox were identified in TP4 (one humerus with proximal epiphysis still fusing, and two unfused humerii proximal epiphyses), and a MNI of two from the H6 samples (two femora with unfused distal epiphyses, and two tibiae with unfused proximal epiphysis). Thus, presuming the epiphyseal fusion sequence for arctic fox is similar to red fox, these data suggest these animals were killed sometime between June, when they tend to be born, and November or December. The timing of epiphyseal fusion for arctic hare and wolverine is not available, not allowing for season of death estimates, however several immature individuals were identified in the samples. At least one immature arctic hare contributed to the hare specimens identified in both TP4 (based on an unfused scapula tubercle) and the H6 samples (unfused posterior epiphysis on axis vertebra), and an immature wolverine was identified in TP4 (one ulna with unfused epiphyses).

Overall, these faunal data suggest Late Dorset were at the site in the spring, perhaps as early as the beginning of May before birds began to nest. The distribution of bird species, and age distribution of arctic fox suggest they stayed throughout the summer. During early summer to late fall they took advantage of the large char run and the large caribou migrations that pass through the site. It is difficult to say whether or not Late Dorset were at the site during the winter based on the faunal evidence; however the semi-subterranean nature of the house suggests they stayed for at least some of the cold season. Although once the large migrations of caribou were gone and any stragglers had left the area it is perhaps most likely they moved to a coastal environment where they would have had access to more dependable resources.

7.4.4 Thule Inuit archaeological features

The Thule Inuit house feature included in this study is Feature 56 (H56), the northernmost Thule house at the Bell site (Figure 7.2), located near the bank of the Ekalluk River (Friesen 2010). The house is not easily observed from the surface, as it is deeply buried and only the rough circular outline of the main room can be identified. In 2010, a 1m^2 test pit was excavated at the rear of the structure (Friesen 2010). The unit was quite deep, with five cultural levels, and sub-levels, at least three of which were floors (Figure 7.12). A substantial number of artefacts and faunal remains were recovered. The artefacts are largely of Thule Inuit origin, however a few Dorset artefacts were encountered in the lowest levels, where the house appears to have been excavated into a Dorset house or midden (Friesen 2010). Radiocarbon dates from this feature are relatively late in the Thule Inuit occupation at the site and fall between 1600-1800 cal CE (Friesen per. com.).

The TP2 midden is located in the middle of the site, approximately 12 metres east of two Thule houses (Friesen 2002b; Figure 7.2). The feature was excavated in 2002, in order to obtain Thule and Dorset materials from stratified contexts. Eight levels, and several sublevels were excavated from the 1m^2 unit, which reached a maximum of 70 cm in depth along the southeast section of the square (Figure 7.13). Level 2 was the first of the cultural levels, which were comprised of organic material and sandy lenses that became more substantial at greater depths (Friesen 2002b). Level 5 consisted of very thick matted vegetation, and abundant artefacts and faunal remains (Friesen 2002b). A number of ephemeral sub-layers were found in Level 5, however it was not possible to differentiate these layers across the entire unit, which represented deposits of possible bedding material from the nearby houses (Friesen 2002b). The artefacts recovered from Levels 1-5 were primarily of Thule origin, although Dorset artefacts, primarily small lithic flakes were found. Levels 6 and 7 were quite distinct from Level 5; they were black in colour and contained abundant organic material. The lowest level, Level 8, was dark in colour, containing organic material and medium-sized cobbles (Friesen 2002b). None of the artefacts from this level were Thule types, but instead all diagnostic pieces were of Dorset origin, with a harpoon head, a type Ha1, diagnostic of the Late Dorset period (Friesen 2002b). There are not enough radiocarbon dates to fully date TP2 Level 5, however it likely accumulated sometime between 1400 and 1600 cal CE (Friesen pers. com.)

The TP3 midden is a 1m^2 unit located 8 metres away from TP2, 5 metres in front of a Thule house (Friesen 2002b; Figure 7.2). The deposition of this midden is similar to TP2, although it is not quite as deep (Figure 7.14). Level 1 is the surface vegetation. The cultural levels begin with Level 2, which, like Level 3, comprises a peaty organic matrix (Friesen 2002b). Level 4, a thick deposit, is composed of organic material including wood chips, root, and moss, as well as a layer of flat stone slabs that are likely associated with the adjacent Thule structure. Level 5 comprised a grey ashy material, sand and vegetation. All the artefacts found in Levels 1-5 were primarily Thule, although similar to TP2, a number of Dorset small lithic flakes were identified. Their presence is likely the result of Thule structures being excavated into earlier Dorset deposits, which were then re-deposited into the Thule middens. The lower levels were primarily associated with Dorset activities. Level 6 was black peaty deposit. The lowest level, Level 7 contained large cobbles, representing the original beach (Friesen 2002b). No Thule artefacts were found in these lower layers. Radiocarbon dates indicate L1-5 accumulated during the Thule Inuit occupation at the site sometime between 1400 and 1600 cal CE (Friesen pers. com.).

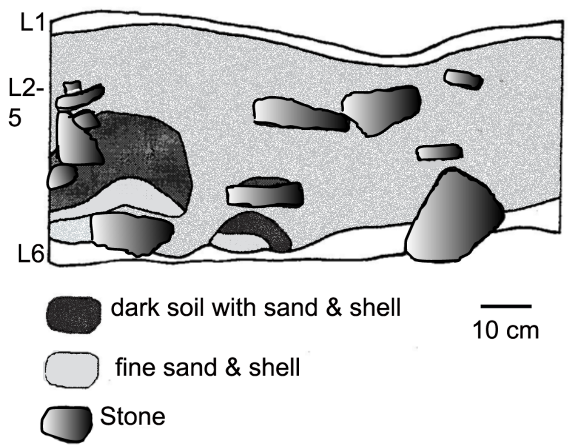


Figure 7.12 Profile of H56 $1m^2$ test pit, the Bell Site (after Friesen 2010).

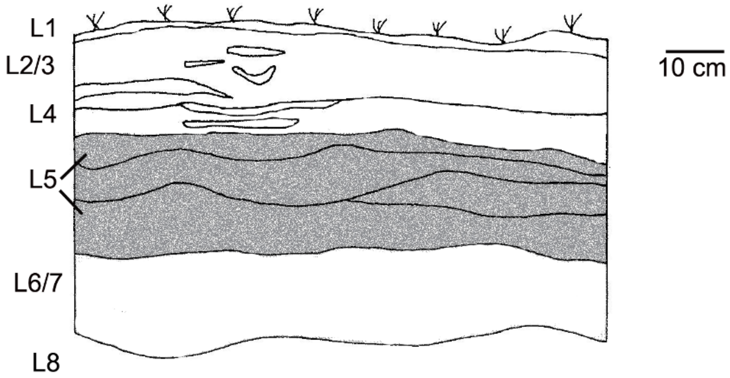


Figure 7.13 Profile of midden feature TP2, the Bell Site (after Friesen 2002b).

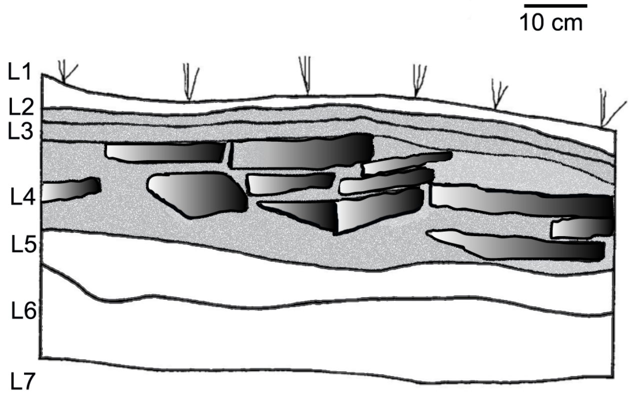


Figure 7.14 Profile of midden feature TP3, the Bell Site (after Friesen 2002b).

7.4.5 Faunal Samples

Each faunal sample was drawn from features that were excavated by trowel and the material was screened through 3mm (1/8") mesh (Friesen 2002b, 2010). The H56 faunal sample includes the faunal material excavated from Levels 2-4 of the 1 m^2 test pit placed in the rear of the structure. All faunal material excavated from Level 5 of the 1 m^2 TP2 was identified for the TP2 faunal sample, and faunal material from Levels 2-4b of the 1m^2 TP3 form the TP3 faunal sample. The lower levels of these features, which are associated with Dorset activities, were excluded from these samples.

7.4.6 Zooarchaeological Analysis

The faunal samples discussed here total 16,716 bone specimens, 76.6% of which have been identified to at least class (Table 7.6). These specimens were well preserved, with the majority indicating early stages of weathering (Stages 2 & 3; Behrensmeyer 1978).

7.4.6.1 Taxonomic Frequencies

Mammal specimens are most frequent in TP3 and H56 comprising 61.8% and 73.9% of the identified fauna, however in TP2 they contributed only 37.1% (Figure 7.15). Fish specimens were most frequent in TP2 comprising 59.4% of the identified fauna. In TP3, fish bones contributed 37.1% and in H56 they contributed 23.3% of the identified fauna. Bird specimens are quite scarce; and in each context they comprise less than 4% of the identified fauna.

Table 7.6 Taxonomic frequencies from TP2, TP3, and H56 at the Bell Site .

Taxon	TP2 Midden		TP3 Midden		House 56		Total	
	NISP	%[1]	NISP	%	NISP	%	NISP	%
Arctic char	66	8.3	39	6.0	11	5.1	116	7.0
Lake trout	57	7.2	8	1.2	9	4.2	74	4.4
Arctic char/ lake trout	656	82.5	604	92.8	196	90.7	1456	87.6
Sculpin	16	2.0		0.0	0	0.0	16	1.0
Indeterminate fish	3034		987		234		4255	
Total Fish[2]	3829	59.4	1638	37.1	450	23.3	5917	46.2
Canada goose	29	30.5	11	25.0	10	37.0	50	30.1
Goose	24	25.3	15	34.1	8	29.6	47	28.3
Long-tailed duck	2	2.1	0		0		2	1.2
Eider	7	7.4	6	13.6	4	14.8	17	10.2
Duck	21	22.1	6	13.6	0		27	16.3
Trumpter swan	0		0		0		0	0.0
Swan	3	3.2	0		4	14.8	7	4.2
Medium gull	0		1	2.3	0		1	0.6
Ptarmingan	9	9.5	5	11.4	1	3.7	15	9.0
Bird indeterminate	131		7		30		168	
Total Bird	226	3.5	51	1.2	57	2.9	334	2.6
Dog	1	0.1	0		2	0.5	3	0.2
Wolf	1	0.1	1	0.2	0		2	0.1
Dog/Wolf	11	1.6	3	0.5	2	0.5	16	1.0
Arctic fox	70	10.3	13	2.2	38	9.1	121	7.2
Arctic hare	0		0		5	1.2	5	0.3
Bearded seal	2	0.3	2	0.3	0		4	0.2
Ringed seal	15	2.2	2	0.3	9	2.1	19	1.5
Caribou	576	85	566	96.8	350	84.1	1492	88.7
Muskox	4	0.6	0		10	2.4	14	0.8
Large terrestrial mammal[3]	519		493		315		1327	
Large mammal	123		377		28		528	
Mammal indeterminate	1071		1269		677		3017	
Total Mammal	2393	37.1	2726	61.8	1436	73.9	6555	51.2
Indeterminate	1036		2565		313		3914	
Total	**7484**		**6976**		**2256**		**16716**	

[1] %NISP's are calculated by class, not by total sample.

[2] Class percentages are calculated using the total sample.

[3] Large terrestrial mammal includes caribou, muskox, and grizzly bear.

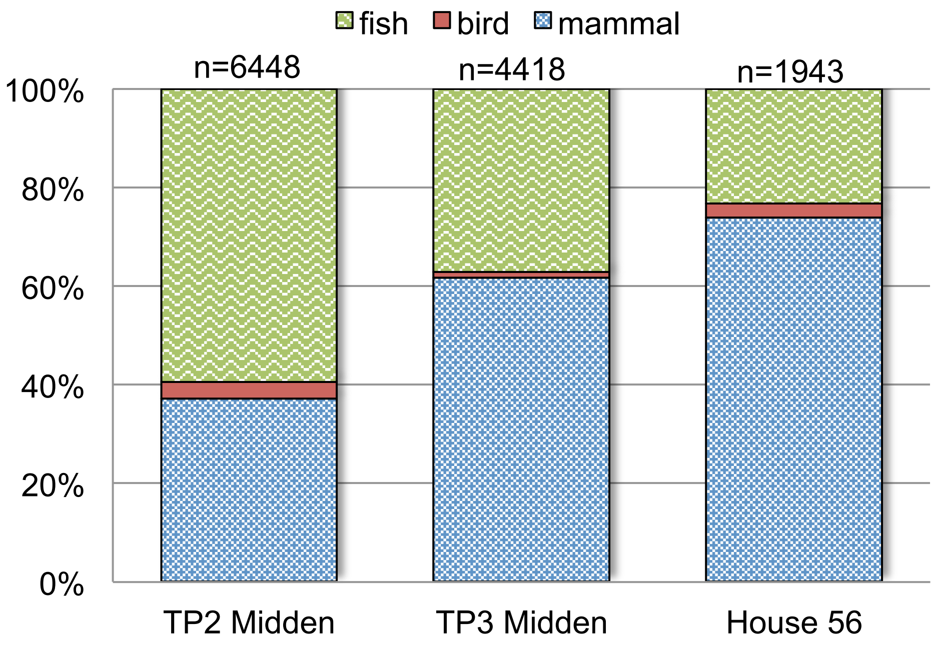


Figure 7.15 Class distributions in the Thule Inuit archaeofaunas from the Bell Site expressed as %NISP.

7.4.6.2 Fish Distribution

The majority of fish specimens in each context were identified as arctic char/lake trout, as these two species are quite difficult to distinguish (Table 7.6). In TP3, arctic char contributed 8.3% of the identified fish bones, 6% in TP3 and 5.1% in H56. Lake trout comprise 7.2% of the identified fish bones from TP2, 1.2% in TP3, and 4.2% in H56. In addition, a low frequency of sculpin specimens (2%) was identified in TP2.

7.4.6.3 Bird Distribution

Of the identified bird bones, goose species are most frequent within each sample, contributing 55.7% in TP2, 59.1 % in TP3, and 66.6% in H56 (Table 7.6). Duck species are also quite common in the midden features, comprising 31.6% of the identified bird bones from TP2, and 27.8% from TP3, however they are less frequent in H56 where they comprise 14.8%. Swan is somewhat important in H56 comprising 14.8% of the identified bird bones, however it is relatively infrequent in TP2 (3.2%), and absent in TP3. Ptarmigan species, which are available year-round, are found in each context. They are most frequent in the midden contexts, comprising 9.5% of TP2 identified bird bones and 11.4% of TP3, whereas in H56 they contribute 3.7%. A single gull specimen was also identified in TP3.

7.4.6.4 Mammal Distribution

Caribou bones are numerous in all features, comprising 85% of the identified mammal bones in TP2, 96.8% in TP3, and 84.1% in H56 (Figure 7.16). Arctic fox bones are somewhat important in TP2, comprising 10.3% of the identified mammal, and in H56 where they comprise 9.1%, however they are relatively infrequent in TP3 where they contribute 2.2% of the identified mammal specimens. As was described earlier, many seal bones cannot be distinguished to species, however a distinction between small and large seals is easily made. These categories generally refer to ringed and bearded seals, respectively, since they are the only seal species known to frequently visit Wellington Bay. However, small and large seal specimens were scarce in each context. Additional mammal species, including arctic hare, dog/wolf, and muskox were also identified but contributed less than 3% of the identified mammal bones in each context. Mammal species are slightly more diverse within H56 with the presence of arctic hare specimens, which are not found in either midden context.

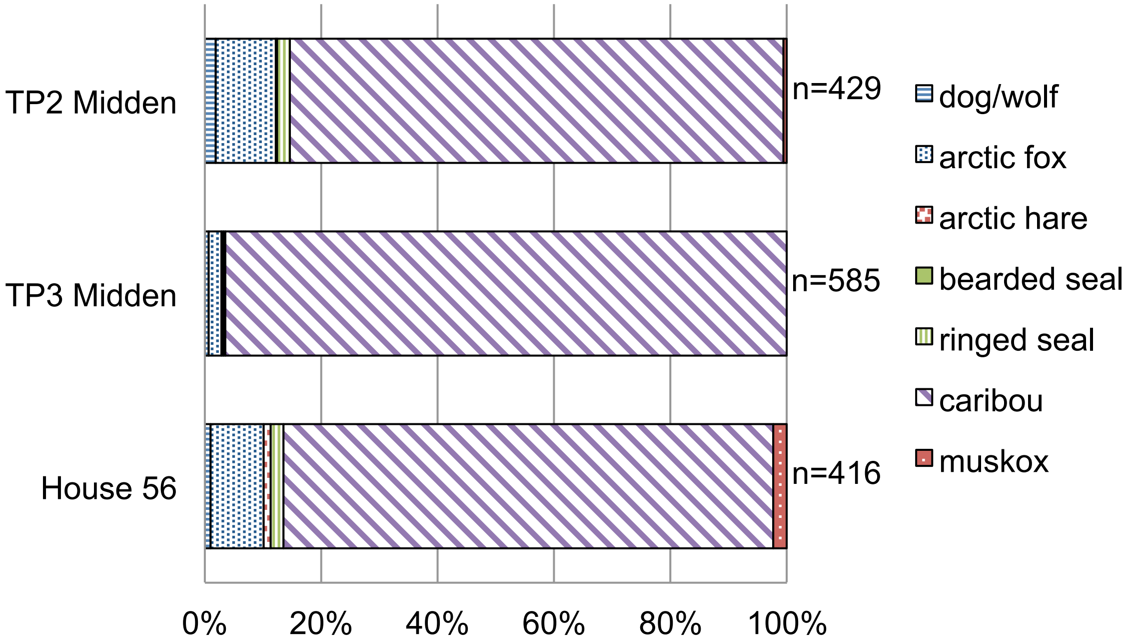


Figure 7.16 Distribution of mammals in the Thule Inuit archaeofaunas from the Bell Site expressed as %NISP.

7.4.7 Animal Element Distributions

This section presents a detailed discussion of the skeletal element distributions of the primary resources at the site, fish and caribou. Again, the distribution of seal skeletal elements is presented and a general discussion of bird element distributions and other mammals is also included. The indices referred to in this section can be found in Chapter 2, and the *Minimal Animal Units* (MAU's) and the *Minimum Number of Elements* (MNE's) discussed are presented in Appendix A.

7.4.7.1 Fish

The distributions of fish elements, identified to the genus *Salvelinus*, are fairly similar across the features, with fish elements belonging to the cranium, fins, and vertebral column identified in each sample. Although vertebral column elements are least abundant overall, they are more abundant in TP3 in comparison to TP2 and H56 where they are scarce (Figure 7.17). As mentioned earlier, bone density measures recorded for a similar salmonid species indicate that vertebral elements are denser than other parts of the skeleton (Butler and Chatters 1994), thus, their lower frequencies do not appear to result from density mediated attrition. Furthermore, significant relationships are not found between *Salvelinus* MAU's and the mean volume bone density (TP2 r_s=-0.38,p=0.13;TP3 r_s=-0.58,p=0.83;H56 r_s=-0.25, p=0.36) or between *Salvelinus* MAU's and bone mineral content (TP2 r_s=0.18, p=0.50; TP3 r_s=0.34, p=0.2; H56 r_s=0.10, p=0.71). Instead, this pattern may result from differences in processing, consumption, or disposal practices (see Whitridge 2001).

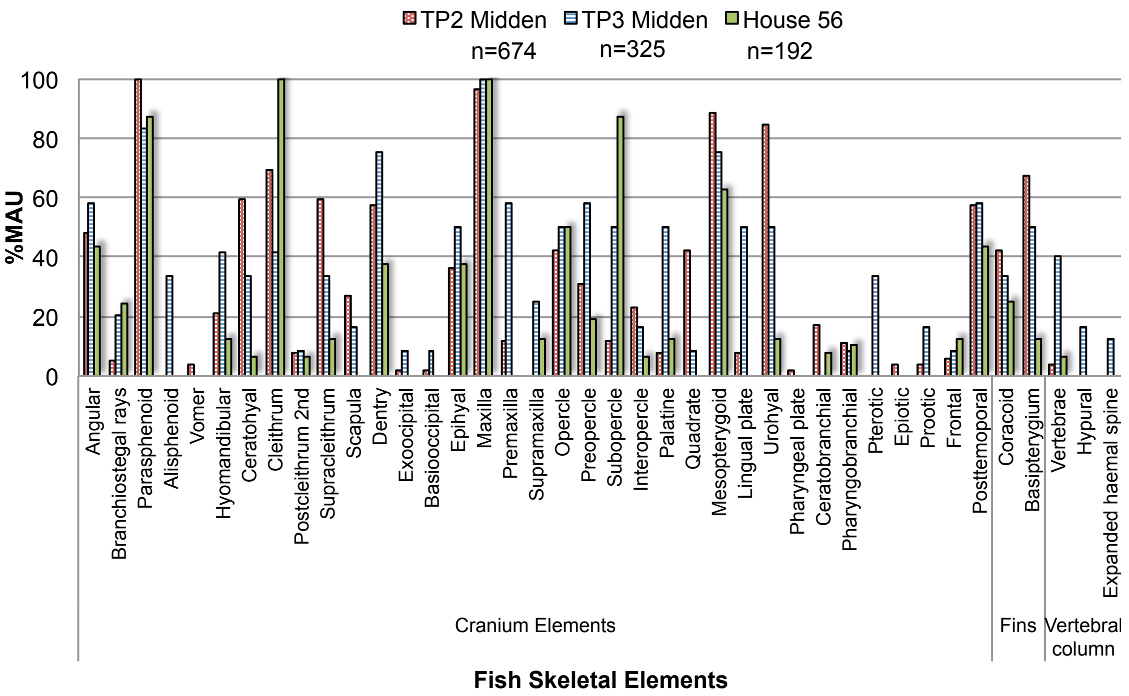


Figure 7.17 Distribution of fish skeletal elements identified to the genus *Salvelinus* in the Thule Inuit archaeofaunas from the Bell Site expressed as %MAU.

7.4.7.2 Caribou

The distributions of caribou elements are fairly consistent throughout the different contexts, with the entire carcass being represented (Figure 7.19), although vertebrae are generally infrequent in each context. The likely close proximity of caribou hunting to the site suggests minimal culling of animal parts to reduce weight for transport. No correlation is found between the caribou Food Utility Index (FUI) of Metcalf and Jones (1998) and the caribou element %MAU's (TP2 r_s=-0.15, p=0.44; TP3 r_s=-0.21, p=0.27; H56 r_s=-0.07, p=0.71), indicating that the meat utility of different skeletal parts did not play a major role in the distribution of caribou elements at the site. The caribou Density Index (DI), however, correlates moderately and positively significantly with the MAU's from the two middens (TP2 r_s=0.52, p=0.04;TP3 r_s=0.57, p=0.02) and strongly and positively with the caribou MAU's from H56 (r_s=0.87, $p \leq 0.001$), suggesting density-mediated attrition was a factor in the distribution of caribou elements at the site. This might explain the low frequencies of vertebrae in the features, as these elements are less dense than others, making them more vulnerable to taphonomic processes. The distribution of caribou elements within each feature also has a weakly to moderately significant, but negative, relationship with the Meat Drying Index (MDI) for caribou (TP2 r_s=-0.49,p=0.03; TP3 r_s =-0.66, p=0.002; H56 r_s =-0.67, p=0.002). The pattern is not consistent with dried meat being consumed and discarded at the site, but it may suggest caribou meat was dried at the site and transported elsewhere for consumption. In order to determine whether marrow processing favoring unsaturated fat occurred, caribou element %MAU's were compared with a Unsaturated Marrow Index (UMI; Morin 2007). Similar to the relationship with the DI, the UMI is positively, but weakly correlated with the two midden features (TP2 r_s=0.58 p=0.06; TP3 r_s=0.55 p=0.08), and strongly correlated with H56 (r_s=0.83 p=0.002). The significant relationships between caribou elements and the DI, the MDI and the UMI, make it difficult to further clarify which activity resulted in the caribou element distribution at the site.

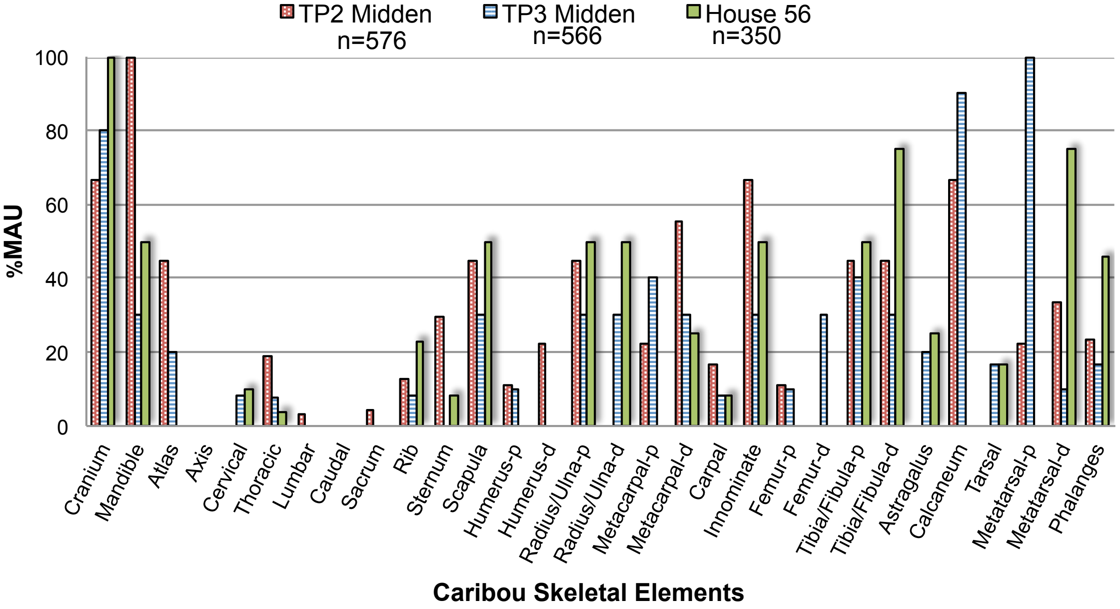


Figure 7.19 Distribution of caribou skeletal elements in the Thule Inuit archaeofaunas from the Bell Site expressed as %MAU's. The ends of long bones were tallied separately (p=proximal end, d=distal end).

7.4.7.3 Other Species

There are no identifiable patterns in the distribution of bird specimens throughout the features (see Appendix A). The majority of the arctic fox skeleton is found in TP2 and in H56, however the distribution of fox elements in TP3 is much more limited. Various specimens identified as dog, wolf or dog/wolf, are found in each feature, although the sample size is small and in no apparent pattern. Few muskox elements were found in TP2, including parts of a sternebra, a femur and a tibia (Appendix B). Arctic hare specimens including parts of a cranium, a humerus, a radius, a rib and a lumbar vertebra were identified in H56. Ivory fragments and whale specimens were quite rare at the site and were only identified in TP3.

7.4.8 Modification Frequencies

In order to reconstruct the impacts of taphonomy on the Thule Inuit faunal samples discussed here, all modifications found on the bone specimens were recorded (Table 7.7). These include cut marks, burning, and gnaw marks, as well as fragmentation rates. Only bone specimens identified as mammal are included in this section.

Table 7.7 Modification frequencies from the Thule Inuit contexts at the Bell Site.

Modification	**TP2**	**TP3**	**House 56**	**Total**
Cut marks	8	13	12	36
% cut marks[1]	0.3%	0.4%	0.8%	0.5%
Gnaw marks	49	73	43	165
% gnaw marks	2.0%	2.6%	3.0%	2.5%
Burn marks	1	89	60	150
% burn marks	0.04%	3.3%	4.1%	2.3%
% fragmentary	86.2%	90.4%	84.6%	87.3%
Fragmentation (NISP:MNE)[2]	2.7	2.2	3.5	2.9
NISP[3]	678	585	416	1679
MNE	311	237	165	713
Whole elements	93	56	64	213

[1] Percentages are calculated using total mammal NISP for each sample see Table 7.1.
[2] Whole elements are excluded from this calculation.
[3] This NISP is used for calculating fragmentation and excludes mammal bone specimens that could not be identified beyond class.

Cut marks are found on a relatively small proportion of the identified mammal bones, including specimens belonging to caribou, arctic fox, and large indeterminate mammal. Their distribution is found in no discernable pattern. Gnaw marks are identified on mammal bones from each context, and their frequency is relatively similar. These marks were variable. Several puncture marks ranging between 5-6 mm in diameter were identified; however the majority of gnaw marks were present in the form of scores, furrows, and pits which tend to result from prolonged chewing on the bone itself, not meat removal (Binford 1981). Burn marks are not consistent throughout the different contexts. Only a single bone specimen from TP2 exhibited burning, yet in TP3 and H56 the most frequent modification that occurred on the mammal bones were burn marks.

The %fragmentary, which indicates the proportion of the sample that represent fragmented elements, was consistent throughout the contexts and indicate the majority of the identified bone were not whole elements. The NISP:MNE ratio is slightly higher in H56 in comparison to the midden features, suggesting that in this feature elements were fragmented into slightly more pieces that were slightly smaller in size.

Overall, modification frequencies vary across the samples. Gnaw marks generally have the greatest impact since they are found on the largest portion of bone specimens from T2 and H56, however burning is greatest on the specimens from TP3.

7.4.9 Seasonal Indicators and Prey Demography

The faunal list includes several summer migrants such as geese, ducks, swans, and gull species. These species comprise the majority of the identified bird in each feature, whereas ptarmigan, a yearlong resident, comprises a much smaller proportion of the identified bird sample. The large proportions of caribou and fish in each context suggest that Thule Inuit hunting activities included the late summer arctic char run, as well as the early fall caribou migration. To obtain further seasonal indicators from the faunal samples the age distribution of prey species, particularly the presence of immature individuals was considered.

In TP2, at least one immature eider duck and two immature geese were present, and in TP3 one immature goose was also identified. These immature geese were quite similar in size and morphological development to the six-week-old goose in the reference collection. Thus, the immature goose and duck specimens identified in these contexts suggest Thule Inuit visited the site sometime between July and August.

The age distribution for seals was assessed using the timing of epiphyseal fusion known from recent seal populations recorded by Storå (2002). No unfused or fusing elements were identified, thus there is no indication that yearlings or immature individuals were captured, and a more precise season of death could not be determined (see Appendix A). However, the sample size is quite small and prevents any reliable inferences regarding age.

Epiphyseal fusion data was also recorded for caribou and assessed using the epiphyseal fusion sequence presented by Hufthammer (1995). Table 7.8 presents the epiphyseal data recorded on the identified caribou specimens. These data suggest that immature and adult caribou were harvested. In TP2, at least two calves were between two and six months of age, indicating their death occurred between August and December. When the available fusion data from the three contexts are considered together, the total unfused elements, in all age categories, account for 32% (n=49) of the caribou specimens assessed (n=153), and represent caribou killed before they reached four and half years of age. A total of 19 specimens belonging to the 'early fusing' element category were unfused, indicating 12.4% of the sample represent individuals younger than 18 months. An attempt was made to assess caribou sex distribution by recording measurements on adult caribou mandibles and metapodia; however, the very small sample size prevents a reliable reconstruction.

For caribou younger than 29 months, the use of tooth eruption sequences is generally considered most reliable (Gotfredsen and Møbjerg 2004; Grønnow et al. 1983; Miller 1974; Morrison and Whitridge 1997), however the high fragmentation of mandibles within the Thule Inuit samples resulted in only one specimen suitable for this type of analysis. This specimen has deciduous premolars and an erupting M1. Using Miller's (1974) tooth eruption sequence for caribou, this specimen belonged to a calf between three and five months of age, placing its death some time between September and November.

Table 7.8 MNE frequencies for unfused caribou elements from the Thule contexts at the Bell Site. Fusion data after Hufthammer (1995).

		TP2 Midden				TP3 Midden				House 56			
Caribou Element	Age in months	unfused	fusing	fused	total	unfused	fusing	fused	total	unfused	fusing	fused	total
Early fusing													
tuber scapulae	2-6	2	-	2	4	-	-	7	7	-	-	6	6
radius p	4-10	-	-	4	4	-	-	3	3	-	-	1	1
humerus d	6-15	1	-	2	3	1	-	-	1	-	-	1	1
phalanx 1 p	6-18	7	-	14	21	6	-	6	12	2	-	3	5
phalanx 2 p	6-18	-	-	-	-	-	-	-	-	-	-	-	-
Total		10	-	21	31	7		16	29	2	-	11	13
%unfused		32%				43.7%				15%			
Middle fusing													
tibia d	18-30	2	-	3	5	1	-	4	5	1	-	4	5
metacarpus d		1	-	2	3	2	-	-	2	1	-	4	5
metatarsus d		1	-	2	3	-	-	6	6	1	-	1	2
calcaneus	18-42	4	-	2	6	2	-	7	9	-	-	-	-
Total		7	-	9	17	5	-	17	22	3	-	9	12
%unfused		41.2%				22.7%				25%			
Late fusing													
radius d	36-48	-	-	-	-	-	-	5	5	1	-	1	2
femur p	36-48	1	-	-	1	-	-	1	1	-	-	1	1
femur d	36-48	2	-	-	2	2	-	1	3	-	-	-	-
tibia p	36-48	2	-	1	3	-	-	1	1	2	-	-	1
ulna p	42-48	4	-	-	4	-	-	1	1	1	-	1	2
humerus p	42-54	-	-	-	-	-	-	1	1	-	-	-	-
Total		9	-	1	10	2	-	10	12	4	-	3	7
%unfused		90%				16.7%				57.1%			
All groups %unfused		32%											

*p=proximal, d=distal

Few additional immature animals were identified in the Thule Inuit samples. A minimum of two immature arctic fox contributed to the faunal samples from TP2. Epiphyseal fusion data is not available for arctic fox, however data recorded for red fox (*Vulpes vulpes*) by Harris (1978) are used as a proxy (see Appendix A). Unfused cervical vertebrae from at least one individual suggest the animal was killed before it was four weeks of age. Since arctic fox generally give birth in June, this would suggest the animal was killed between June and August.

Taken together, these faunal data suggest Thule Inuit were at the site sometime during the summer, possibly late spring. They concentrated their efforts on char and caribou that are abundant in the area during late summer/fall, and perhaps stayed in the area for some part of the winter fishing on the lake ice.

7.5.1 Comparing Late Dorset and Thule Inuit Faunal Remains from the Bell Site

Late Dorset and Thule Inuit occupied the Bell Site sequentially between the 11th and 16th centuries CE. Both groups would have had similar access to the region's resources. As seen in the previous sections, some variation does occur within the Late Dorset and Thule Inuit faunal samples. It also must be recognized that archaeological features generally represent activities that have occurred over an extended period, and it is possible that each of the midden contexts discussed here mask smaller scale inter-annual or inter-decadal changes. In this section, the faunal material from each group is aggregated and compared in order to highlight any variability that may reflect culturally distinct ways in which they interacted with animals. Following the comparison, the potential explanations for why variability may have occurred are discussed. For the purposes of this research, in order to better understand the impacts of technological differences on the Late Dorset and Thule Inuit archaeofaunas, and ultimately how these two societies interacted with animals, several factors that influence the composition of faunal samples are explored. In addition to variable technologies, these factors, which are often interdependent, include taphonomic processes, season(s) of occupation, and storage practices.

7.5.1.1 Class Distribution

A total of 32 959 bone specimens were analyzed from six contexts at the Bell Site, roughly evenly divided between the Late Dorset and Thule Inuit samples. From the Late Dorset contexts, mammal contributed 60.3%, fish 35.7%, and bird 4%. From the Thule Inuit features, 51.2% of the bones are mammal, 46.2% are fish, and 2.6% are bird (Figure 7.21 Table 7.1 & 7.6). While the differences between the distribution of mammal, bird, and fish from the Late Dorset and Thule Inuit contexts are not dramatically different they are considered statistically significant (X^2=260.09, p<0.01).

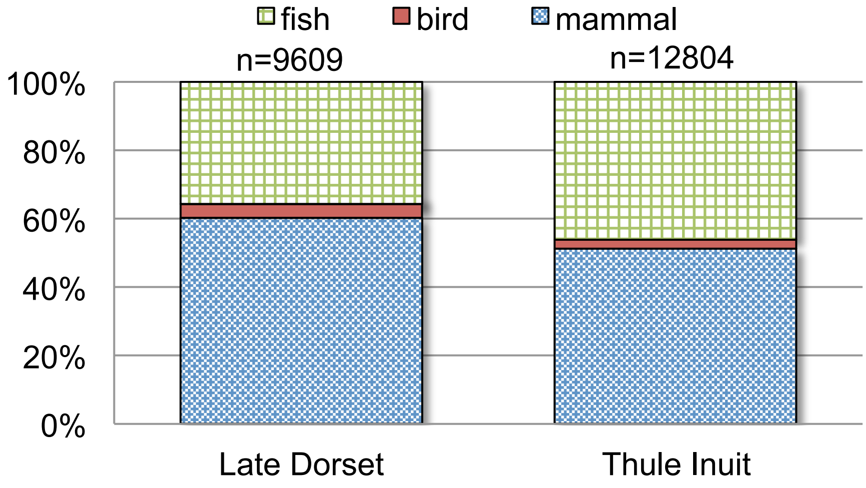


Figure 7.21 Class frequencies in the Bell Site archaeofaunas expressed as %NISP.

7.5.1.2 Fish Distribution

At the site, the identified fish species almost exclusively belong to the genus *Salvelinus*. In the Late Dorset features, arctic char comprises 8.7% of the identified fish species, over three times as frequent as lake trout, which comprises 2.4%. However, within the Thule contexts, arctic char comprises 7% of the identified fish, which is only one and half times as frequent as lake trout, which comprises 4.5%. The differences between the distribution of fish species in the Late Dorset and Thule Inuit contexts at the site is statistically significant (X^2=20.85, p<0.01). Measures of evenness indicate the distribution of fish species in the Thule Inuit sample is more even than the Late Dorset sample, and the Late Dorset sample is fairly strongly dominated by arctic char (Table 7.9).

Table 7.9 Taxonomic richness and evenness of fish species at the Bell site.

Diversity Measure	**Late Dorset**	**Thule Inuit**
Taxonomic richness	2	3
Shannon index of heterogeneity	0.525	0.889
Shannon Index of evenness	0.478	0.810
Reciprocal of Simpsons Index	1.519	2.212

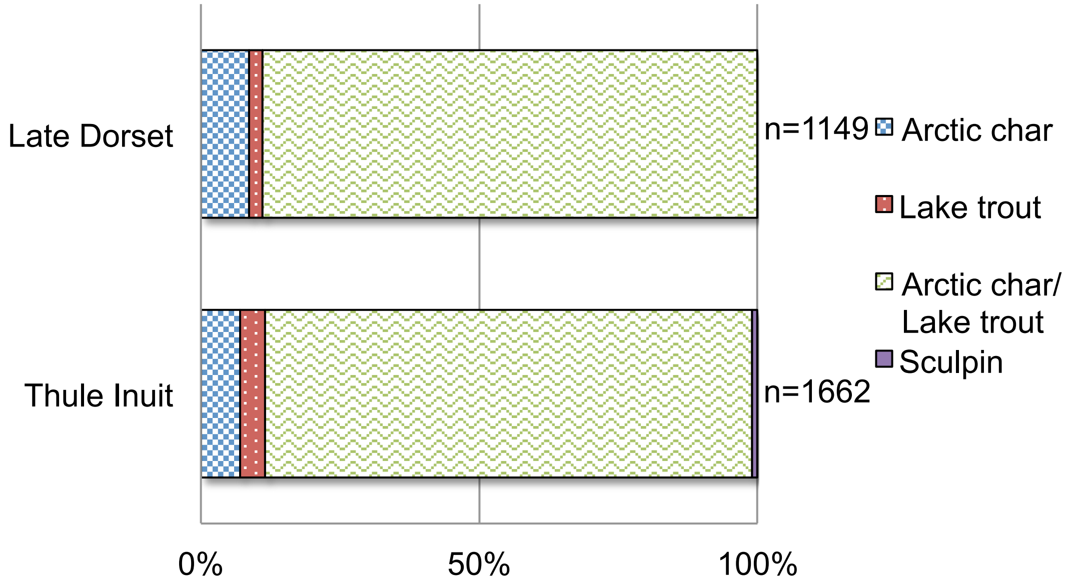


Figure 7.22 Distribution of fish species at the Bell Site expressed as %NISP.

7.5.1.3 Bird Distribution

The distribution of bird species is variable amongst the Late Dorset (n=383) and Thule Inuit (n=384) contexts (Table 7.1 & 7.6). A greater diversity of bird species is found in the Late Dorset features in comparison to the Thule Inuit features, which lacks jaegers, *Larus* species, and sandhill crane. Additionally, ptarmigan, a yearlong Arctic resident, comprises a higher proportion of identified bird specimens in the Late Dorset contexts, comprising 15.6%, in comparison to the Thule Inuit contexts where it comprises 9%. However, in both the Late Dorset and Thule Inuit contexts migratory bird taxa are most common. The differences between the distribution of bird species in the Late Dorset and Thule Inuit contexts at the site are statistically significant (X^2=30.2, $p<0.05$). Overall, the Late Dorset sample is more heterogeneous but slightly less even than the Thule Inuit sample (Table 7.10). Geese somewhat dominate both samples but more so in the Thule Inuit sample.

Table 7.10 Taxonomic richness and evenness of bird species at the Bell site.

Diversity Measure[1]	Late Dorset	Thule Inuit
Taxonomic richness	20	8
Shannon index of heterogeneity	2.28	1.68
Shannon Index of evenness	0.49	0.67
The reciprocal of Simpsons index	0.84	0.78

[1] See Appendix A for the categories used for this table.

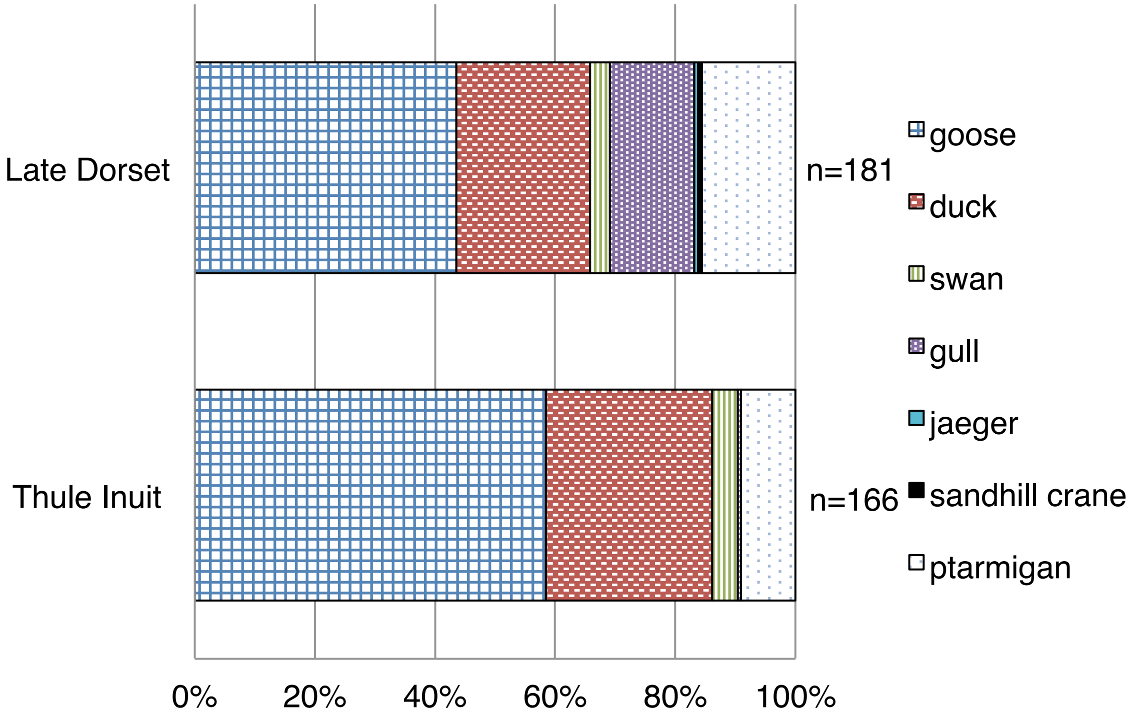


Figure 7.23 Distribution of bird species at the Bell Site expressed as %NISP.

7.5.1.4 Mammal Distribution

Some noteworthy differences also occur in mammal frequencies at the site. Late Dorset acquired a broader range of species, since wolverine and polar bear, were identified in the Late Dorset features but were absent from the Thule Inuit features (Table 7.1 & 7.6, 7.11). The only taxon present in the Thule Inuit sample and absent in the Late Dorset sample is dog. Overall, caribou is by far the most frequent mammal in all features, and is slightly more common in the Thule Inuit contexts, comprising 84-97% of the identified mammal specimens. Within the Late Dorset features, caribou is most frequent in H6, where it represents 80% of the identified mammal specimens. However, it contributes significantly less of the identified mammal specimens within the Late Dorset middens, with caribou contributing between 58- 65% of the identified mammal. Notably, Late Dorset acquired higher frequencies of both seal and arctic fox in comparison to the Thule Inuit at the site (Figure 7.24). Within the Late Dorset features, arctic fox accounts for 27.2% of the identified mammal specimens, whereas within the Thule Inuit features, only 7.2% of the identified mammal specimens were arctic fox. Within the Late Dorset contexts, seal, specifically small seal, accounts for 5.6% of the identified mammal specimens, however within the Thule Inuit contexts seal contributed a mere 1.5% of the identified mammal specimens. The distribution of mammal species between the Late Dorset and Thule Inuit samples differs significantly (X^2=383.2, $p<0.05$). Overall, taxonomic heterogeneity and taxonomic evenness for mammal species is greater in the Late Dorset sample, and distribution of mammal species in the Thule Inuit sample is more strongly dominated by caribou.

Table 7.11 Taxonomic richness and evenness of mammal species at the Bell site.

Diversity Measure	**Late Dorset**	**Thule Inuit**
Taxonomic richness	9	7
Shannon index of heterogeneity	0.95	0.49
Shannon Index of evenness	0.29	0.23
The reciprocal of Simpsons index	0.51	0.21

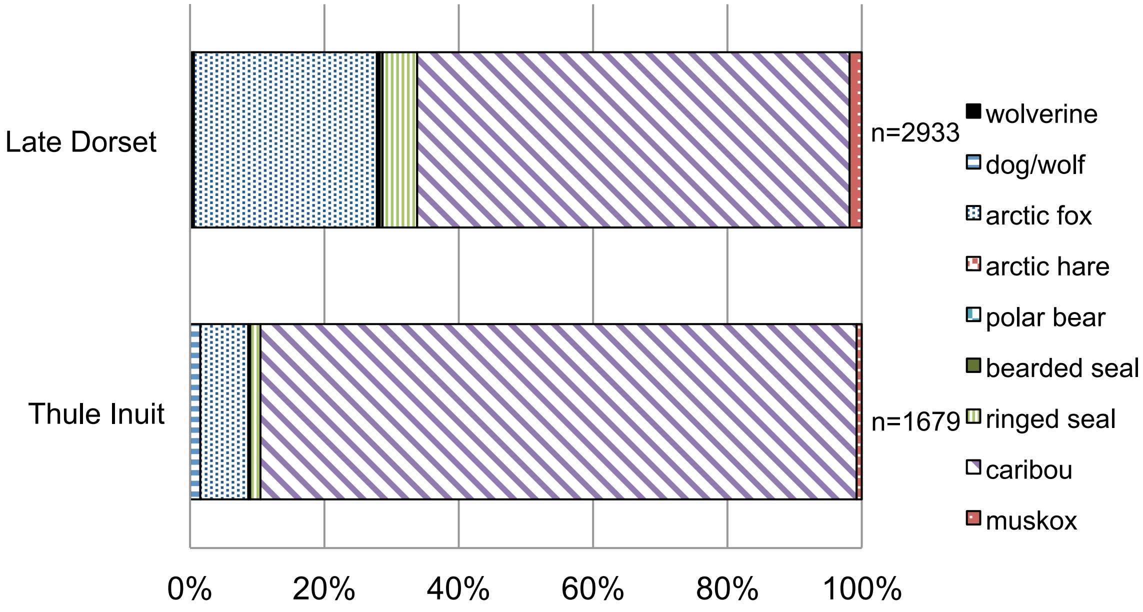


Figure 7.24 Distribution of mammal species at the Bell Site expressed as %NISP.

7.5.2 Animal Element Distribution

The element distributions of the primary resources at the site, fish and caribou, are generally consistent within both the Late Dorset and Thule Inuit archaeofaunas. In both archaeofaunas, the entire *Salvelinus* skeleton is represented, there is a predominance of cranial elements and moderate frequencies of fin elements, and elements belonging to the vertebral column are least frequent (Appendix A). Similarly, the entire caribou carcass was found in each of the Late Dorset and Thule Inuit samples , though in varying frequencies. As mentioned earlier, it is likely most caribou hunting occurred at the caribou drives found within a few kilometres from the site, and as a result it appears both Late Dorset and Thule Inuit largely brought entire carcasses back to camp. Likewise, there is no significant relationship between the distribution of caribou elements in either sample and the caribou food utility index, but all caribou element distributions in are positively and moderately significantly correlated with bone density (see Appendix A), thus indicating that they were likely impacted to some extent by taphonomic factors. Additionally, the distribution of caribou elements within all samples have negative but significant relationships with the meat-drying index (see Appendix A), and may suggest that Late Dorset and Thule Inuit both dried caribou meat at the site, but also transported it elsewhere for consumption. Again, all contexts correlate significantly with the unsaturated marrow index, thus, it is difficult to further clarify which activity had the primary impact on the caribou element distributions within both the Late Dorset and Thule Inuit archaeofaunas.

There are few identifiable patterns in the element distributions of secondary resources at the site. There is no distinct pattern in the distribution of bird specimens in either the Late Dorset or Thule Inuit archaeofaunas. The majority of the arctic fox skeleton is found in both the Late Dorset and Thule Inuit contexts, although this varies from feature to feature. The distribution of seal skeletal elements at the site is somewhat variable. The identified specimens in the Late Dorset samples suggest they transported the entire seal carcass to the site, however, seal specimens are limited to rear elements such as femora, tibiae, and the hind flipper in the Thule Inuit samples. The seal element distributions in all the features at the site do not correlate with food utility or bone density, with the exception of the TP4, which has a negative and weak correlation with density (see Appendix A). Due to small sample sizes, it is not possible to determine whether these differences represent important differences in carcass transport patterns. There are differences in the distribution of muskox elements at the site. The majority of the muskox skeleton is found in the Late Dorset contexts, although this varies amongst the features, however muskox specimens are rare in the Thule Inuit contexts and are limited to parts of a sternebrae, a femur, and a tibia. In both the Late Dorset and Thule Inuit samples, there are no distinct patterns in the element distribution of the remaining identified mammal species which are represented by various skeletal elements.

7.5.3 Modification Frequencies

The identified mammal bones of the Late Dorset and Thule Inuit features exhibit a similar frequency of cut marks (Table 7.12). There is little variability between the frequency of burnt specimens where 3.6 % of the identified mammal bones from the Late Dorset contexts were burnt, and 2.3% of the bones from the Thule Inuit contexts were burnt. Gnaw marks are found on 2.5% of the identified mammal bones from the Thule Inuit features, and on 1.6% of the identified bone from the Late Dorset features. Again, this is not much variability, however the higher frequency of gnaw marks from the Thule Inuit features was expected since they had dogs, while Dorset did not. In addition, gnaw marks can appear as either punctures, pits, scores or furrows, depending on the activity of the scavenger (Binford 1981). All the gnaw marks on the Late Dorset specimens were punctures that are 2-3 mm in diametre, suggesting arctic fox was the culprit. The gnaw marks were more variable in the Thule Inuit samples, where scores, furrows, and pits, which result from prolonged chewing on the bone itself, not meat removal (Binford 1981), were more frequent than puncture marks. When puncture marks were found they ranged between 5-6 mm in diametre. The %fragmentary measure indicates the majority of the Late Dorset and Thule Inuit mammal specimens are fragmented elements, not whole elements, although whole elements account for a larger proportion of the Thule Inuit specimens. The intensity of bone fragmentation (NISP:MNE), however, is consistently low across the Late Dorset and Thule Inuit contexts, suggesting bone elements were broken into similar size and number of pieces at the site. The higher %fragmentary in the Thule Inuit contexts potentially resulted from dog activities, and while the frequency of gnaw marks is not much greater in the Thule Inuit features than in the Late Dorset features, it is possible that the fragmentation of bones obscured some of these marks.

Table 7.12 Modification frequencies at the Bell site.

Modification	Late Dorset	Thule Inuit
Cut marks	86	36
% cut marks	1.1%	0.5%
Gnaw marks	75	165
% gnaw marks	1.6%	2.5%
Burn marks	278	150
% burn marks	3.6%	2.3%
%fragmentary	66.4%	87.3%
Fragmentation (NISP:MNE)[2]	2.3	2.9
NISP[3]	2933	1679
MNE	1832	713
Whole elements	985	213

[1] Percentages are calculated using total mammal NISP for each sample see Table 7.1.
[2] Whole elements are excluded from this calculation.
[3] This NISP is used for calculating fragmentation and excludes mammal bone specimens that could not be identified beyond class.

7.5.4 Seasonality and Prey Demography

The faunal distribution across all the contexts, specifically the large proportions of caribou and fish, indicate that at a minimum both Late Dorset and Thule Inuit took advantage of the region's more productive upstream late summer arctic char run, as well as the early fall caribou migration. Late Dorset acquired higher frequencies of ptarmigan (15.6% vs. 9%) and fox (27.2% vs. 7.2%), both species that are available at the site year-round, possibly suggesting they inhabited the site for a longer duration throughout the year than Thule Inuit. To gain a further understanding of which seasons Late Dorset and Thule Inuit inhabited the site, the age distribution of prey species, immature individuals in particular, were considered.

In the Late Dorset assemblage, a MNI of five immature geese, one immature duck, and one immature swan were found. In addition, at least one goose specimen exhibited significant deposits of medullary bone indicating it was about to lay eggs, since this generally occurs at the end of May the animal likely died no more than a few weeks prior. This suggests Late Dorset were at the site sometime during mid/late May. In the Thule contexts, a MNI of three immature geese, and one immature duck were found, suggesting Thule Inuit were at the site sometime during July or August.

Using available epiphyseal fusion data from small seals, age at death estimates were made (Table 7.3). In the Late Dorset assemblage there are a minimum of three yearlings, that were killed between April and September, and at least one fetal or newborn, killed between March and May. In the Thule assemblage, there are no un-fused elements, therefore the data do not allow for a more precise season of death to be determined.

In the Late Dorset assemblage, caribou epiphyseal fusion data indicate a minimum of five calves aged between two and six months, were killed sometime between August and December (Table 7.4). Another four were aged between four and ten months, indicating deaths occurred between October and April. Of the specimens assessed (n=263), 46% (n=121) represent animals killed before they reached four and a half, and 18% (n=56) represent individuals younger than 18 months. In the Thule Inuit assemblage, epiphyseal fusion on specimens from two calves indicates they were killed between August and December (Table 7.8). Overall fusion data from the Thule Inuit assemblage indicates 32% (n=49) of the specimens assessed (n=153) represent animals younger than four and a half years, and 12.4% represent account for individuals less than 18 months of age. However, the differences between the distributions of young caribou in the assemblages are not statistically significant (X^2=4.23, p=0.120).

Data derived from caribou tooth eruption sequences provide indicators that Late Dorset may have also been at the site for a longer period throughout the year. In the Late Dorset assemblage, mandibles were identified from two calves aged between three and five months, and one mandible was from a calf between six and ten months, thus the younger of these calves would have been killed between September and November, with the older being killed between December and April (Table 7.5). Another mandible was from an individual between 16-21 months of age, thus would have been killed sometime between October and March. In the Thule Inuit assemblage, one mandible represents a calf killed between three and five months, placing its death sometime between September and November.

Immature individuals of other species were also identified in both the Late Dorset and Thule Inuit samples. While it is not always possible to determine which season these animals were killed in, they do indicate that young, smaller animals were also harvested.

From the Late Dorset contexts, one immature muskox that would have been killed sometime during November or December was identified. One immature arctic hare, a minimum of three immature arctic fox, and one immature wolverine were identified. Fewer additional immature specimens are found in the Thule Inuit contexts and are limited to a minimum of two immature arctic foxes that may have been killed July and August.

Table 7.13 Seasonality indicators for Late Dorset and Thule Inuit at the Bell Site.

	Month	**Late Dorset**	**Thule Inuit**
summer migrants (bird)	May-July	84.4% of identified bird	91% of identified bird
seal metric data	April-September	MNI 2 yearlings	
	March-May	MNI 1 fetal or newborn	
caribou metric data	August-December	MNI 5 calves	MNI 2 calves
	October-April	MNI 4 calves	
caribou tooth eruption	September-November	MNI 2	MNI 1 calve
	December-April	MNI 1	
	October-March	MNI 1	
immature bird	July/August	MNI 7	MNI 2
egg-laying bird	May/August	MNI 1	
immature fox	June-August	MNI 5	MNI 1
immature muskox	November-December	MNI 1	

7.5.5 Discussion and Conclusion

Taken together, these various comparisons indicate broad similarities between the subsistence and settlement patterns of Late Dorset and Thule at the Bell site, though some noteworthy differences do occur. The faunal analyses suggest that taphonomic processes generally had a similar impact on both the Late Dorset and Thule Inuit faunal material with one important difference – the impact of dogs on the Thule Inuit samples. The Thule Inuit faunal samples have a slightly greater overall frequency of gnawing on mammal bones, and differences in the size of punctures confirm the expected and major impacts of dogs. While it is difficult to quantify the impact of dogs, it is highly likely that they differentially affected various categories of bones, and in particular likely removed large amounts of fish bone from the archaeological record. Thus, it is possible that the fish frequencies, which currently appear quite similar between the Late Dorset and Thule Inuit contexts, are distorted, and that originally Thule Inuit relied to a greater degree than the Late Dorset on fish.

Both of these occupations are broadly similar, and are based largely around the consumption of caribou and arctic char. This is, of course, expected; and these same two species drew Inuit to this region well into the twentieth century (Friesen 2004a). The dominance of caribou and char at a site with semi-subterranean houses and deep extensive middens is, de facto, evidence for storage of these two taxa in significant amounts. In fact, the upstream arctic char run, occurring from mid-August to mid-September, and the fall caribou migration, which occurs mainly in September and October, are both limited duration events, which would have supplied large amounts of food only if their products were stored for later consumption.

Beyond these major similarities, several differences do occur. Most generally, the Thule Inuit economy appears to be more "focal" than its Late Dorset counterpart, which had higher taxonomic richness and evenness (Table 7.9-7.11). This is most evident in the mammal assemblages, for which caribou make up a significantly higher proportion for Thule Inuit, while the Late Dorset acquired a broader range of secondary resources. Likewise, Late Dorset ate more birds than the Thule Inuit, both in terms of total contribution to diet and in terms of number of bird species. Fish, on the other hand, runs against this general pattern, in that it seems that Thule relied on arctic char and lake trout in almost equal proportions, as opposed to the Late Dorset concentration on char.

The distribution of skeletal elements is also somewhat variable between the Late Dorset and Thule Inuit contexts. The distribution of *Salvelinus* specimens suggests that the two groups used differing processing methods. Late Dorset appear to have processed the fish outside the house structure where parts belonging to the vertebral column were frequently deposited, and brought the rest of the fish inside the house, where the head in particular was further processed, consumed and disposed of. There is no clear pattern in the distribution of fish elements within the Thule Inuit contexts and it should be noted that dogs likely impacted the distributions identified, and were perhaps fed certain parts of the skeleton.

The distribution of caribou elements at the site suggests that both groups utilized all parts of these animals. It is difficult to clarify whether the caribou element distributions were the result of density mediated attrition, meat drying practices, or marrow rendering, as the samples have significant relationships with each of these indices. Overall, a slight difference does occur with vertebrae being less abundant within the Thule Inuit contexts in comparison to the Late Dorset contexts. This is potentially related to the presence of dogs in Thule Inuit society, since their scavenging activities likely impacted the distribution of skeletal elements at the site, and may have decreased the presence of various elements in the features analyzed.

Site seasonality is difficult to deduce, since there is such an overwhelming dominance of caribou and arctic char in all contexts. This alone suggests both groups were at Iqaluktuuq in late summer and early fall, in order to take advantage of the arctic char run and fall caribou migration, when caribou were in prime condition. The caribou epiphyseal and tooth eruption data for both Late Dorset and the Thule Inuit samples are all consistent with fall kills, with the exception of a single mandible from a Late Dorset context which seems to indicate a winter/early spring kill. Seal ages from the Late Dorset contexts indicate one spring kill and two spring or summer kills, though the Thule Inuit samples did not produce any seals allowing seasonal interpretations. Both samples contain a variety of waterfowl available only during the warm season, and in both cases juvenile birds indicate a likely presence in the early summer. However, it would appear that at least some Late Dorset arrived before eggs were laid in late May. Also in relation to birds, the Late Dorset sample contains a much higher proportion of year-round resident birds, in particular ptarmigan, than does the Thule Inuit samples. The semi-subterranean nature of both houses suggests that both groups were at the site for at least part of the cold season. When the proportions of lake trout to Arctic char are extrapolated, it seems that the Thule Inuit obtained significantly higher frequencies of lake trout. This may indicate fish acquisition during a broader seasonal range than was true for the Late Dorset, including during most of the winter through the ice of nearby Ferguson Lake. To summarize these seasonal indicators further is difficult, but overall they appear fairly similar, with minor differences cancelling each other out. The Late Dorset sample contains evidence for additional seasons of occupation, but this is mainly due to seal seasonality, which was not possible to assess for Thule due to smaller sample sizes.

It must be noted that the impacts of contrasting technologies of Late Dorset and Thule Inuit are difficult to tease out of the faunal frequencies. One possible difference, though difficult to separate from seasonality issues, is the greater frequency of lake trout in the Thule Inuit samples. This may result from a broader range of fishing technologies, including the use of lures and multiple types of fish spears (see Chapter 5). In addition, the fact that a higher proportion of caribou in the Thule Inuit contexts were adults may indicate that Inuit, with their bows and arrows, could be more selective in their hunting than their Late Dorset counterparts. Late Dorset people appear to have harvested more immature mammals, including immature muskox, arctic fox and arctic hare. Furthermore, the overall higher proportion of caribou with the mammal sample for the Thule Inuit may indicate higher success rates resulting from bow and arrow hunting. Thule Inuit appear to have relied particularly heavily on caribou and the two species of salmonid fish, apparently relying heavily on stored food for most or all of the winter. Late Dorset, while also relying mainly on these species, spent much more effort to acquire additional mammal and bird species, most notably seal and fox.

Chapter 8

Grinnell Peninsula, North West Devon Island

8.1 Introduction

The archaeofaunas analyzed from the Grinnell Peninsula, northwestern Devon Island, were excavated from: 1) a Late Dorset site at Hornby Head (RbJq-1); and, 2) a Thule Inuit occupation located at Porden Point (RbJq-6). These sites are situated directly across from one another at the southwestern end of the Peninsula, and are separated by a small bay approximately 5 km wide (Figure 8.1). This chapter is divided into four sections: first, the region's physical environment and ecosystem are presented; second, the history of archaeological research conducted on the Grinnell Peninsula is reviewed; third, the Late Dorset and Thule Inuit study sites including site organization, the description of the relevant archaeological features and corresponding archaeofaunas, are discussed consecutively; and finally, the results of the zooarchaeological analyses of both the Late Dorset and Thule Inuit archaeofaunas are compared, and factors that may have contributed to any observed variation are explored.

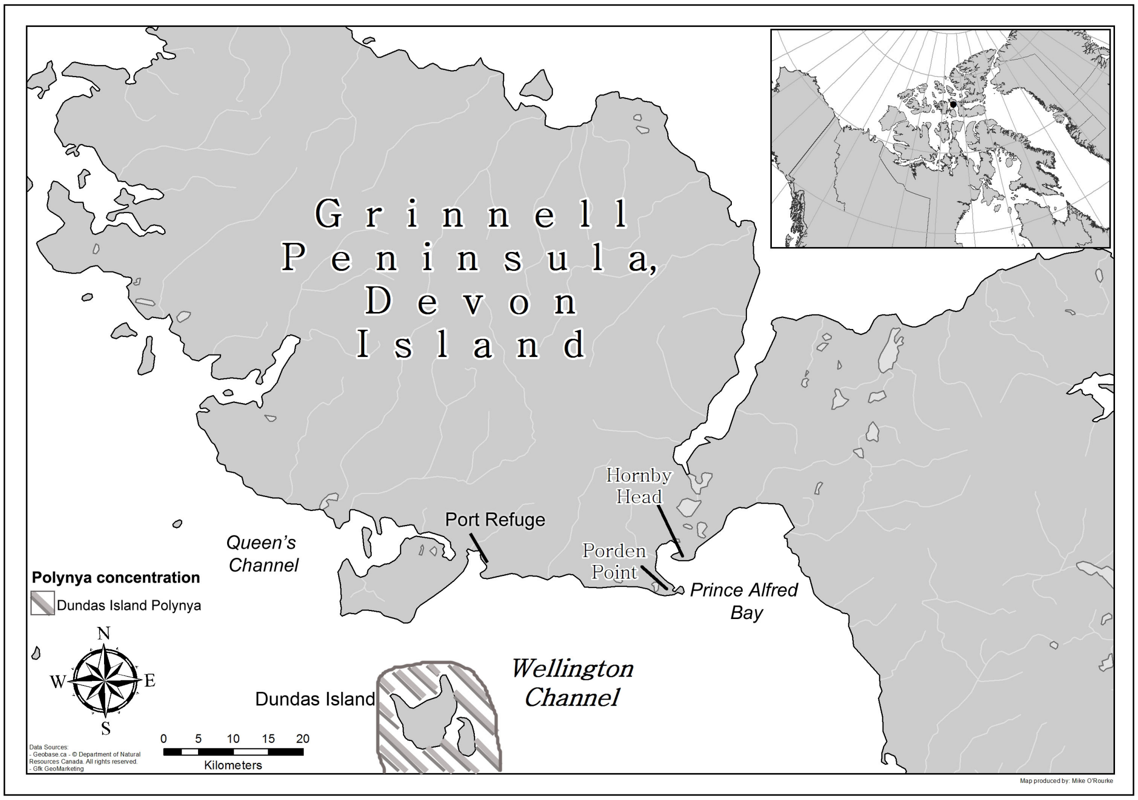


Figure 8.1 Map of the Grinnell Peninsula, southwestern Devon Island, Nunavut.

8.2 The Physical Environment and Ecology of the Grinnell Peninsula

The Grinnell Peninsula is an area approximately 100 km in diameter that connects to the rest of the island by means of a 10 km wide isthmus. The landscape consists of many steep cliffs that increase in height from the coast to the centre of the Peninsula, ranging from 100 to 500 metres above sea level (McGhee 1979). Small glaciers cover the cliffs found in the centre of the Peninsula and drain into many streams and several ponds that support a limited fish population. The Peninsula forms part of the Cornwallis Fold Belt, a geological region consisting of sandstone and limestone (Fortier et al. 1963; Wordie 1938). Porden Point and the southern portion of Hornby Head are comprised largely of beach sediments, such as gravel and sand, which form ridges and swales, and the centre of Hornby Head is comprised of till veneer that is thick and continuous (Dyke 2001).

The climate in this region is characteristic of a Polar Desert. When Robert McGhee (1979) surveyed the area between 1972 and 1977, summer temperatures reached a maximum of 16° C and a minimum of -3° C. The earliest record of winter conditions in this area comes from Sir Edward Belcher who visited the region in 1853 while in search of Sir John Franklin and his party. Belcher (1855:26-28) provides description of high winds, severe cold, and frequent snowstorms. Today, the nearest weather station is found in the community of Resolute (74° 43N, 94° 58 W), where between 1977 and 2000 the average annual temperature was -16.4° C. Between 1977 and 2000, the record extreme temperatures reached -52.2° C in January, and 18.3° C in July (Environment Canada n.d). Mean temperatures in June are above freezing, and in July they are between 4° C and 5° C (Edlund and Alt 1989). Characteristic of the High Arctic, the region is a sparsely vegetated polar desert (Gajewski 2012). The lowland vegetation consists of shrubs, and sedges and mosses dominate the wet areas (Edlund and Alt 1989). Small patches of lichens are found across the gravel beach ridges (McGhee 1979:4). On average, less than 100 mm of precipitation occurs throughout the year, 50 % of which is snow (Environment Canada n.d).

The sea bordering the Grinnell Peninsula is frozen for at least nine months of the year, with the exception of Penny's North Water, a small polynya located in the Queen's Channel to the west of the Grinnell Peninsula, and the Dundas Island Polynyas, a series of polynyas located to the south (Hannah et al. 2009). In January, open water develops between Dundas Island and Baillie-Hamilton Island, which is found just south of the Grinnell Peninsula, and persists throughout the winter months (Barber and Massom 2007). The maximum extent of the polynyas occurs in late April/early May. Ice break-up begins in June, and shallow waters and the placement of small islands form a bottleneck of ice. By late June/early July, Penny's North Water fuses with the Dundas Island Polynyas, forming a large ice free zone (Barber and Massom 2007).

These semi and permanently ice-free waters support a dense concentration of sea life, including ringed (*Pusa hispida*) and bearded seals (*Erignathus barbatus*), polar bears (*Ursus maritimus*), walruses (*Odobenus rosmarus*), belugas (*Delphinapterus leucas*), narwhals (*Monodon monoceros*), and bowhead whales (*Balaena mysticetus*) (Born et al. 1995; Cleator and Stirling 1989). While many of these species can be found throughout the year, only seals are prevalent year-round, however walruses and whales are found in higher numbers during the summer when migrating populations move into the area. The Queen's Channel also attracts a range of avian species. Several duck species (e.g., common eider, *Somateria mollissima*, king eiders, *Somateria spectabilis*, long-tailed duck, *Clangula hyemalis*), geese (e.g., snow goose, *Chen caerulescens*, high arctic brant, *Branta bernicla hrota*), loons (e.g., red-throated loon, *Gavia stellate*; yellow-billed loons, *Gavia adamsii*) and birds of prey such as the peregrine falcon (*Falco peregrinus*), can be found during the summer (Mallory and Gilchrist 2003; Prach and Smith 1992). Summer visitors also include a number of gull species (e.g., glaucous gull, *Larus hyperboreus*, Thayer's gull, *L. Thayeri*, and Sabine's gull, *Xema sabini*) that have colonies along the west coast of Grinnell Peninsula (Nettleship 1973), and species such as the ivory gull (*Pagohila eburnean*), which are rare today, also once bred in the area (Chardine et al. 2004; Mallory and Gilchrist 2003). Black-legged kittiwake (*Rissa tridactyla*), arctic terns (*Sterna paradisaea*), and fulmars (*Fulmarus glacialis*) are found in the spring and summer in colonies on cliff ledges and further out at sea when it is ice free (Mallory and Gilchrist 2003; Nettleship 1973). Similarly, black guillemot (*Cepphus grylle*) and thick-billed murre (*Uria lomvia*) are found and occasionally these birds will overwinter in High Arctic polynya locations (see Mallory and Grant Gilchrist 2005; Renaud et al. 1980). Large breeding colonies are not known in the area but are located further south in Lancaster Sound (Gaston et al. 2012).

Although less abundant than the area's marine resources, several important terrestrial species can also be found in the region. These include a relatively small population of Peary caribou (*Rangifer tarandus pearyi*). In 1961, the Devon Island caribou population was estimated to be 150 individuals (Tener 1963), and in 2008 surveys confirmed the presence of at least 17 caribou for the island (Jenkins et al. 2011). Since the 1960s Inuit hunters reported the Grinnell Peninsula area to be a reliable caribou hunting ground (Taylor 2005). Muskoxen (*Ovibos moschatus*) are also present on the island, and are known to be more abundant than caribou. Surveys conducted between 1966 and 1967 estimate the presence of at least 450 muskoxen on the Grinnell Peninsula (Freeman 1971) and over the past five decades Inuit have consistently observed the presence of muskoxen along the eastern coast of the Grinnell Peninsula (Taylor 2005). Arctic wolf (*Canis lupus arctos*), arctic fox (*Vulpes lagopus*), and arctic hare (*Lepus arcticus*) also inhabit the island, and small frequencies of arctic char inhabit rivers and ponds (Banfield 1974).

8.3 History of Archaeological Research

In 1972 Robert McGhee began archaeological investigation of the region (McGhee 1976b; McGhee 1979). During this field season, investigation was focused on the south coast of the Grinnell Peninsula in the vicinity of Point Refuge, which is located approximately 30 km west of Porden Point and Hornby Head (Figure 8.1). At Port Refuge, a large Thule winter village, as well as large Pre-Dorset and Independence I sites were investigated (McGhee 1981). McGhee and his team also surveyed Dundas Island, a small island located just south of the Grinnell Peninsula, where they excavated the Snowdrift Village Site, a small Late Dorset Site (McGhee 1981). McGhee and his team returned to the region for three additional field seasons in 1974, 1976, and 1977, during which they conducted field surveys and excavations across the Peninsula in order to better understand past environmental change (see McGhee 1976, 1979, 1981). His work on the Grinnell Peninsula resulted in an extensive inventory of Thule Inuit, Early and Late Dorset, and Pre-Dorset sites (McGhee 1981), demonstrating it to be an important region for many past Arctic societies.

8.4 Hornby Head (RbJq-1)

Hornby Head is located on the southeast corner of the Grinnell Peninsula on a south facing headland, 11 metres above sea level. It is situated directly across from Porden Point, from which it is separated by a small bay (Figure 8.1). The Hornby Head site is a small single component site. No radiocarbon dates are available, however almost all the artefacts appear to be of Late Dorset origin (McGhee 1976a; Park 2001). In 1974, Robert McGhee identified the site and undertook limited excavations (McGhee 1976a). In 2001, Robert Park, of the University of Waterloo, who was investigating Late Dorset settlement patterns and demography in the surrounding area, returned to the site and conducted further excavations. He identified four Late Dorset house structures, and an ambiguous rock structure labeled House 5 (Figure 8.2; Park 2001). In addition, an artefact and animal bone scatter with no associated structure was designated Area 6 (Park 2001). The animal bones from House 2 (H2), House 3 (H3), H3's midden, and a sheet midden that surround these structures were analyzed for the present project (Figure 8.3).

House 2 was the best-preserved house at the site. Prior to excavation, the structure appeared as a sub-rectangular depression with a slightly raised rim (Park 2001). A total of 18.5 square metres were excavated from within the house. A well-preserved axial feature, following the long axis of the house that ran from ENE-WSW was uncovered. Various artefacts were recovered, including knives, bifaces, endscrapers, microblades, an endblade, a soapstone lamp fragment, box fragments, fish spear prongs, harpoon heads, a fragment of iron, and an ivory carving of a bird's head. House 3 was less obvious on the surface, and there was evidence of lemming disturbance prior to excavation. Eight square metres from the house interior were excavated, revealing an axial feature that also ran ENE-WSW. H3 was not as well preserved as H2, although a number of artefacts and faunal remains were recovered. Two square metre units were excavated from the H3 midden, which is located directly east of H3 (Figure 8.3). Within the midden, depositional episodes were not distinguished. Two square metre units were also excavated from the sheet midden, which is located south west of H3, and north west of H2 (Figure 8.3). Depositional episodes were also not distinguished within this context.

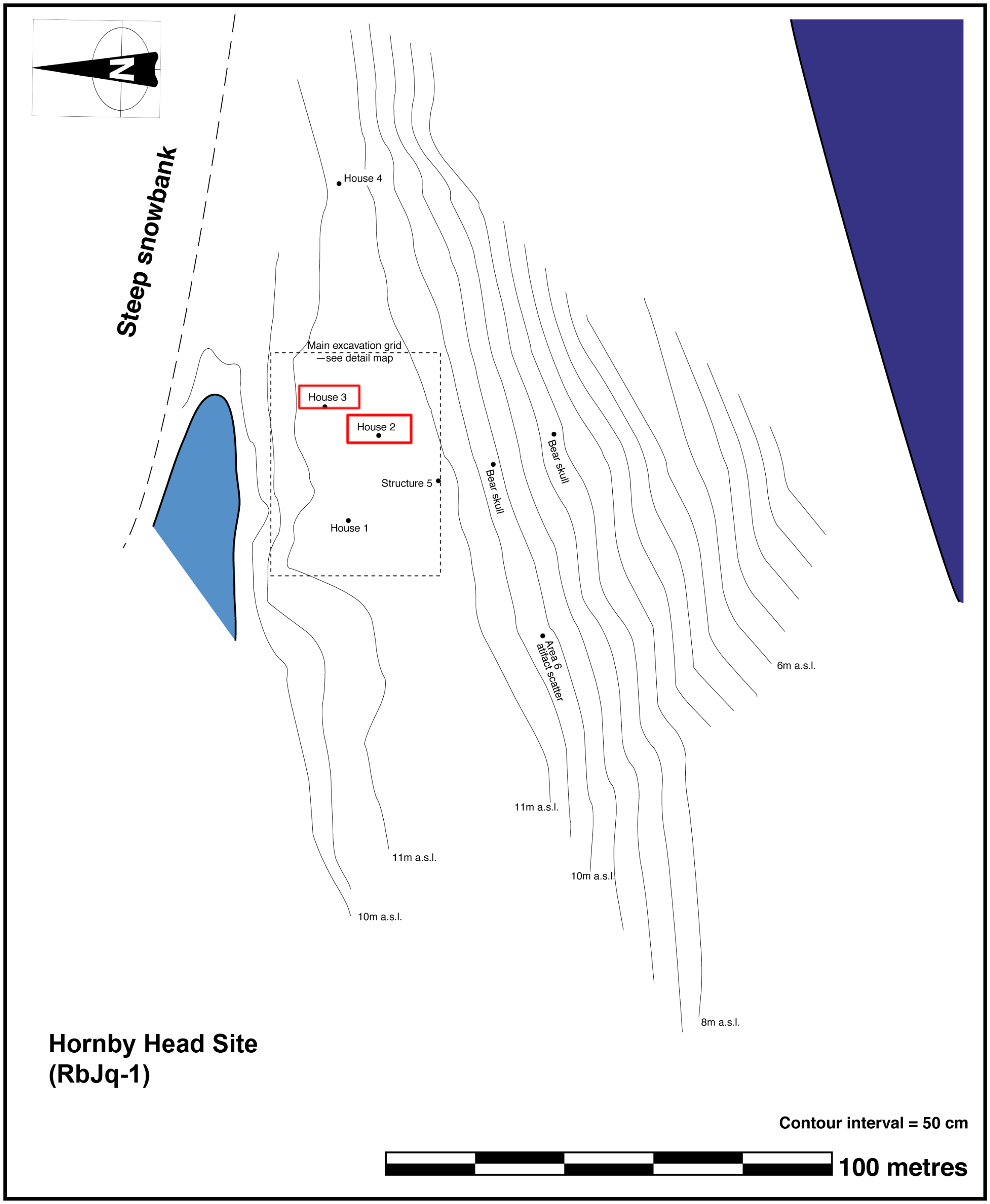


Figure 8.2 Distribution of features at the Hornby Head site (after Park 2001:34).

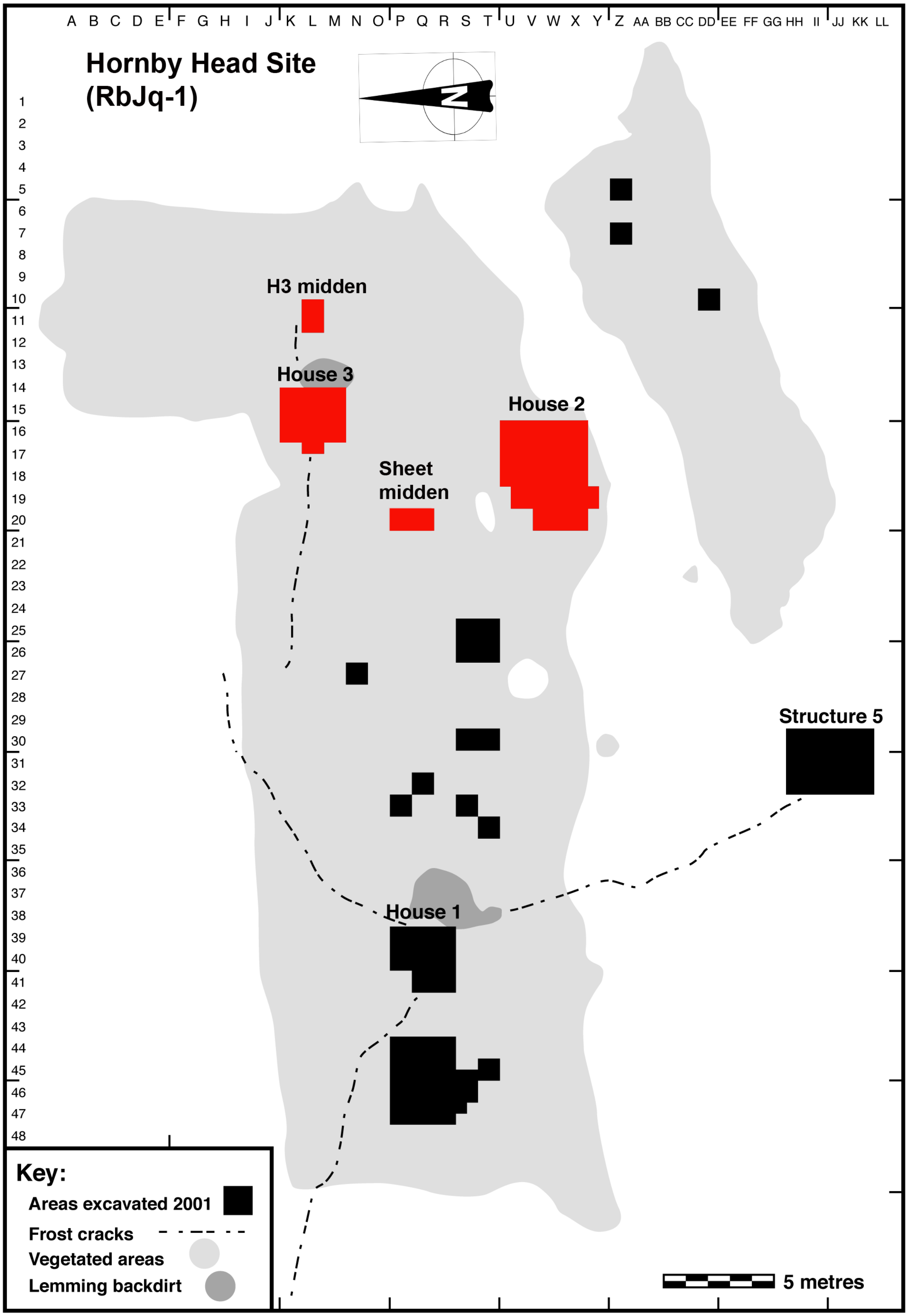


Figure 8.3 Site map highlighting the extent of excavations at the Hornby Head Site (after Park 2001:37).

8.4.1 Faunal Samples

All features were excavated by trowel, however the material was not screened. The H2 and H3 faunal samples consist of the faunal material excavated from the occupational levels of the house. The H3 midden and sheet midden faunal samples consist of the faunal material excavated from the two square metres in each context.

8.4.2 Zooarchaeological Analysis

The faunal samples discussed here total 1976 bone specimens, 94% of which has been identified to at least class (Table 8.1). Overall, bone specimens were well preserved, with the majority of specimens indicating early to middle stages of weathering (Stages 1-4; Behrensmeyer 1978).

8.4.2.1 Taxonomic Frequencies

There does not appear to be significant variability in class distribution amongst the different contexts (Figure 8.4). Mammal bones are predominant in all features, comprising at least 95.9% (H2) of the identified fauna. Bird specimens are less numerous. They are most frequent in H3 and H2 where they contribute 3.8% and 3.7% of the identified fauna, respectively. In the H3 midden, bird specimens comprise 1.1% of the identified fauna, and they are absent from the sheet midden. Fish bones are rare, and are only found in H2 where they comprise 0.4% (n=2) of the identified specimens.

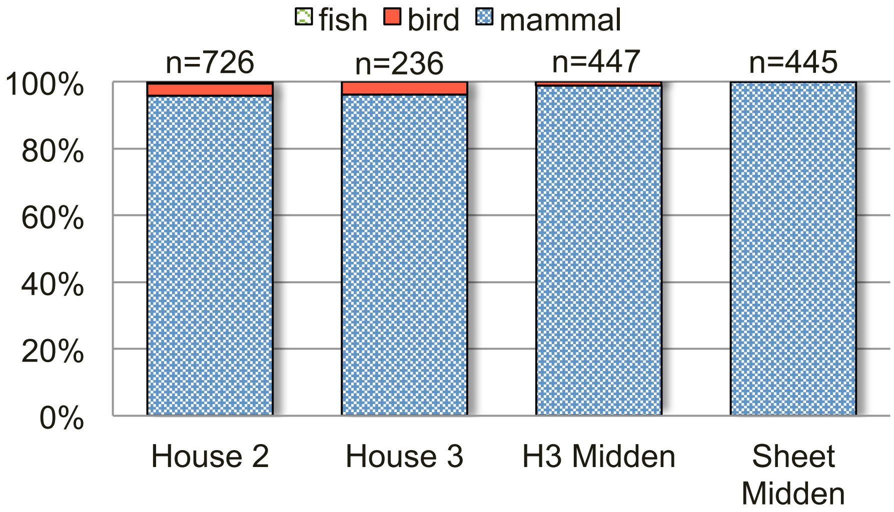


Figure 8.4 Class frequencies in the Late Dorset archaeofaunas from the Hornby Head site expressed as %NISP.

Table 8.1 Taxonomic frequencies from H2, H3, H3 midden, and the sheet midden at the Hornby Head site.

Taxon	**House 2**		**House 3**		**H3 Midden**		**Sheet Midden**		**Total**	
	NISP	%[1]	NISP	%	NISP	%	NISP	%	NISP	%
Salvelinus	3	100	0		0		0		3	100
Indeterminate fish	0		0		0		0		0	
Total Fish[2]	3	0.4	0	0	0	0	0	0	3	0.2
Canada goose	0		0		1	33.3	0		1	3.7
Snow goose	5	26.3	2	40	0		0		7	25.9
Goose	2	10.5	0		0		0		2	7.4
Eider	2	10.5	0		0		0		2	7.4
Duck	7	36.8	2	40	1	33.3	0		10	37
Small gull	1	5.2	1	20	0		0		2	7.4
Gull	2	10.5	0		1	33.3	0		3	11.1
Bird indeterminate	8		4		2		0		14	
Total Bird[2]	27	3.7	9	3.8	5	1.1	0	0	41	2.2
Small whale	0		1	0.6	1	0.3	0		2	0.1
Bowhead whale	0		0		0		1	0.3	1	0.1
Wolf	7	1.7	0		0		0		7	0.5
Dog/Wolf	1	0.2	0		0		0		1	0.1
Arctic fox	80	19.4	34	21.9	33	8.5	48	12.7	195	14.6
Arctic hare	4	0.9	3	1.9	1	0.3	3	0.8	11	0.8
Polar bear	13	3.1	3	1.9	0		1	0.3	17	1.3
Bearded seal	16	3.9	6	3.8	3	0.8	12	3.2	37	2.8
Large seal	6	1.4	1	0.6	2	0.5	2	0.5	11	0.8
Large seal/Walrus	2	0.5	0		0		0		2	0.1
Ringed seal	230	55.7	89	57.3	345	88.5	306	81	970	72.7
Walrus	5	1.2	7	4.5	4	1.0	2	0.5	18	1.3
Caribou	38	9.2	11	7.1	1	0.3	3	0.8	53	4
Muskox	10	2.4	0		0		0		10	0.7
Sea mammal	7		11		0		0		18	
Large sea mammal[3]	4		4		3		8		19	
Large terrestrial mammal[4]	12		6		1		0		19	
Mammal indeterminate	261		51		48		69		429	
Total Mammal[2]	697	95.9	228	96.2	442	98.9	455	100	1820	97.6
Indeterminate	96		5		10		0		111	
Total		**822**		**241**		**457**		**455**		**1976**

[1] %NISP'sare calculated by class, not by total sample.
[2] Class percentages are calculated using the total sample.
[3] Large sea mammal includes large seal, walrus, and whale species.
[4] Large terrestrial mammal includes caribou, muskox, and polar bear.

8.4.2.1.1 Fish

The two fish specimens from H2 were identified as *Salvelinus* (Table 8.1), and most likely belong to arctic char or lake trout.

8.4.2.1.2 Bird

Bird specimens are absent from the sheet midden and infrequent in the remaining contexts (Table 8.1), the majority of them belong to duck and goose species. Few gull specimens were also found in H2, H3, and in the H3 midden.

8.4.2.1.3 Mammal

Although many small seal elements are not easily distinguished to species, the majority of the small seal specimens identified at the site likely belong to ringed seal, as ringed seal is the only small seal species known to inhabit the area. This species is the most frequent mammal in all features (Figure 8.5). The frequency of ringed seal specimens, however, is quite variable throughout the contexts. A particularly large proportion of ringed seal bones was identified in the middens, comprising 88.5% of the identified mammal specimens in the H3 midden, and 81% in the sheet midden. They are less numerous in the house features, contributing 57.4% in H3 and 55.8% in H2. This may suggest that seals were initially processed outside the houses with many bones not being introduced into the structures, or that household cleaning activities resulted in seal bones from the house being re-deposited into the midden. Arctic fox comprised a significant proportion of the identified mammal specimens in each feature. They are most frequent in the house structures, contributing 21.9% in H3 and 19.4% in H2, and they are notably less frequent in both the midden contexts, where they comprise 12.7% in the sheet midden, and 8.5% in the H3 midden. Caribou specimens were also more frequent in the house structures, contributing 9.2% of the identified mammal specimens in H2 and 7.1% in H3, whereas in the middens they contributed less than 1%. A variety of additional mammal species were identified in each feature, although in low frequencies. All were more frequent in the house features in comparison to the middens, and include arctic hare, dog/wolf, polar bear, muskox, large seal, and walrus.

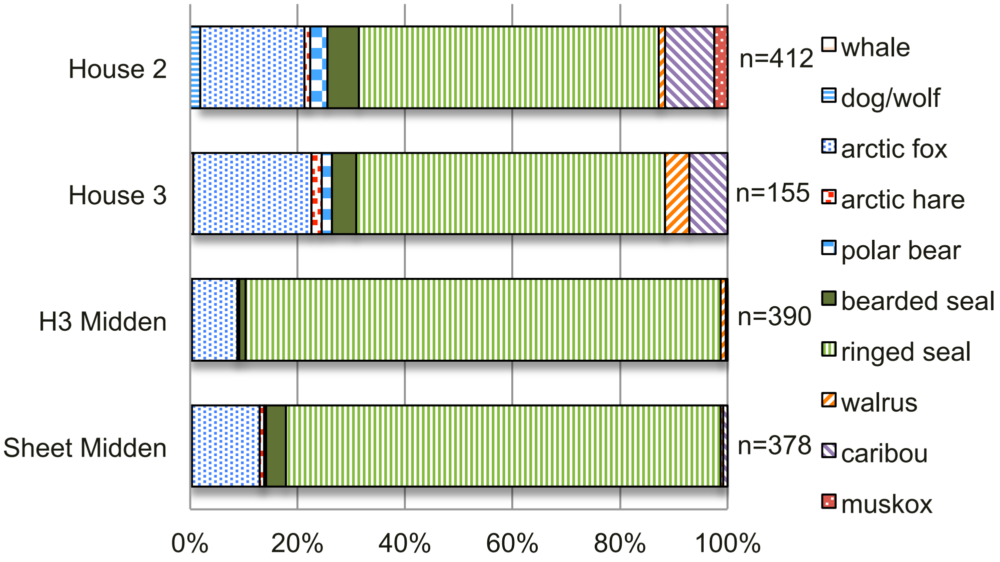


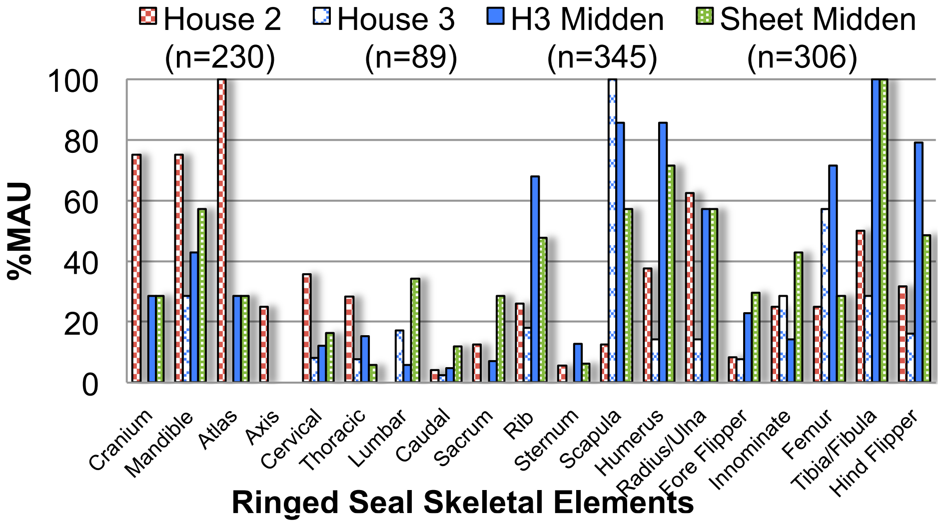
Figure 8.5 Distribution of mammal in the Late Dorset archaeofaunas from the Hornby Head site expressed as %NISP.

8.4.2.2 Animal Element Distributions

The distribution of animal elements can help infer how the animal was captured, butchered, consumed and disposed (Binford 1978; Lyman 2008; see Chapter 2 for further discussion). In this section, a detailed discussion of the skeletal element distributions of ringed seal is provided. No distinct patterns were found in the element distribution of other species, although these data can be found in Appendix B. Additionally, all data discussed in this section, including *Minimal Animal Units* (MAU's) and the *Minimum Number of Elements* (MNE's) can be found in Appendix B. The various indices that are applied can be found in Chapter 2.

8.4.2.2.1 Ringed Seal

Throughout the features the distribution of seal element frequencies is somewhat consistent, with the majority of the carcass represented in each feature (Figure 8.6). Ringed seals can be found in the waters surrounding the Grinnell Peninsula throughout the year, thus seal hunting likely took place close to the site. When ringed seal element %MAU's are compared to the small seal Food Utility Index (Lyman et al. 1992) no significant correlation is found (H2, r_s=0.21, p=0.46; H3, r_s =0.12, p=0.64; H3 midden, r_s =-0.15, p=0.61; sheet midden, r_s =0.01, p=0.9), suggesting the presence and absence of seal elements was not the result of the amount of meat attached to them. In order to determine whether the distribution of small seal skeletal elements was the result of density-mediated attrition, the MAU's were compared with the seal Bone Mineral Density Index (Lyman 1994). However, no significant relationship exists (H2, r_s =0.33, p=0.13; H3, r_s =-0.07, p=0.74; H3 midden, r_s =0.17, p=0.44; sheet midden, r_s =0.02, p=0.94), indicating bone mineral density did not significantly impact the distribution of small seal elements within the features. A preference-ranking index for various small seal skeletal elements was also considered in order to determine whether preferred skeletal parts correlated with the %MAU of small seal at the site. This qualitative measure considers the role of sensory characteristics, including taste/smell and texture, in the meat preferences of Iñupiat, from Barrow, Alaska (Diab 1998). No correlation was found between the preference-ranking index for small seal elements and the %MAU's for H2 ($r_{s=-}$ 0.24, p=0.47) or either midden (H3 midden, $r_{s=}$0.40, p=0.22; sheet midden, $r_{s=}$0.49, p=0.13), however a positive and significant relationship was found between the preference-ranking index for small seal elements and the distribution of skeletal elements within H3 ($r_{s=}$0.64, p=0.04). Explaining this correlation is not straightforward. While the greater relative abundance of tibiae, fibulae, and innominates in H3 may be related to taste preference, it is also possible butchery practices or household cleaning practices influenced this element distribution. Generally, hind limb elements are more abundant than the rest of the skeleton in H3, which may suggest these elements were disproportionally introduced into the house. When the absolute abundance of skeletal elements is considered, skeletal elements are generally more abundant in H3's associated midden in comparison to H3. This may suggest cleaning practices were somewhat responsible for the element distribution in these features, as elements were possibly removed from the house and re-deposited in the midden. However, there is no discernable pattern in regards to which elements were removed from the house and re-deposited in the midden.



*The fore flipper and hind flipper categories include metacarpals, carpals, and front phalanges, and metatarsals, tarsals, and hind phalanges, respectively.

Figure 8.6 Distribution of ringed seal skeletal elements in the Late Dorset archaeofaunas from the Hornby Head site expressed as %MAU.

8.4.2.3 Modification Frequencies

All modifications found on the bone specimens were recorded in order to help reconstruct the taphonomic processes that impacted the study assemblages. Cut marks, burning, and gnaw marks are presented in Table 8.2. Fragmentation rates, including the extent of fragmentation and the intensity of fragmentation were also considered. This section focuses solely on the modifications found on bone specimens identified as mammal, and excludes less robust fish and bird bones.

Table 8.2 Modification frequencies on mammal bones from the Late Dorset contexts at Hornby Head site.

Modification[1]	**House 2**	**House 3**	**H3 Midden**	**Sheet Midden**	**Total**
Cut marks	20	3	10	7	40
% cut marks	2.9%	1.3%	2.3%	1.5%	2.2%
Gnaw marks	66	18	40	21	145
% gnaw marks	9.5%	7.9%	9.0%	4.6%	8.2%
Burn marks	7	2	3	1	13
% burn marks	1%	0.9%	0.7%	0.2%	0.7%
%fragmentary	97.1%	96.8%	97.2%	94.7%	96.4%
Fragmentation (NISP:MNE) [2]	1.4	1.1	1.6	1.5	1.4
NISP[3]	413	156	390	378	1337
MNE	301	139	241	264	945
Whole elements	12	5	11	20	48

[1] Percentages are calculated using total mammal NSP for each sample see Table 8.1.

[2] Whole elements are excluded from this calculation.

[3] This NISP is used for calculating fragmentation and excludes mammal bone specimens that could not be identified beyond class.

Cut marks are found on fox, hare, large and small seal, and caribou specimens, but overall are present on a small proportion of the mammal bones (Table 8.2). The placement of the majority of cut marks is indicative of skeletal disarticulation. The placement of few cut marks on arctic fox and arctic hare specimens, however, suggests they resulted from skinning. Gnaw marks are the most frequent bone modification identified. They are found on 9.5% of the identified mammal specimens from H2, 9.0% of the H3 midden, 7.9% of H3, and 4.6% of the sheet midden. Gnaw marks were variable. They largely appear as puncture marks that range between 2-3 mm in diameter, although three specimens exhibited larger puncture marks measuring 5 mm in diameter. Gnaw marks in the form of scores, furrows, and pits were also identified. Burn marks are consistently rare, and represent 1% or less of the identified mammal bones in each feature. The %fragmentary, which indicates the proportion of the sample that is not whole elements, in each context is quite high (94.7% plus). The intensity of fragmentation (NISP:MNE) is consistently low, indicating mammal bones at the site are fragmented into a similar number and size of pieces.

Overall, bone modification frequencies are generally similar across the features. Gnawing had the greatest impact on the faunal samples, which primarily consisted of fragmented bone elements. Cut marks were also consistent throughout the samples, and were the second most frequent modification, although they were found on a generally small proportion of each sample; and burning had little impact on all samples.

8.4.2.4 Seasonal indicators and prey demography

Bird specimens are infrequent at the site, and those identified belong to summer migrants including geese, ducks, and gull species. The majority of the identified bone specimens, however, belong to ringed seals, which are year-round arctic residents. Thus, it is not possible to conclude whether or not Late Dorset were in the area during additional seasons based on the faunal list alone. For a better understanding of when the site was occupied, prey demography was considered, with specific attention given to specimens from immature individuals, as they have the greatest probability of yielding accurate season of death estimates.

Immature duck specimens were identified in H2 and in both middens, representing a MNI of one in each context. These specimens were quite porous and small, suggesting they were killed during late spring or early summer.

The fusion sequence of small seal elements was also considered to help establish age at death estimates (Table 8.3). Table 8.3 presents the fusion data recorded for each age group. Assuming the people who contributed to both samples were the same, the H3 and the H3 midden samples have been combined. Elements that fuse in the first year of life do so before the animal's sixth month, and are the best way to narrow the season during which an animal was killed. No yearling specimens were identified in H2, however several were identified in the H3 Total and sheet midden samples, representing an MNI of four and five, respectively. This is based on scapulae with unfused supraglenoid tubercles and metatarsals with unfused distal epiphyses. Given that ringed seals generally give birth between April-May, these yearlings were killed sometime between April-September. Additionally, a very porous and small femur and scapula suggest at least one fetal or newborn contributed to the H3Total sample. The nature of these specimens suggests death likely occurred sometime between March-May. At least two old adults were recovered from the H3 Total sample, based on tibiae with fused epiphyses. However, the fusion data suggests the majority of seals were killed before they reached seven years.

Table 8.3 Small seal element fusion data from the Late Dorset contexts at the Hornby Head site expressed as MNE's.

	H2				**H3Total**				**Sheet Midden**			
Age Fusion Sequence	unfused	fusing	fused	total	unfused	fusing	fused	total	unfused	fusing	fused	total
Y: metatarsal 1, distal	0	0	1	1	7	0	0	7	6	0	0	6
Y: pelvis, acetabulum	0	0	2	2	0	0	1	1	0	0	1	1
Y: scapula, supraglenoid	0	0	0	0	6	1	0	7	4	1	0	5
Total	0	0	3	3	14	0	0	15	10	1	1	12
% unfused	0%				93.3%				83.3%			
J: femur, proximal	4	0	0	4	10	0	1	11	7	0	0	7
J: radius, proximal	2	0	0	2	3	0	1	4	2	0	1	3
J: humerus, distal	1	0	1	2	5	0	0	5	5	0	0	5
Total	7	0	1	8	18	0	2	20	14	0	1	15
% unfused	87.5%				90%				93.3%			
YA: femur, distal	1	0	0	1	7	0	1	8	5	0	0	5
YA: humerus, proximal	1	0	0	1	2	0	0	2	1	0	0	1
YA: ulna, proximal	1	0	2	3	1	0	0	1	1	0	0	1
YA: tibia/fibula, proximal	2	0	0	2	0	0	1	1	4	0	1	5
Total	5	0	2	7	10	0	2	12	11	0	1	12
% unfused	71.4%				83.3%				91.6%			
OA: ulna, distal	1	0	0	1	3	0	0	3	3	0	0	3
OA: metatarsal 1,	0	0	0	0	1	0	0	1	1	0	0	1
OA: radius, distal	1	0	0	1	4	0	0	4	4	0	0	4
OA: tibia/fibula, distal	4	0	0	4	6	0	2	8	5	0	0	5
Total	6	0	0	6	14	0	0	16	13	0	0	13
% unfused	100%				87.5%				100%			

Y=yearling, J=juvenile, YA=young adult, OA=old adult

Femur measurements of small seals were also considered in an attempt to further clarify age distribution and season of death at the site. For ringed seals, comparisons of minimum femur shaft breadth and maximum femur shaft depth, and minimum femur shaft breadth and minimum femur length, have proven to be effective age of death indicators (Storå 1994, 2002). Figures 8.7 and 8.8 show the size distribution of ringed seals at the site. The metric data presented in Figures 8.7 and 8.8 represent at least four individuals. These data suggest the majority of ringed seals were harvested in their first year of life, although juveniles, and at least one adult were also taken.

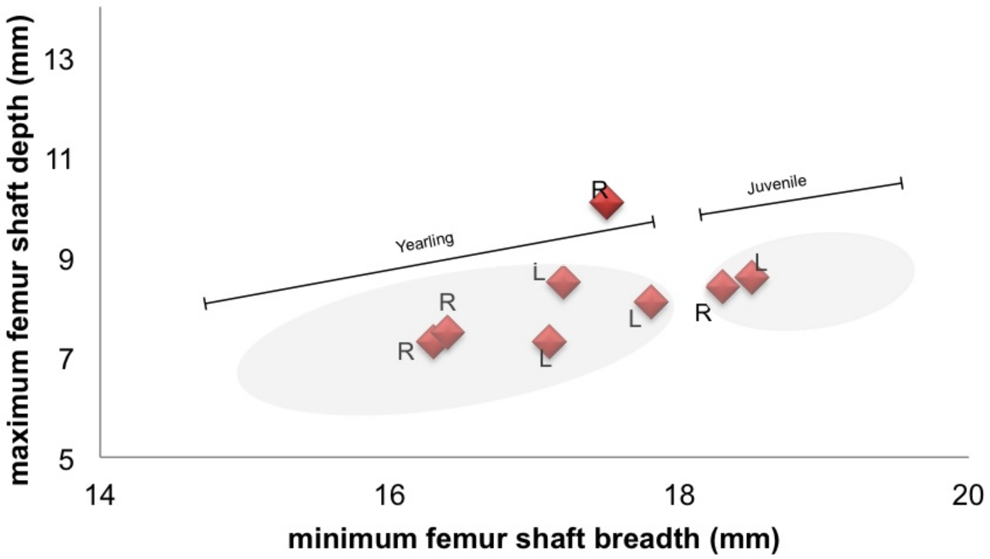


Figure 8.7 Ringed seal femur shaft depth vs. shaft breadth from the Late Dorset archaeofaunas from the Hornby Head site. Shaded areas represent measurement clusters observed in the NRM ringed seal sample (L=left, R=right; Storå 1994, 2002).

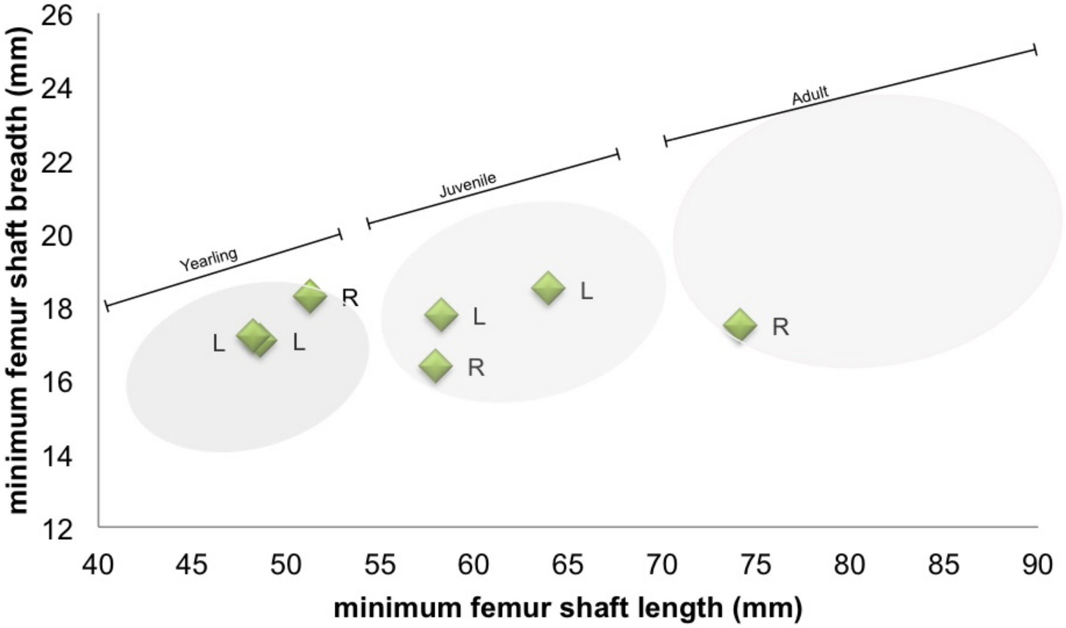


Figure 8.8 Ringed seal femur shaft breadth vs. shaft length in the Late Dorset archaeofaunas from the Hornby Head site. Shaded areas represent measurement clusters observed in the NRM ringed seal sample (L=left, R=right; Storå 1994, 2002).

Additional immature mammals were also identified at the site. Data are not available for the timing of epiphyseal fusion in arctic fox, although a fusion sequence for epiphyseal fusion in red fox (*Vulpes vulpes*) has been recorded (Harris 1978:111-112). Using this information, at least one immature arctic fox was identified in the sheet midden (one medial phalanx with unfused proximal and distal epiphyses, fusion occurs between nine and twelve weeks; and a radius with unfused epiphyses, fusion occurs by 28 weeks). At least one immature arctic fox was identified (cervical vertebra body unfused, fusion occurs between three and seven weeks) in H2, and a MNI of one from the H3 Total sample (one thoracic vertebra unfused, fusion occurs between four and ten weeks; and, one mandible with an unerupted 2nd molar, eruption date unknown). Assuming the epiphyseal fusion sequence for arctic fox is similar to red fox, these data suggest the immature individuals were killed sometime between June, when they tend to be born, and August. One immature arctic hare (one femur with an unfused proximal epiphysis) was identified in H2, however epiphyseal fusion sequences are not available for hare and thus do not allow for season of death estimates. One immature walrus specimen was also identified in the H3 Total sample (unfused metatarsal I); if fusion sequences are similar in all pinnipeds, this individual would have been captured before it was six months old, placing its death between April and November.

Faunal indicators suggest animals were largely captured during the spring on the sea ice, though some arctic fox appear to be summer catches. There is no clear evidence of winter kills, however, the location of the site would have allowed for easy access to seals throughout the winter.

8.5 Porden Point

Porden Point is located on the southeast corner of the Grinnell Peninsula, Devon Island, Nunavut (Figure 8.9). It is a gravel spit that partially borders the southern shore of Prince Alfred bay, where several Thule Inuit sites (RbJr-1, RbJr-4, RbJr-5; Park 1989, 1984) and Early Dorset sites (RbJr-2, RbJr-9; McGhee 1981) have been identified. In 1984 and 1985, Robert Park began an extensive study of the large winter Thule sites that McGhee had initially identified in 1974 (McGhee 1976a, 1977a). The material excavated from these sites formed the basis for Park's doctoral research, which examined intra-site variability and the settlement strategies used by Thule Inuit who once occupied this region (Park 1989). During Park's 1984 and 1985 field seasons at Porden Point a second research project took place under the direction of Rochelle Allison. Allison, a graduate student at the University of Alberta, was primarily interested in the nature of Thule Inuit "warm season" structures and excavated several features at two sites, RbJq-5 and RbJq-6 (which have been referred to elsewhere as RbJr-11 and RbJr-12 respectively; Allison 1984, 1985). These sites border a lake approximately 500 metres from the northern tip of Porden Point, where Prince Alfred Bay enters into the Wellington Channel (Figure 8.9). The archaeofaunas excavated from RbJq-6 have been analyzed for the present research.

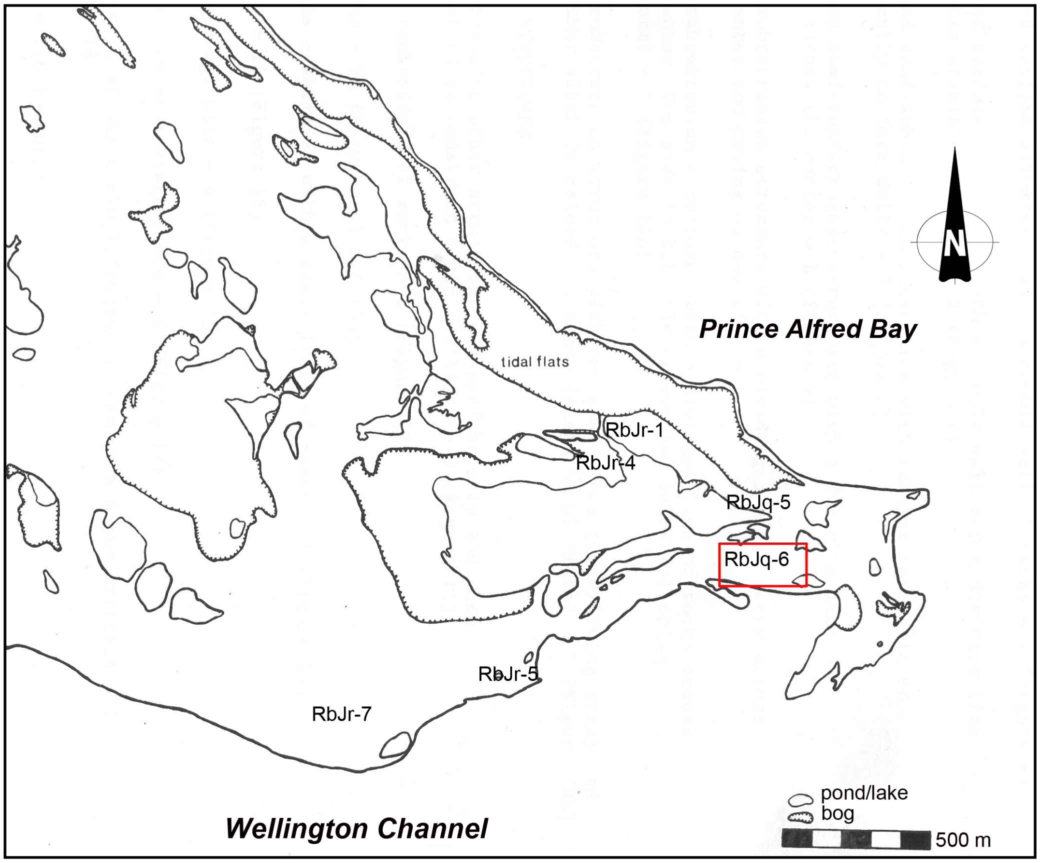


Figure 8.9 Plan of Porden Point, identifying location of RbJq-6 (after Allison 1984).

8.5.1 RbJq-6- Archaeological Features

Excavations took place at RbJq-6 during the 1985 field season (Allison 1985). This site first recorded by McGhee (1976a, 1977), is situated between the southern shore of the lake and the coast bordering Wellington Channel and covers an area measuring approximately 300 by 100 m (Figure 8.10). A total of 116 features were identified, including semi-subterranean structures, tent rings, hearths, storage pits, and umiak rests scattered along several beach ridges ranging from 5 to 8 metres above sea level (Figure 8.11; Allison 1985). The faunal material analyzed from this site was recovered from four semi-subterranean house structures, House 11 (H11), House 13 (H13), House 21 (H21), and House 37 (H37), and one midden feature, Feature 27 (F27). These structures were considerably less substantial then the majority of houses found at the nearby Porden Point Brook Village site (RbJr-1), the Porden Point Pond Village site (RbJr-4), and RbJr-5 (Park 1989), where large whalebone was incorporated into the construction of semi-subterranean houses and deemed to be winter dwellings. This led Allison (1985) to believe the houses at RbJq-6 were ‘warm-season’ dwellings. The features included in this research are found in the eastern half of the site (Figure 8.10). They were chosen because they contained the most robust and well preserved faunal material recovered from the site excavations. Although radiocarbon dates at the site have not been obtained, the recovered artefacts, including Thule Type 2 and Type 3 harpoon heads suggest the site is a Classic Thule Inuit occupation.

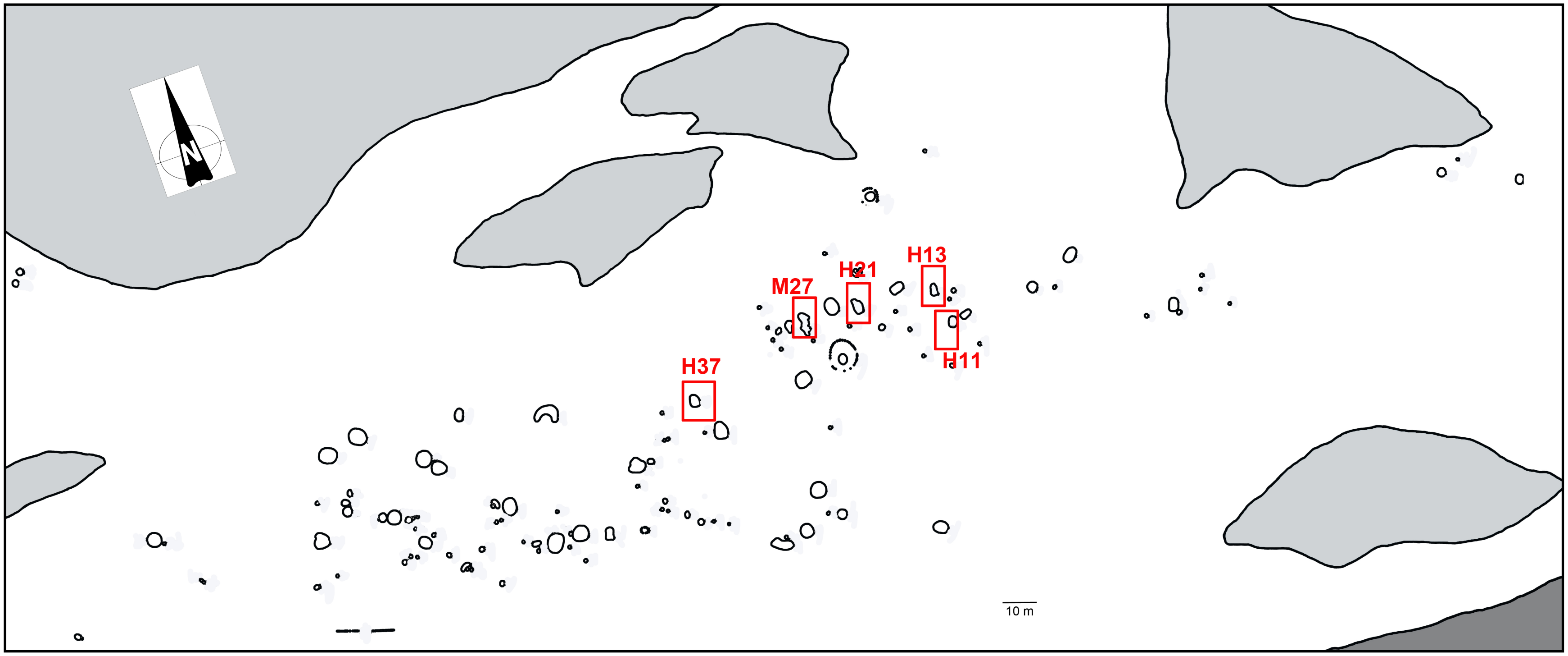


Figure 8.10 Distribution of features at RbJq-6, Porden Point, the Grinnell Peninsula, Devon Island (after Allison 1985).

House 11 is a semi-subterranean structure with vertically placed tabular rocks forming the house outline, which is slightly oval in shape (Allison 1985:33). The exact depth of the structure is not available in the site reports, however three levels were excavated and Level 3 was identified as the floor of the structure. The floor consisted of a fine-gravel to sandy-gravel matrix. A small paved area that might have served as a storage area is found in the southwest corner (Figure 8.11 and 8.12). The paving stones were mostly shattered, which likely resulted when the stones forming the adjacent wall collapsed. Faunal remains were located between and under these rocks. A Thule type 2 harpoon head was recovered from the floor level, suggesting Thule Inuit people inhabited the structure.

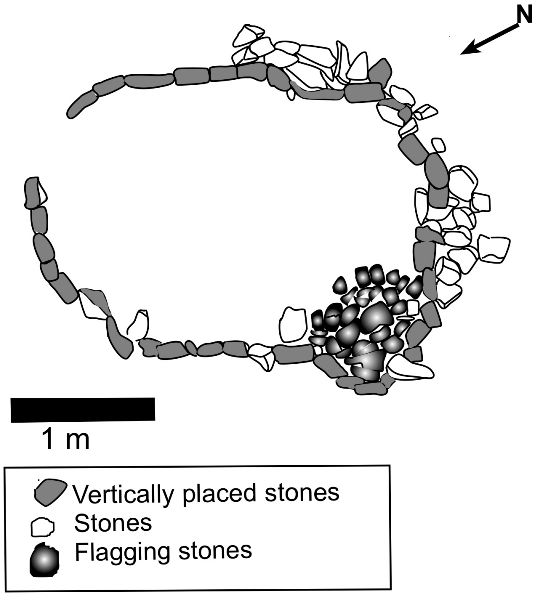


Figure 8.11 Plan of House 11, the Porden Point site (after Allison 1985: 34).

Figure 8.12 Photograph of House 11, the Porden Point site (Allison 1985:9).

House 13 is a semi-subterranean structure with a centre line of rocks separating the living floor from the sleeping area (Figure 8.13; Allison 1985:40). A raised sleeping platform was identified in the north half of the structure along the east wall and SE corner, and consisted of gravel with shell and bone inclusions. A total of three levels were excavated from the living area. Level 1 consisted of the surface material and vegetation cover. Level 2 generally went down 10 cm below the surface. Level 3 included a significant deposit continuing from 15 cm below surface to the floor, which consisted of gravel and a very fine sand-gravel, and began at around 21 cm and reached a maximum depth of 37 cm below surface along the north wall on the gravel. A small raised paved area, similar to that found in H11, was identified in the southwest corner and interpreted as a possible storage area (Allison 1985:40). A small hearth or possible lamp stand was identified in the southeast corner of the living area, which was surrounded by blackened and stained rocks, and charred bone and ash. A Thule Type 3 harpoon head was identified in Level 2, suggesting Thule Inuit people occupied the house. Several additional artefacts of Thule origin were also identified in Level 3.

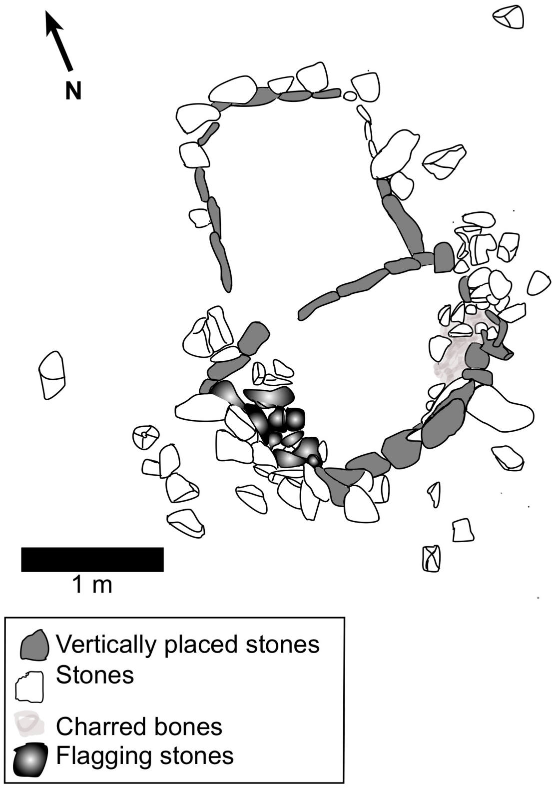


Figure 8.13 Plan of House 13, the Porden Point site (after Allison 1985:43).

House 21 is another semi-subterranean structure with vertical tabular stones forming the walls, however unlike H13 there was no centre line of stones. The north wall of the structure was largely intact, however the rest of the house walls appear to have collapsed into the house interior (Allison 1985:33). Allison (1985:33) surmised the house was once fully encased by tabular rocks, many of which were dismantled and used in the construction of other houses at the site. The north side of the structure is raised and was interpreted as the sleeping platform. Three levels were excavated from the house, and the floor was found between 17 cm and 22 cm below surface (Allison 1985:33). The majority of the faunal material was excavated from the living area in the southern part of the structure. Along the south wall, charred bones and stained sand were also found, suggesting it was the location of a hearth or possible lamp stand.

House 37 is a semi-subterranean structure with a paved living area (Figure 8.14 and 8.15). At the surface the house appeared as a sub-rectangular depression filled with vegetation with few stones found in the centre of the depression. No structural stones were visible on the surface, however the wall stones were exposed once the thick sod was removed. The wall consisted of vertically placed tabular stones supported by irregularly shaped stones. The main living area was found on the south side of the house, and the sleeping platform was found along the north wall. Again, the exact depth of this structure is not known, but at least two living floors, Levels 2 and 3, were identified, however they were not easily defined in all areas of the structure. Level 2 consisted of a paved living floor with highly fragmented flagstones that were likely fractured by the wall collapse (Allison 1985:46). Charred material was found in the centre of the south wall. Once the stones from Level 2 were removed a 2nd well preserved paved floor was exposed. The Level 3 deposit was thicker than Level 2, and served to protect the Level 3 flagstones. A raised area of congealed seal fat bordered the south and west walls that consisted of vertically placed rocks. Few artefacts were recovered from this house, however all were of Thule origin.

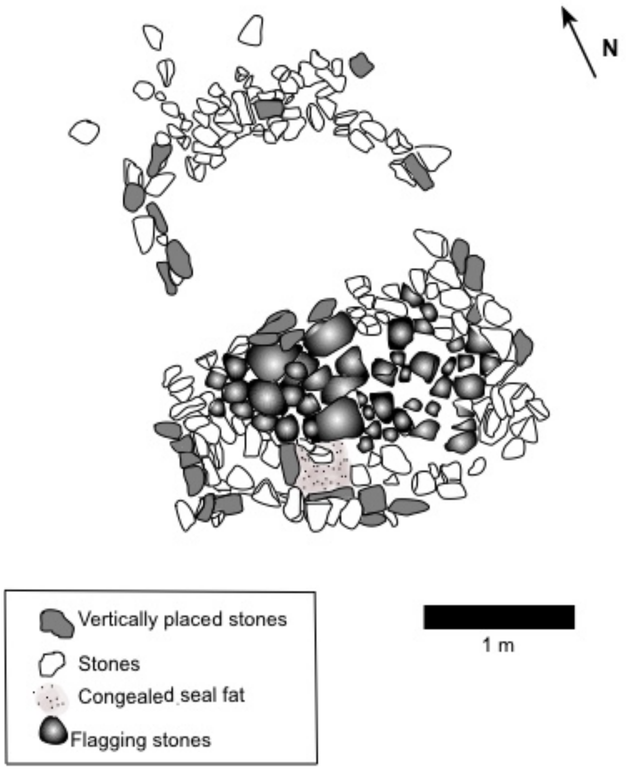


Figure 8.14 Plan of House 37, the Porden Point site (after Allison 1985: 48).

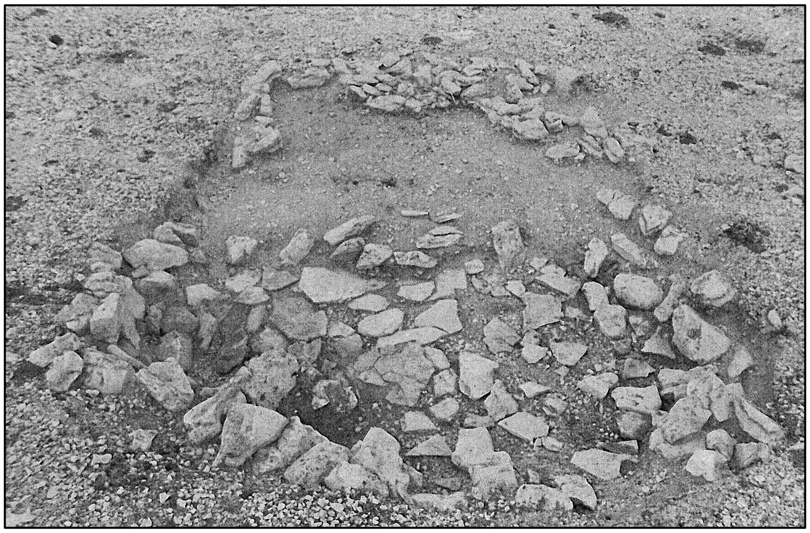


Figure 8.15 Photograph of House 37, the Porden Point site (Allison 1985:11).

Feature 27, a midden deposit, is located just east of a semi-subterranean structure, House 28 (Figure 8.10). On the surface the feature appeared as an irregular-shaped heavily vegetated depression. Allison (1985) suggested it had been a windbreak, or other structure, that was reused as a midden. No vertical stones or flagstones were found, however a concentration of charred bone, ash, and congealed seal fat was identified, suggesting it was once the location of a hearth. The feature contained no clearly defined deposits and was relatively shallow, measuring a maximum of 13 cm below surface (Allison 1985:51). Similar to the rest of the features at the site, few artefacts were recovered. One proximal end of an ivory Thule type 3 harpoon head was identified, suggesting the feature was of Thule Inuit origin.

8.5.2 Faunal Samples

All contexts were excavated by trowel, however the material was not screened. The faunal samples include all the faunal material excavated from each of the features, excluding that recovered from the surface level.

8.5.3 Zooarchaeological Analysis

The faunal samples discussed in this section total 1890 bone specimens, 58% (n=1087) of which have been identified to at least class (Table 8.4). In general, the bone specimens from each context were well preserved, with the majority of specimens indicating early stages of weathering (Stages 1-3; Behrensmeyer 1978).

8.5.3.1 Taxonomic Frequencies

Class frequencies are somewhat variable throughout the different contexts (Figure 8.16), although in each context mammal bones are most frequent. In H37, mammal bones are most numerous comprising 86.8% of the identified fauna. In the remaining features they comprise between 72.9% and 51.7% of the identified fauna, and are least numerous in the midden (F27). Bird bones comprise a notable portion of the identified fauna in all contexts, and are most frequent in the midden where they comprise 47.4%, and are least frequent in H37 where they comprise 12.9% of the identified fauna. Overall, fish bones are rare. They are absent from H13 and comprise less than 1% of the identified specimens in the remaining features.

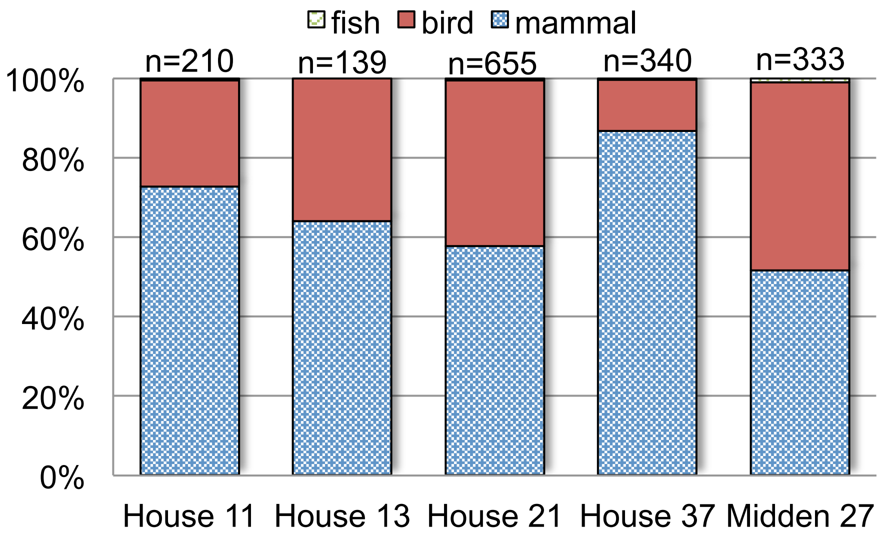


Figure 8.16 Class frequencies in the Thule Inuit archaeofaunas from the Porden Point site (RbJq-6) expressed as %NISP.

Table 8.4 Taxonomic frequencies from H11, H13, H21, H37, and midden F27 at the Porden Point site.

Taxon	**House 11**		**House 13**		**House 21**		**House 37**		**Midden 27**		**Total**	
	NISP[1]	%	NISP	%	NISP	%	%	%	NISP	%	NISP	%
Salvelinus	0		0		3	100	0		2		3	
Indeterminate fish	1		0		0		1		1		5	
Total Fish[2]	1	0.5	0		3	0.5	1	0.3	3	0.9	8	0.5
Canada goose	0		0		0		0		4	5.7	4	1.3
Goose	0		0		2		10	0.4	26	37	38	12.1
Long-tailed duck	1	7.7	0		0		0		0		1	0.3
Common Eider	0		0		33	20.4	1	0.04	6	8.6	40	12.7
Eider	3	23	3	6.8	67	41.4	7	28	10	14.3	90	28.7
Duck	2	15	3	6.8	46	28.4	0		4	5.7	55	17.5
Loon	0		0		0		5	20	0		5	1.6
Glaucous gull	0		0		8	4.9	0		15	21.4	23	7.3
Large gull	0		0		1	0.6	0		0		1	0.3
Medium gull	0		0		0		0		1	1.4	1	0.3
Small gull	1	7.7	6	13.6	1	0.6	0		0		8	2.5
Gull	1	7.7	1	2.3	4	2.5	0		4	5.7	10	3.2
Black guillemot	0		1	2.3	0		0		0		1	0.3
Thick-billed murre	1	7.7	2	4.5	0		0		0		3	0.9
Murre	4	30.8	28	63.6	0		1	0.04	0		33	10.5
Shorebird	0		0		0		1	0.04	0		1	0.3
Bird indeterminate	43		6		111		19		88		267	
Total Bird[2]	56	26.7	50	36	273	41.7	44	12.9	158	47.4	581	34.7
Small whale	1	0.1	0		0		0		1	1.9	2	0.3
Bowhead	0		1	1.5	6	2.3	0		0		7	1.1
Dog/Wolf	0		1	1.5	0		0		0		1	0.2
Arctic fox	6	6.2	0		1	0.4	5	2.7	1	1.9	13	1.9
Arctic hare	0		0		0		1	0.5	0		1	0.2
Polar bear	0		0		2	0.8	1	0.5	0		3	0.5
Bearded seal	6	6.2	2	3.1	4	1.5	2	1.1	1	1.9	15	2.3
Ringed seal	84	86.6	57	87.7	236	91.1	175	95	46	90.2	598	91.2
Walrus	0		0		1	0.4	0		0		1	0.2
Caribou	0		1	1.5	2	0.8	0		2	3.9	5	0.8
Muskox	0		3	4.6	7	2.7	0		0		10	1.5
Large sea mammal[2]	0		0		1		0		0		1	0.2
Large terrestrial mammal[3]	7		0		0		0		6		13	
Large mammal	0		3		4		4		9		20	
Mammal indeterminate	49		21		115		106		106		397	
Total Mammal[2]	153	72.9	89	64	379	57.9	294	86.8	172	51.7	1087	64.9
Indeterminate	33		16		159		0		6		214	
Total		**243**		**155**		**814**		**339**		**339**		**1890**

[1] %NISP's are calculated by class, not by total sample.

[2] Class percentages are calculated using the total sample.

[3] Large sea mammal includes large seal, walrus, and whale species.

[4] Large terrestrial mammal includes caribou, muskox, and polar bear.

8.5.3.1.1 Fish

The contexts contained few fish bones, the majority of which could not be identified past class (Table 8.4). However, those that were could not be identified below genus *Salvelinus*.

8.5.3.1.2 Bird

A variety of bird species were identified from each context (Table 8.4; Figure 8.17). Anatidae specimens are most common in H11 (45.7%), H21 (13.6%), H37 (92%) and F27 (71.3%), but they were much less substantial in H13 where they comprise 13.6% of the identified bird. Murre specimens, including those belonging to black guillemot and thick-billed murre, were most important in H13, comprising 70.4% of the identified bird specimens. They were also quite substantial in H11 where they comprise 38.5% of the identified bird specimens, in H37 they were less important, comprising 4%, and they were absent in H21 and the midden (F27). A variety of gull species contributed a substantial portion of the identified bird specimens in the midden (28.5%). Moderate proportions of gull species were also identified in H11 (15.4%), H13 (15.9%), and H21 (8.6%), but they were absent in H37. In H37, loon and shore bird specimens were also identified, comprising 20% and 4% of the identified specimens, respectively. These species, however, were absent in the remaining features.

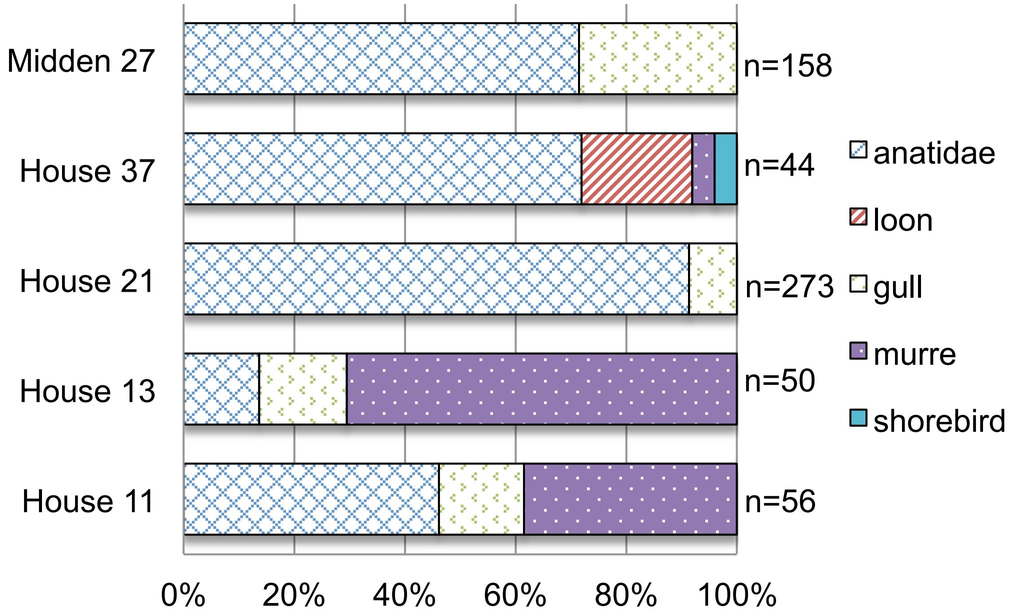


Figure 8.17 Distribution of bird in the Thule Inuit archaeofaunas from the Porden Point site (RbJq-6) expressed as %MAU.

8.5.3.1.3 Mammal

Ringed seal is the most frequent mammal in all features (Figure 8.18), and ringed seal bones comprise between 86.6% (H11) and 95.1% (H37) of the identified mammal specimens amongst the different contexts (Table 8.4). Large seal specimens are most frequent in H11 (6.2%), and contribute less than 3% of the remaining samples. Arctic fox bones comprise 6.2% of the identified mammal specimens in H11, but contribute less than 2.7% in H37, H21 (0.4%), and the midden (2.0%), and are absent in H13. Muskox specimens comprise 4.6% of the identified mammal bones in H13 and 2.7% in H21. Caribou specimens are infrequent or rare, contributing 3.9% to the midden, 1.5% to H13, 0.8% to H21, and are absent in the remaining features. Low frequencies of whalebone are found in four features, and are absent in H37. A range of additional species was also identified, although these species only comprise a small proportion of the samples, and include polar bear, walrus, dog/wolf, and arctic hare.

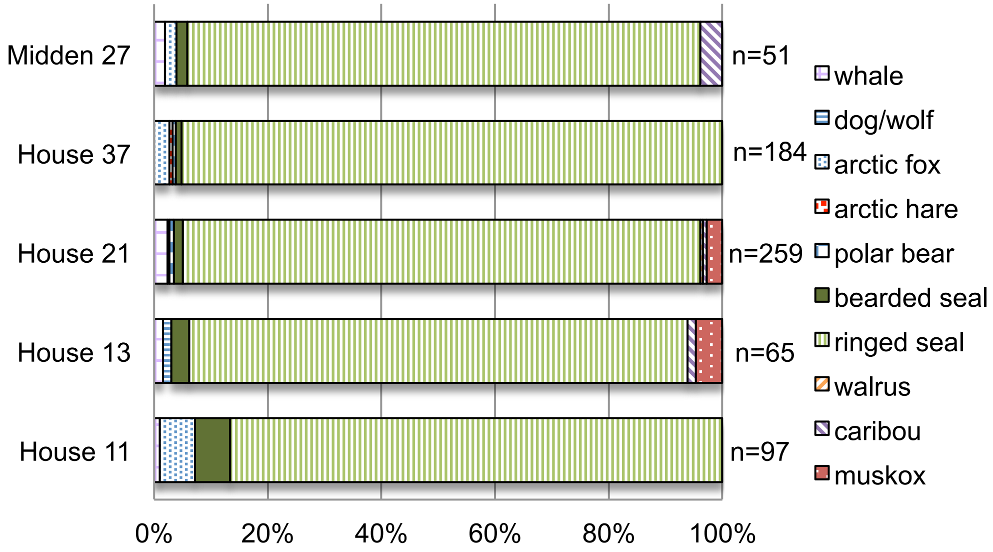


Figure 8.18 Distribution of mammal in the Thule Inuit archaeofaunas from the Porden Point site (RbJq-6) expressed as %NISP.

8.5.3.2 Animal Element Distributions

In this section, the skeletal element distribution for small seals is discussed in detail. No distinct patterns were found in the distribution of other species, but the raw data has been included in Appendix B, which also includes the *Minimal Animal Units* (MAU's) and the *Minimum Number of Elements* (MNE's) discussed in this section. All indices applied to the data can be found in Chapter 2.

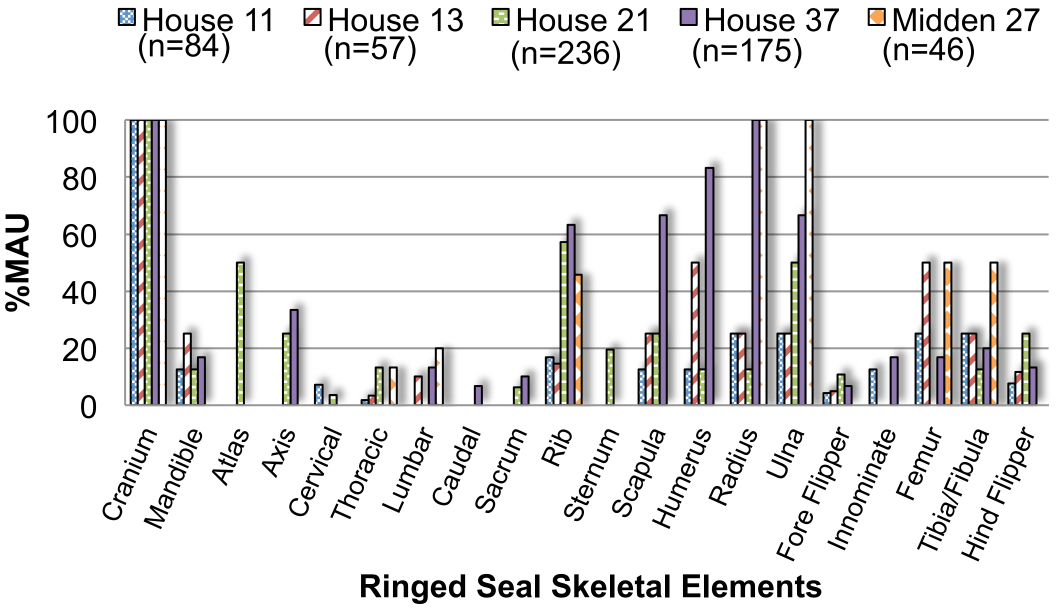
8.5.3.2.1 Ringed seal

The distribution of ringed seal skeletal elements is somewhat variable amongst the features (Figure 8.19), though crania are abundant and vertebrae are consistently infrequent in each context. Generally, transportation of whole seals from the coast to the site would have been relatively easy since they are in close proximity, however the entire seal skeleton was not identified in any of the samples.

To better understand these patterns the distribution of ringed seal skeletal elements was compared with various indices. If the seals were hunted in locations further away from the site, the ringed seal element distribution at the site is expected to consist primarily of high meat utility elements and %MAU's should have a positive correlation with the FUI for small seals. However, no correlation was found between the FUI for small seals (Lyman et al. 1992) and small seal %MAU's from either context (H11, r_s=-0.01, p=0.96; H13, r_s=-0.16, p=0.57; H21, r_s= 0.22, p=0.44; H37, r_s= 0.09, p=0.73; M27, r_s=0.07, p=0.80), suggesting that the meat utility of different skeletal parts was not significant in the distribution of small seal elements at the site.

To determine the impact of density-mediated attrition on the distribution of ringed seal elements at the site the Bone Density values for small seal elements (Lyman 1994) and the small seal element MAU's were considered. However, no significant relationship was found (H11, r_s=0.07, p=0.80; H13, r_s=-0.09, p=0.66; H21, r_s= -0.13, p=0.55; H37, r_s= 0.26, p=0.22; M27, r_s=0.10, p=0.64), suggesting density-mediated attrition did not play a role in element distribution.

The distribution of ringed seal elements was also compared with a food preference-ranking index for small seal skeletal elements. Generally, this index ranks hind limbs higher than fore limbs. No correlation was found between the food preference-ranking index for small seal elements and small seal MAU's in H11 (r_s=0.07, p=0.84), H37 (r_s=0.04, p=0.91), and the midden (r_s=-0.36, p=0.27), however, negative and moderately significant correlations were found for H13 (r_s=-0.61, p=0.05) and H21 (r_s=-0.61, p=0.04). Why less preferred elements are more frequent than most preferred elements in H13 and H21 is difficult to explain. It is perhaps more likely that the distribution of seal elements in these features, specifically the higher relative abundance of fore limbs in comparison to hind limbs, is attributed to butchery and processing methods. Savelle (1984:520) has suggested that when seals are processed and stored for consumption during early winter the upper trunk and associated elements, including fore limbs, are sometimes removed for consumption prior to being cached. If H13 and H21 were occupied in part during the warm season, and seal carcasses were being processed and stored for later consumption, it may explain the relatively low abundance of tibiae/fibulae and femora and relatively higher frequencies of ribs and forelimbs in these two features.. In other words, the hind limbs may have been removed and stored for later use. While an index for dried seal meat is not currently available, it is probable that the small seal element distribution at the site is related to an associated method of processing as dried seal meat from spring and summer harvests likely formed a significant part of the diet for Thule Inuit during the winter (Park 1999).



*The front flipper and hind flipper categories include metacarpals, carpals, and front phalanges, and metatarsals, tarsals, and hind phalanges, respectively.

Figure 8.19 Distribution of ringed seal skeletal elements in the Thule Inuit archaeofaunas from the Porden Point site (RbJq-6) expressed as %MAU.

8.5.3.3 Modification Frequencies

In order to assess the effects of taphonomy on the archaeofaunas discussed here, all modifications identified on the bone specimens were recorded (Table 8.5). The following discussion focuses on mammal bones, and the less robust birds and fish were excluded.

Table 8.5 Modification frequencies from the Thule Inuit contexts at the Porden Point site (RbJq-6).

Modification[1]	**House 11**	**House 13**	**House 21**	**House 37**	**Midden 27**	**Total**
Cut marks	0	0	1	0	0	1
% cut marks	-	-	0.3	-	-	>0.1
Gnaw marks	32	11	30	32	7	112
% gnaw marks	20.9%	12.4%	7.9%	10.9%	4%	10.3%
Burn marks	0	0	26	37	34	97
% burn marks	-	-	6.9%	12.6%	19.8%	8.9%
%fragmentary	88.7	90.9	85.7	82.6	66.7	82.9
Fragmentation (NISP:MNE)[2]	1.5	1.4	1.6	1.9	1.2	1.6
NISP[3]	97	65	259	184	51	656
MNE	68	52	180	113	45	458
Whole elements	11	15	37	32	17	112

[1] Percentages are calculated using total mammal NSP for each sample see Table 8.4.

[2] Whole elements are excluded from this calculation.

[3] This NISP is used for calculating fragmentation and excludes mammal bone specimens that could not be identified beyond class.

Cut marks are rare, and are only found on one ringed seal vertebra from H21. Gnaw marks are identified on mammal bones from each context. They are at least twice as frequent in the houses as they are in the midden where they are found on 4% of the mammal specimens. These marks included scores, furrows, and few punctures. Puncture marks varied in size. One puncture measured 3mm in diameter, a second measured 5mm in diameter, and a third measured 3 cm in diameter. Burn marks are not found on bone specimens from H11 and H13, however they are relatively common in H21 (6.9%) and H37 (12.6%), and are most frequent in the midden feature (19.8%). Generally, fragmentation is low. The extent of fragmentation was quite similar throughout the houses, and the faunal samples largely represented fragmented elements. In the midden, however, the extent of fragmentation was much lower, where 33% of the sample consisted of whole elements. Similarly, the intensity of fragmentation was also consistent throughout the houses; but the midden had a slightly lower rate suggesting elements were fragmented slightly less, or were found in larger pieces in the midden.

Overall, modification frequencies were highly variable throughout the samples. Cut marks had little impact on the faunal samples. Gnaw marks had the greatest impact on the samples from H11, H13, and H21; and, while they were found on a moderate proportion of the specimens from H37 and the midden, burning had a greater impact on the samples from these features.

8.5.3.4 Seasonal Indicators and Prey Demography

The identified bird species at the site, including geese, ducks, swans, loons, auks and shorebirds, are all summer migrants, and bird species that are yearlong Arctic residents, such as ptarmigan, were not found. However, ringed seals are yearlong Arctic residents and account for the majority of the bone specimens at the site. In H11, at least one immature duck was present, and in the midden one immature goose specimen was identified. The size of the immature goose specimen was slightly smaller, but similar in morphological development to the six-week-old goose in the reference collection. Thus, these immature birds suggest Thule Inuit visited the site sometime between July and August.

The fusion sequence of small seal elements was also considered to help establish age at death estimates. Table 8.6 presents the fusion data recorded for each age group. One yearling was identified at the site in H21, based on a scapula with an unfused supraglenoid tubercle. Given that ringed seals generally give birth between April-May, this yearling was killed sometime between April and September. In H11, at least two juveniles, one young adult, and one old adult were identified. In H13, at least one juvenile, one young adult, and one old adult were identified. In H21, at least one juvenile, three young adults, and three old adults were identified. In H37, at least three juveniles, one young adult, and three old adults were identified, and in the midden at least one juvenile and one old adult were recovered.

Few complete seal femora were found at the site, and femur metrics were only available for three specimens that represent a MNI of three. Two of the specimens fall within the size range of adult seals and one specimen represents a yearling (see Appendix B). The only additional immature specimens at the site belong to large whale, all of which are unfused vertebral epiphyses.

Taken together these data indicate animals were largely taken during the summer months, and perhaps during late spring. There is no evidence suggesting Thule Inuit were inhabiting the site during other seasons, and the presence of more robust Thule houses located at sites nearby (see Park 1989) suggest the houses were not occupied during the coldest months.

Table 8.6 The MNE frequencies for small seal elements from the Thule Inuit contexts at the Porden Point site (RbJq-6).

	H11				**H13**				**H21**				**H37**				**M27**			
Age Fusion Sequence	unfused	fusing	fused	total	unfused	fusing	fused	total	unfused	fusing	fused	total	unfused	fusing	fused	total	unfused	fusing	fused	total
Y: metatarsal 1, distal	0	0	1	1	0	0	1	1	0	0	2	2	0	0	1	1	0	0	0	0
Y: pelvis, acetabulum	0	0	1	1	0	0	0	0	0	0	0	0	0	0	3	3	0	0	0	0
Y: scapula, supraglenoid	0	0	1	0	0	0	0	0	1	0	0	1	0	0	2	2	0	0	0	0
Total	0	0	3	2	0	0	1	1	1	0	2	3	0	0	6	6	0	0	0	0
% unfused	0%				0%				33.3%				0%				0%			
J: femur, proximal	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
J: radius, proximal	2	0	0	2	1	0	0	1	0	0	1	1	3	0	3	6	1	0	0	1
J: humerus, distal	0	0	0	0	1	0	0	1	1	0	0	1	1	0	0	1	0	0	0	0
Total	4	0	0	4	2	0	0	2	1	0	1	2	4	0	3	7	1	0	1	2
% unfused	100%				100%				100%				57.1%				50%			
YA: femur, distal	1	0	0	1	0	0	0	0	0	0	0	0	0	0	2	2	0	0	1	1
YA: humerus, proximal	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
YA: ulna, proximal	0	0	0	0	0	0	1	1	3	0	0	3	1	0	1	2	0	0	1	1
YA: tibia/fibula, proximal	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0	1	0	0	0	0
Total	1	0	0	2	1	0	2	3	3	0	1	4	2	0	3	5	0	0	2	2
0% unfused	100%				33.3%				75%				40%				0%			
OA: ulna, distal	0	0	0	0	0	0	0	0	3	0	0	3	3	0	3	6	1	0	0	1
OA: metatarsal 1,	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	1	0	0	1
OA: radius, distal	1	0	0	1	1	0	1	2	1	0	0	1	3	0	2	5	0	0	0	0
OA: tibia/fibula, distal	1	0	0	1	0	0	1	1	0	0	0	0	1	0	0	1	0	0	0	0
Total	2	0	0	2	1	0	2	3	5	0	0	5	4	0	5	9	2	0	0	2
% unfused	100%				33.3%				100%				44.4%				100%			

Y=yearling, J=juvenile, YA=young adult, OA=old adult

8.5.4 Comparing Late Dorset and Thule Inuit Archaeofaunas from the Grinnell Peninsula

Late Dorset and Thule Inuit occupied the Grinnell Peninsula sometime between the 10th and 15th centuries CE. Radiocarbon dates are not currently available from either site, however artefacts and house style are consistent with a Late Dorset occupation at Hornby Head and a Thule Inuit occupation at Porden Point. In this region, both groups would have had similar access to the region's resources, yet the data presented in the previous sections indicate some variation between the Late Dorset and Thule Inuit faunal samples. In this section the faunal material from each group is aggregated and compared in order to highlight any variability that may reflect culturally distinct ways in which each group interacted with animals. Following this, I outline potential explanations for this variability. In order to best understand how Late Dorset and Thule Inuit interacted with animals in this region, a number of potential, and often interdependent, influencing factors, including taphonomy, season(s) of occupation, technological differences, and storage, are considered.

8.5.4.1 Class Distribution

A total of 3866 bone specimens were analyzed from Hornby Head (RbJq-1) and Porden Point (RbJq-6), which roughly equally divide between the Late Dorset and Thule Inuit samples. From the Late Dorset contexts mammal is most frequent, contributing 97.6% of the identified bone specimens, bird accounts for 2.2%, and fish accounts for 0.2% (Figure 8.20). From the Thule Inuit features mammal is also most frequent, but they are significantly less dominant than they are within the Late Dorset features, contributing 64.9% of the identified specimens, whereas bird comprises 34.7%, and fish 0.5%. Class distribution is quite similar amongst the Late Dorset features and is relatively similar amongst the Thule Inuit contexts (Figures 8. 4 and 8.16). Overall, bird specimens are much more frequent in the Thule Inuit contexts. At the Thule site, they are least frequent in H37 where they comprise 12.9%, however this is at least three times greater than the greatest proportion of bird found at the Late Dorset site in H3 where it comprises 3.8%. Also, at the Thule Inuit site bird is most frequent within the midden feature, whereas at the Late Dorset site they are most frequent in the house features (Tables 8.1 & 8.4). In both the Late Dorset and Thule Inuit features, fish specimens are rare. They were identified in one out of four of the Late Dorset contexts and in four out of five of the Thule Inuit contexts. Thus, the major differences in class distribution between the Late Dorset and Thule Inuit contexts are the frequencies of mammal and bird specimens. The differences between the distribution of mammal, bird, and fish from the Late Dorset and Thule Inuit contexts are statistically significant (X^2=647.8, p<0.01).

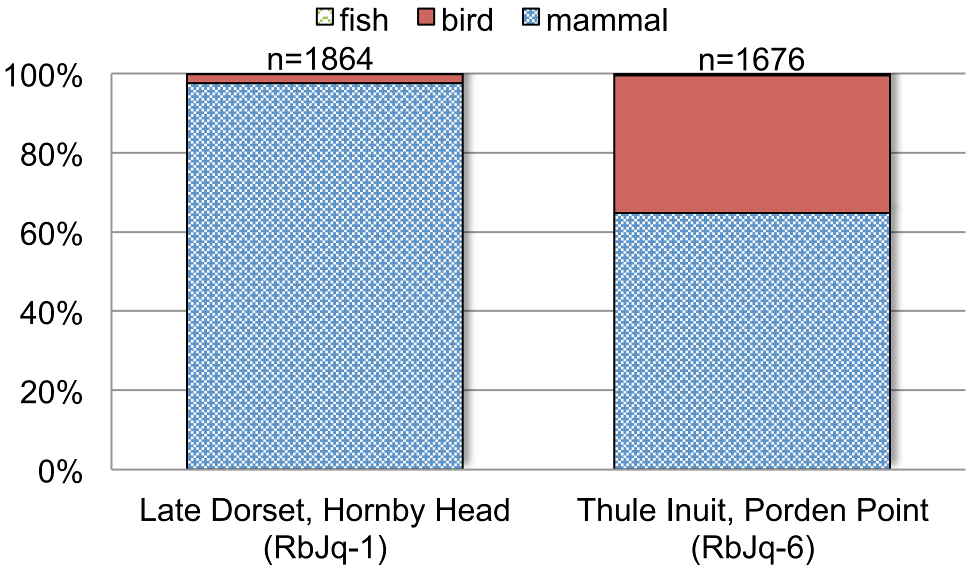


Figure 8.20 Class frequencies in Grinnell Peninsula archaeofaunas expressed as %NISP.

8.5.4.2 Fish Distribution

The identified fish specimens within both the Late Dorset and Thule Inuit features belong exclusively to the genus *Salvelinus,* and could not be identified to species.

8.5.4.3 Bird Distribution

The distribution of bird species is highly variable between the Late Dorset and Thule Inuit contexts (Table 8.1 & 8.4). A greater diversity of bird species contributed to the Thule Inuit contexts in comparison to the Late Dorset contexts, where only goose, duck, and gull species were identified (Figure 8.21). In the Thule Inuit contexts, Anatidae specimens, including duck and goose, are also most frequent, and gull, murre, loon, and shorebird were also identified. The difference in bird frequencies between the Late Dorset and Thule Inuit features, however, is not statistically significant (X^2=14.2,

$p<0.05$). Overall, the distribution of bird species in the Late Dorset assemblage is more even, though a greater heterogeneity is found in the Thule Inuit assemblage (Table 8.7). Anatidae species dominate both assemblages, but more so in the Thule Inuit assemblage. This pattern, however, is perhaps largely the result of the small sample size of bird bones from the Late Dorset assemblage.

Table 8.7 Taxonomic richness and taxonomic evenness of bird species in the Grinnell Peninsula archaeofaunas.

Diversity Measure	**Late Dorset**	**Thule Inuit**
Taxonomic richness[1]	7	16
Shannon index of heterogeneity	1.66	2.07
Shannon Index of evenness	0.75	0.50
The reciprocal of Simpsons index	0.77	0.84

[1] See Appendix B for the categories and numbers used for this table.

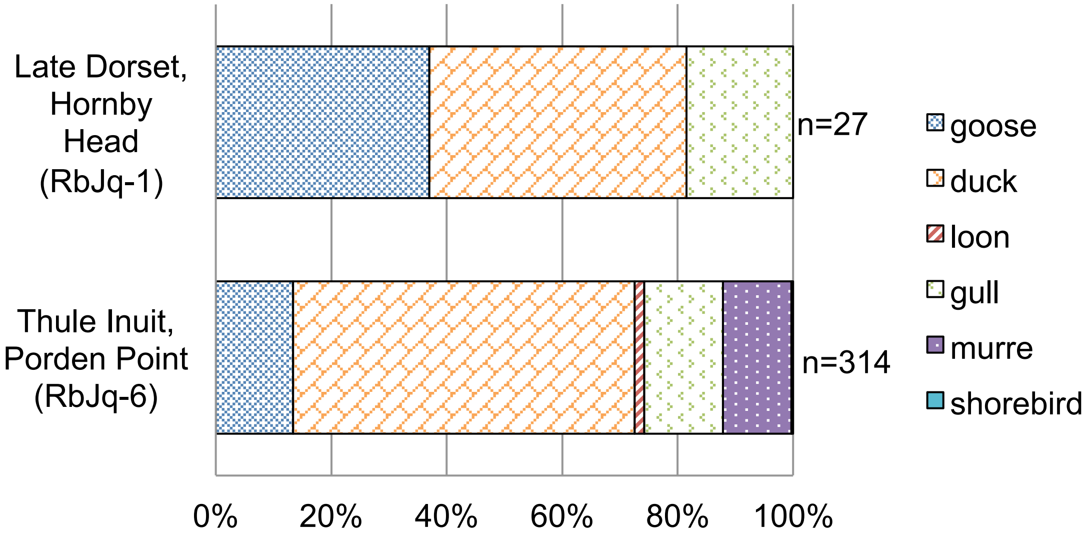


Figure 8.21 Distribution of bird species in the Grinnell Peninsula archaeofaunas expressed as %NISP.

8.5.4.4 Mammal Distribution

Both Late Dorset and Thule Inuit acquired a similar range of mammal species (NTAXA), however species abundance was highly variable between the two groups (Table 8.1 & 8.4). Small seal is most frequent at both sites, but it contributes significantly less of the identified mammal specimens in the Late Dorset contexts (72.8%) than it does in the Thule Inuit features (91.2%). Late Dorset also acquired a higher frequency of arctic fox, which accounts for 14.6% of the identified mammal specimens in comparison to the 2% it comprises in the Thule Inuit features (Figure 8.22). At both sites, the distribution of arctic fox varied amongst the different contexts. Of the Late Dorset contexts, fox is least frequent within the H3 midden where it accounts for 8.5% of the identified mammal. This is still more abundant, however, than its highest frequency at the Thule Inuit site, where it contributes 6.2% of the identified mammal specimens in H11. Bearded seal is the second most frequent mammal species within the Thule Inuit contexts where it comprises 2.3% of the identified mammal. At the Late Dorset site bearded seal contributes 3.6% of the identified mammal and was the fourth most frequent mammal species. With the exception of whale and muskox, Late Dorset acquired higher frequencies of all other mammal species, than Thule Inuit. Caribou was four times as frequent in the Late Dorset contexts than in the Thule Inuit contexts, and arctic hare, dog/wolf, and polar bear were all twice as frequent in the Late Dorset contexts than in the Thule Inuit contexts. However, none of these species contribute more than 4% of the identified mammal specimens at both sites. The distribution of mammal species at both sites differs significantly (X^2=433.0, p>0.0001). Measures of evenness indicate the Late Dorset sample was more even and more heterogeneous than the Thule Inuit sample, and in the Thule Inuit sample mammal distribution was more strongly dominated by seal.

Table 8.8 Taxonomic richness and taxonomic evenness of mammal species in the Grinnell Peninsula archaeofaunas.

Diversity Measure[1]	**Late Dorset**	**Thule Inuit**
Taxonomic richness	13	11
Shannon index of heterogeneity	1.04	0.469
Shannon Index of evenness	0.22	0.145
The reciprocal of Simpsons index	0.45	0.168

[1] See Appendix B for the categories and numbers used for this table.

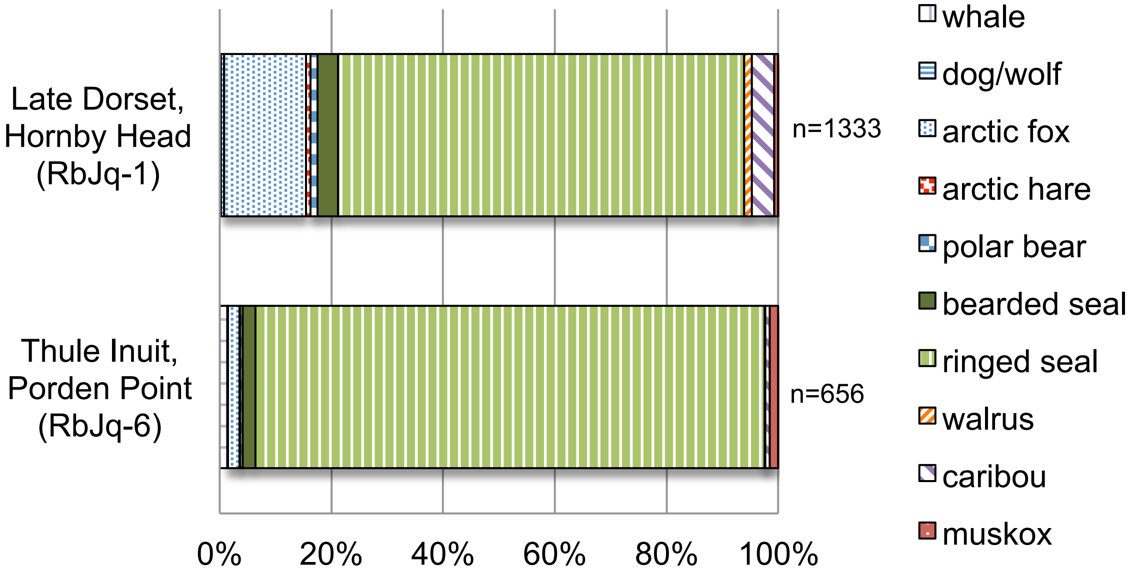


Figure 8.22 Distribution of mammal species in the Grinnell Peninsula archaeofaunas expressed as %NISP.

8.5.5 Animal Element Distribution

The distribution of ringed seal elements is variable throughout the Late Dorset and Thule Inuit contexts. The majority of the seal skeleton is found in each of the Late Dorset features, however the entire carcass is not present in any of the Thule Inuit contexts and the distribution of ringed seal elements is much more variable (Figures 8.6 & 8.19). When the ringed seal element distributions from both sites are compared to the small seal food utility index (see sections 8.3.2.2.1 & 8.4.4.4.1), no significant relationship exists, indicating that element distribution is not the result of the amount of meat attached to them. There is also no significant relationship between small seal Bone Density and the distribution of ringed seal elements, suggesting that their distribution was also not determined by taphonomic factors. At the Late Dorset site, the distribution of seal elements in one of the houses (see section 8.3.2.2.1) may have been impacted by taste preference, as there is a positive correlation with the preference-ranking index. However, as mentioned earlier, this distribution, which favours hind limbs, may reflect butchery activities. At the Thule Inuit site, a negative but significant relationship was found between the distributions of ringed seal elements in two of the houses and the preference-ranking index, which is based on a higher frequency of hind limbs in comparison to fore limbs. As previously discussed, a correlation does not necessarily indicate decisions based on food preference and in fact known seal processing and storage practices (see Savelle 1984) make it is plausible, that hind limbs, were removed and stored for later consumption.

Each site is located very close to the coast, where ringed seal populations would have been easily hunted and returned to camp. The close proximity of the likely kill site and home camp suggests a limited degree of culling would have occurred at the kill site to reduce weight for transport. Thus, the more variable distribution of ringed seal elements within the Thule Inuit contexts is most likely the result of storage activities and perhaps the season in which seals were hunted; this is further evaluated in the following sections.

8.5.6 Modification Frequencies

Cut marks on the mammal bones from both the Late Dorset and Thule Inuit contexts were infrequent, although they are over 20 times more frequent on the Late Dorset specimens (Table 8.9). Gnaw marks were identified on moderate numbers of mammal bones at both sites. Within the Late Dorset contexts, gnaw marks were largely punctures 2-3 mm in diameter, although three specimens exhibited larger punctures measuring 5 mm in diameter. Scores, furrows, and pits were also identified. The smaller puncture marks were likely the result of arctic fox activity, the larger punctures were likely inflicted by scavenging wolves, or perhaps dogs. Because gnaw marks were at least twice as frequent in the house structures as in the midden at the Late Dorset site, and due to the lack of evidence of dog use in Late Dorset society (Morey and Aaris-Sørensen 2002), it is likely that the majority of gnaw marks were inflicted after the houses were abandoned. In the Thule Inuit contexts, gnaw marks were slightly more frequent than in the Late Dorset contexts. They were primarily in the form of scores and furrows, and punctures were limited to three specimens. These specimens included a small puncture measuring 3 mm in diameter was likely inflicted by a fox, another measuring 5mm in diameter was likely inflicted by a dog or wolf, and the large puncture measuring 3 cm in diameter was likely inflicted by a polar bear. Again at the Thule Inuit site, gnaw marks were notably more frequent in the house features (max 20.9%) in comparison to the midden (4%; Table 8.5). This may have resulted from Thule Inuit keeping their dogs inside, or from scavenging dogs or wolves after the houses were abandoned. The frequency of burn marks was quite variable between the two sites, with less than 1% of the mammal bones from the Late Dorset site exhibiting burn marks and 8.9% of the mammal bones from the Thule Inuit site exhibiting burn marks. Generally, fragmentation rates were somewhat variable between the two sites. The %fragmentary was higher at the Late Dorset site where 96.4% of the mammal bone specimens were fragmented, whereas 82.9% of the mammal bone specimens were fragmented at the Thule Inuit site. The intensity of fragmentation (NISP:MNE) at both sites was more similar, suggesting that individual bones were fragmented into similar number and size of pieces at both sites.

Table 8.9 Modification frequencies on mammal bones from the Grinnell Peninsula archaeofaunas.

Modification[1]	**Late Dorset**	**Thule Inuit**
Cut marks	40	1
% cut marks	2.2%	>0.1
Gnaw marks	145	112
% gnaw marks	8.2%	10.3%
Burn marks	13	97
% burn marks	0.7%	8.9%
%fragmentation	96.4%	82.9%
Fragmentation (NISP:MNE) [2]	1.4	1.6
NISP[3]	1337	656
MNE	945	458
Whole elements	48	112

[1] Percentages are calculated using total mammal NISP for each sample see Tables 8.1 & 8.4
[2] Whole elements are excluded from this calculation.
[3] This NISP is used for calculating fragmentation and excludes mammal bone specimens that could not be identified beyond class.

8.5.7 Seasonality and Prey Demography

In general, Late Dorset and Thule Inuit hunted various animals that were available year-round. However, in this region Thule Inuit appear to rely more heavily on warm weather migrants. For example, bird specimens at both sites represent spring/summer migrants, however they are much more frequent in the Thule Inuit sample where they account for 33.7% (n=313) of the entire sample and 2.2% (n=27) of the Late Dorset sample (Table 8.10).

At the Late Dorset site, immature duck specimens were found in H2 and in both middens, representing a MNI of three. The porosity and size of these specimens suggest they were killed between late May and July. At the Thule Inuit site, at least one immature duck and one immature goose were identified. The size of these specimens suggests they were killed sometime between July and August.

Using available epiphyseal fusion data from small seals, age at death estimates were made (Table 8.3 & 8.6). In the Late Dorset contexts, there are a MNI of nine yearlings killed between April and September, and at least one fetal or newborn that was likely killed sometime between March and May. Adults that were seven and a half years plus were also recovered, however the majority of the specimens belong to individuals that were killed before they reached seven years of age. At the Thule Inuit site, one yearling was killed sometime between April-September. There were also at least 14 small seals between one and seven years of age and nine adults that were seven and a half years plus. The femoral metric data collected from the samples further suggests that Late Dorset primarily harvested young seals, with yearlings being most frequent. In the Thule Inuit sample, the sample size was quite small, however it is in agreement with the epiphyseal fusion data that indicates adults were more prevalent than younger individuals. Based on the data collected, it appears that Late Dorset primarily harvested yearlings that tend to occupy the land fast ice, and individuals younger than seven years of age who are primarily found at the ice edge (Smith 1973, 1987). Thule Inuit, however, appear to have focused their efforts on harvesting older individuals, particularly older adults who would have occupied the landfast ice prior to break up and the open water during the summer.

Table 8.10 Seasonal indicators for Late Dorset and Thule Inuit at the Grinnell Peninsula sites.

Seasonal indicator	**Month**	**Late Dorset**	**Thule Inuit**
Summer migrants (bird)	May-July	2.2% of identified fauna	34.7% of identified fauna
Seal Metric data	April-September	MNI 9 yearlings	MNI 1 yearling
	March-May	MNI 1 fetal or newborn	
Immature bird	July/August	MNI 3	MNI 2
Immature fox	June-August	MNI 3	
Immature walrus	April-September	MNI 1	

8.5.8 Discussion and Conclusion

There are several noteworthy differences between the subsistence and settlement patterns of the Late Dorset and Thule Inuit who occupied Hornby Head and Porden Point, respectively. Overall, the analyses suggest that taphonomic processes including gnawing and fragmentation had a similar impact on both the Late Dorset and Thule Inuit archaeofaunas. Burn marks, however, were eight times more frequent in the Thule Inuit assemblage than in the Late Dorset assemblage, suggesting there were differences in cleaning practices at the two sites. The slightly higher frequency of gnaw marks at the Thule Inuit site in comparison to the Late Dorset site likely resulted from the absence of dogs in Late Dorset society. However, the %fragmentation is slightly higher in the Late Dorset assemblage in comparison to the Thule Inuit assemblage, and at both sites the intensity of fragmentation was somewhat similar. Therefore, there is no evidence that dogs had a greater impact on the distribution of species or skeletal elements at the Thule Inuit site. In addition, while cut marks are generally uncommon at both sites (2.2% - >0.1%), they are 20 times more frequent on the Late Dorset mammal specimens. This may suggest the Late Dorset mammal specimens were subject to more intense processing than the Thule Inuit mammal specimens, which may also have resulted in the slightly higher frequency of fragmented elements in the Late Dorset assemblage.

Although ringed seal was the most abundant animal at both sites, Late Dorset acquired higher frequencies of additional mammals, particularly arctic fox, and the distributions of mammals in the Late Dorset assemblage is more even and has a greater heterogeneity than the Thule Inuit assemblage (see Table 8.8). Overall, the Thule Inuit assemblage has a greater taxonomic richness, however they appear to have focused their activities on harvesting seals, which more strongly dominate their assemblage. The faunal material analyzed by Park (1989) from the nearby winter Thule Inuit occupations exhibit somewhat similar patterns. Similarly, the mammal distributions from the winter houses at the Porden Point Brook Village site (RbJr-1) and the Porden Point Pond Village site (RbJr-2) are more strongly dominated by seal and exhibit lower evenness and heterogeneity than that identified here in the Late Dorset study assemblage (see Appendix B). It should be noted, however, that at RbJr-5, another nearby site analyzed by Park (1989), the mammal distribution is more even and has a greater heterogeneity than the Late Dorset study assemblage; this appears to largely result from a lower frequency of seals at the site. Though it may be that RbJr-5 was subject to a higher degree of scavenging activities than the other sites, ultimately resulting in this pattern that does not conform to that found in the rest of the Thule assemblages in the region; however it is difficult to say for certain based on the data currently available.

Also noteworthy, is that arctic fox is more frequent in the assemblages from the nearby Thule Inuit winter sites (RbJr-1: 15.9%; RbJr-4: 6.3%; RbJr-5: 5%) analysed by Park (1989), in comparison to the Thule Inuit assemblage analyzed for this research (RbJq-6: 1.9%), and the frequency of arctic fox specimens from the Brook Village site (RbJr-1) is similar to that found in the Late Dorset assemblage (14.6%). At first this seems to be a result of differences in seasonality between the Thule Inuit sites, since the study assemblage appears to have been a spring/summer occupation. However, at RbJq-5 another "warm weather" site located nearby (Allison 1984), arctic fox bones comprise 7.6% of the mammal specimens (Howse unpublished data). Since this variation between the distributions of fox occurs at sites that were likely occupied during the same time of year, it seems that seasonality is not the primary cause of this pattern. Instead, it may suggest capturing foxes was a task performed by specific households.

The distributions of small seal elements at the sites suggest possible differences in how both groups utilized and processed seals. While the proximity of both sites to the coast, and the likely kill location, would have easily allowed both groups to bring the entire seal skeleton back to site, the entire skeleton is not found in any of the Thule Inuit contexts, although it is found in each of the Late Dorset contexts. Thule Inuit likely fed carcass parts to their dogs, which would have contributed to differences in seal element distributions at the sites. An underrepresentation of hind limbs in two of the Thule Inuit contexts may suggest Thule Inuit were storing these elements for later use, a practice known historically (see Savelle 1984). This pattern, however, is not identifiable in the Late Dorset assemblage. While it is not possible to determine whether or not the occupants of the Thule Inuit site discussed here also inhabited the winter sites nearby, it is noteworthy that hind limbs, particularly femora and tibiae, are most abundant in several of the houses at these winter sites (RbJr-1: H1, H2 H9; RbJr-4: H1,H3, H4; RbJr-5: H5, and perhaps represent stored food (Park 1989:214-219).

Although both sites include animals that are year-round residents and summer migrants, a higher proportion of summer migrants are found in the Thule Inuit samples. In particular, Thule Inuit harvested a high frequency of murres. These birds tend to arrive in the area during late spring and can easily be taken by nets in the open water, which historically was commonly practiced while hunting for larger sea mammals (e.g., Falk and Durinck 1992; Gaston 2002). Additionally, Late Dorset captured a higher number of immature individuals than did Thule Inuit, suggesting they may have occupied the site earlier in the season. While the infrequency of immature individuals in the Thule Inuit samples does not preclude the possibility that Thule Inuit were in the area during spring and early summer, it may suggest they arrived in the area slightly later than Late Dorset. The large proportion of older seals in the Thule Inuit assemblage, and a high frequency of murre species that are altogether absent in the Late Dorset assemblage, perhaps indicate Thule Inuit hunting activities generally took place later in the season when they would have been able to target larger, adult, seals and capture murres while hunting from boats in open water. The faunal samples from both sites were excavated from houses that were semi-subterranean, suggesting that at least in part, both were occupied during colder months. However, large Thule Inuit sites with numerous winter houses are found in very close proximity and were the likely winter residence of the individuals who occupied the houses discussed here (Figure 8.9). Taken together with the faunal data, it is likely that Late Dorset occupied the area in the spring through early summer, and possibly later. Whether Late Dorset overwintered at the site is difficult to determine based on the available faunal data, since there are no direct seasonal indicators; however because the site was well positioned for capturing seals through breathing holes on the sea ice and the houses were semi-subterranean, it is probable they did. Data suggest Thule Inuit arrived at Porden Point sometime during the spring, staying perhaps throughout the summer and into the fall. Again, there is no clear evidence the site was occupied during the winter months, although it is possible. In all likelihood they moved into the more robust winter houses located at the sites nearby.

While it is difficult to discern the impacts of contrasting technologies of Late Dorset and Thule Inuit on their archaeofaunas, it would appear that technologies at least indirectly contributed to differences in the faunal samples. For instance, the rarity of evidence they used boats and throwing harpoons and the absence of float technologies within the Late Dorset toolkit would have made it more difficult for Late Dorset to harvest seals during the summer months. In the absence of a reliable resource near the site during this time, they potentially moved elsewhere to hunt terrestrial resources. The presence of these technologies in Thule Inuit society, however, would have allowed them to direct their hunting strategies towards hunting sea mammals during the summer months. Although it is not clear from the faunal evidence examined here, it is likely the Thule Inuit who occupied this site spent the majority of their time hunting bowhead whales that are frequent during the summer months and might also occasionally be taken during the winter in the nearby polynyas. Bowhead bones are not typically brought south for analysis, and although they were not prevalent at the RbJq-6 site of Porden Point, they are found in large frequencies at the large winter Thule Inuit sites located nearby (see Park 1989).

Chapter 9

The Smith Sound Region – Qeqertaaraq, Greenland and Skraeling Island, Canada

9.1 Introduction

The two study sites from the Smith Sound region include: 1) the Late Dorset South West Point site at Qeqertaaraq, southern Inglefield Land, Greenland; and 2) the Thule Inuit Skraeling Island Site (SfFk-4), located 5 km north of Ellesmere Island's Johan peninsula (Figure 9.1). These two settlements are separated by approximately 65 km of sea at the juncture of Smith Sound and Kane Basin.

The region's polynya concentrations provide the majority of food resources in the area. East of Skraeling Island and southwest of Qeqertaaraq is the North Water Polynya (NOW), the largest polynya (70,000-80,000 km^2) in the eastern North American Arctic (Barber and Massom 2007). A combination of latent-heat processes and upwelling of warm water results in ice-free waters throughout the year (Barber et al. 2001), and has the largest per-unit-area of biological production of all Arctic waters (Barber and Massom 2007). Although the inhabitants of these two sites would have confronted variability within their local environments, their respective ecosystems have been well researched and will be incorporated into the zooarchaeological analyses. The primary purpose of this chapter is to present the history of archaeological research conducted on the Canadian and Greenlandic sides of the Smith Sound region and provide a detailed description of each site's physical environment and ecosystem, site organization, and archaeofaunas. The final section of this chapter compares the results of the zooarchaeological analyses at both sites in order to assess whether, and by how much, they differ, and to suggest what factors contributed to any variation that may be observed.

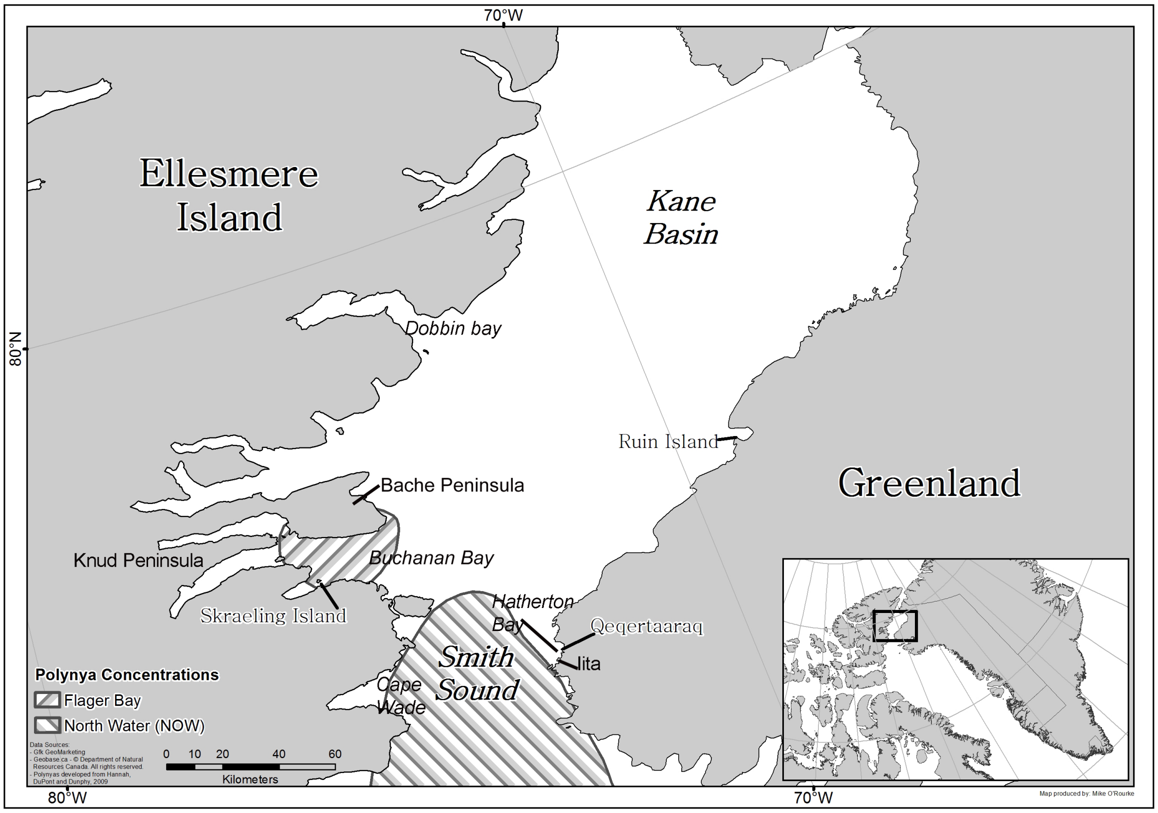


Figure 9.1 Map of Smith Sound Region.

9.2 The History of Archaeological Research in the Smith Sound Region

The region surrounding Smith Sound has been an area of special interest for Arctic archaeologists since the early twentieth century. The geography, including the ice-free corridor of Sverdrup pass connecting Ellesmere Island from west to east, make this region a favourable crossroads for past Arctic peoples travelling from Canada to Greenland, and was potentially the route taken by the first peoples to enter Greenland (Appelt and Gulløv 1999; Schledermann 1990). Arctic explorers have visited the area for centuries while in search of the missing Franklin expedition and on explorations to the North Pole. During their visits they introduced European goods to the indigenous populations, documented aspects of traditional life, and took note of the ancient ruins in the region.

The Norse were likely the first Europeans to visit the Smith Sound region, sometime during the 13th century CE (Appelt and Gulløv 1999, 2009; McGhee 2009b;

Schledermann 1990). Several items of Norse origin have been found throughout the Arctic (Harp 1975; McCartney and Mack 1973; McGhee 1981a; Sabo and Sabo 1978; Sutherland 1987), however, in the vicinity of the Bache Peninsula, on Ellesmere Island, a high number of Norse artefacts excavated from Thule Inuit occupations represent the second largest concentration of Norse finds in North America (Schledermann and McCullough 2003a), the largest concentration being found at the L'Anse aux Meadows Site in Newfoundland (Wallace 2000). These artefacts include several pieces of chain mail, knife and spear blades, a possible axe blade, boat rivets, iron and copper pieces, pieces of woolen cloth, a barrel bottom, box section, a tapered iron awl, and an ivory figurine (Schledermann 1980a; Schledermann and McCullough 2003a). Many Norse items were also excavated from Thule Inuit occupations in Inglefield Land including a comb, woven cloth, chain mail, knife blades, an iron spear point, several bone chess pieces, the leg of a bronze cooking pot, a barrel bottom section, a wooden box, and several wrought iron and copper pieces (Grønnow 1981; Holtved 1944b, 1954). In addition, a piece of a bronze pot has been excavated from a Late Dorset house (structure 4) at the South West Point Site, Qeqertaaraq (Appelt and Gulløv 1999; Appelt et al. 1998). It is unclear whether the Norse and local inhabitants had face to face contact, since the large quantity of Norse artefacts excavated from the sites in the region may not have resulted from trade; it could have been obtained from a ship wreck (Gulløv 1997; Schledermann 2000; Sutherland 2000, 2009). Nevertheless, the Thule Inuit and likely the Late Dorset peoples in the region would have been aware of the existence of the Norse people and the valuable metals they used.

In the 19th and early 20th centuries many explorers visited the Smith Sound/Kane Basin region, with the area serving as a primary locus of contact between European and American explorers and Northern peoples, as well as between local Canadian and Greenlandic indigenous peoples (Mary-Rousselière 1991; Oswalt 1979). These early visits, including encounters with local peoples, were well documented (Bessels 1884; Hayes 1867; Kane 1856, 1877; MacMillan 1918; Peary 1907; Rasmussen et al. 1908; Rasmussen and Koch 1921), offering a glimpse into local traditions during this time period. The indigenous groups in the area who were encountered by early explorers are known as the Inughuit (Polar Inuit), although today Inughuit primarily occupy settlements on the Greenland side. When first contact was made with Inughuit groups in this area during the early 19th century they were lacking several technologies that were utilized by West Greenlanders, including the kayak, *umiak*, bow-and-arrow, and the fishing leister (Ross 1819). The loss of these technologies suggests the groups in this area remained isolated from other groups for some time, although for how long is unknown. The lack of these implements is believed to have greatly impacted local hunting traditions and settlement patterns. These implements, however, were later reintroduced by Baffin Island Inuit, who migrated into the area in the mid-1860s (Birket-Smith 1918; Holtved 1967; Mary-Rousselière 1991).

Archaeological investigation first took place on the Canadian side of Smith Sound in the 1930's during the Oxford University Ellesmere Land Expedition (Humphries et al. 1936), and the Cambridge University expedition (Wordie 1938). In 1937, T.C Lethbridge (1939) conducted four days of excavation at the Eskimopolis site (which Lethbridge called the Turnstone Beach site), a Thule Inuit occupation located on the Johan Peninsula. Archaeology, however, was a minor component of these research expeditions and the short duration of the excavations limited their findings. From 1977 to 1982, and 1987 to 1989 the area became the focus of the Ellesmere Research Project, of the Arctic Institute of North America, which focused on population movements in the Arctic (Schledermann 1990; Schledermann et al. 1990). A team of researchers headed by Peter Schledermann conducted a series of archaeological surveys and excavations throughout the region, which spanned as far north as Dobbin Bay and south to Cape Wade (McCullough 1989; Schledermann 1990; Schledermann and McCullough 2003b). A total of 242 sites representing Independence I, Saqqaq, Pre-Dorset, Early and Late Dorset, and Early and Late Thule Inuit occupations were recorded (McCullough 1989; Schledermann 1990). This work securely established the region as not only an important crossroads from Canada to Greenland, but as a long-term settlement area for Paleo-Inuit and Thule Inuit societies from approximately 2000 BCE until 1700 CE (Schledermann 1990).

Of the sites recorded on the Canadian side of Smith Sound, 15 were Thule winter sites (Schledermann and McCullough 2003b), four of which, including the Skraeling Island site (SfFk-4), contain house features related to the Ruin Island phase of the Thule culture (McCullough 1989). This phase was initially defined by Eric Holtved (Holtved 1944b) after his archaeological excavations on the Greenland side of Smith Sound, particularly the Thule occupation on Ruin Island. These sites shared several characteristics that were unique to this area, including material culture traits very similar to those found on Alaskan Thule sites (Holtved 1944; Schledermann 1978). These sites also yielded a high number of Norse artefacts, which Holtved considered to be *in situ* and led him to date the occupation to sometime after 1300 CE when Norse were believed to have been in the area (Holtved 1944). Holtved (1944) considered the Ruin Island phase of the Thule culture to represent a second migration of Alaskan groups into the Smith Sound region where he believed an earlier migration of Thule Inuit people had already settled. Karen McCullough re-evaluated the identity of the Ruin Island phase in her PhD (later published as McCullough 1989). Based on the excavation and dating of Ruin Island sites on the Canadian side of the Smith Sound region, including the Skraeling Island site, and the absence of an earlier Thule Inuit occupation in the area, McCullough argued that the Ruin Island phase represented the first migration of Thule Inuit people into this part of the eastern Arctic (McCullough 1989). At the time of her research, it was commonly held that Thule first left Alaska sometime around 1000 CE (Maxwell 1985; McGhee 1996). However, researchers began to question this date and suggested the migration did not take place until much later (McGhee 2000). More recently, the re-dating of Thule Inuit Sites in the Western Canadian Arctic has confirmed these suspicions, placing the initial Thule migration well into the 13th century CE (Friesen and Arnold 2008; see Chapter 3 for further discussion). The Ruin Island phase in the Smith Sound region is now usually considered as representing the initial Thule migration into the eastern High Arctic. This view, however, is not unanimous. H.C Gulløv (1997) postulates that when the Ruin Island Thule first arrived in the Smith Sound region, a small population of Classic Thule Inuit was already occupying the area. This position relies heavily on harpoon head typology and the presence of features that suggest cultural contact between this suggested earlier group and Dorset and Norse populations who occupied the area during the 13th century (Gulløv 1997). Whatever the case may be, the tight range of C-

14 dates obtained by McCullough, suggest the Ruin Island phase represent at the least one of the earliest Thule Inuit migrations into this area.

Archaeological investigations on the Greenland side of the Smith Sound/Kane Basin further suggest this region was an important settlement area throughout prehistory. George Comer, Peter Freuchen and Lauge Koch carried out the first archaeological excavations in this region in the beginning of the 20th century when they excavated the Uummannaq site, otherwise known as Comer's Midden (Wissler 1918). Captain Comer also carried out excavations at Iita (Etah) and collected surface material throughout Inglefield Land. The first archaeological surveys in the area were conducted in 1921 by Knud Rasmussen (1921), who recorded numerous features including Thule winter houses, tent rings, fox traps, and caches. After Holtved's (Holtved 1944b, 1954) two field periods between 1935 and 1937 and 1946 and 1947, archaeological field work did not continue in the region until 1991 when Torben Diklev and Bo Madsen of the local Thule museum conducted surveys along southern Inglefield Land (Diklev and Madsen 1992). During the 1991 field season, and another in 1993 when Madsen and David Qaavigaq returned to the area, many Thule Inuit features including winter houses, tent rings, burials, caches and fox traps were recorded. They also identified a number of Paleo-Inuit occupations, which had been previously unknown in this part of Greenland, although their existence had been assumed based on the Paleo-Inuit material culture excavated from the region's Thule houses (Holtved 1944). During the 1991 survey, Diklev and Madsen (1992) visited the Qeqertaaraq Peninsula in Hatherton Bay, which proved to be rich with Paleo-Inuit archaeology including what appeared to be Late Dorset structures, a rare feature for Greenland (see Chapter 3 for discussion of Late Dorset site distribution). Up to this point, the only *in situ* Late Dorset finds in Greenland were from a tent ring in Hall Land, excavated in 1921 by Lauge Koch (Mathiassen 1928a). These discoveries lead to the formation of the Gateway to Greenland Project, a collaborative research program between the Danish National Museum, the Greenland National Museum and Archives, and the Universities of Nuuk, Copenhagen and Århus (Appelt and Gulløv 1999; Appelt et al. 1998). Between 1996 and 1998, fieldwork focused on the area between Cape Hatherton and Cape Alexander along the coast of Hatherton Bay, southern Inglefield Land. In total, almost 500 house structures were identified, many of which date to the Late Dorset period (Appelt and Gulløv 1999). Excavations were undertaken at three locales including the Late Dorset occupations at Qeqertaaraq (Appelt et al. 1998), the Qallunatalik/Polaris site (Grønnow 1999), and the David Site (Appelt 1999).

Archaeological investigations in this region have more recently been the focus of the Inglefield Land Archaeological Project (ILAP), a multi-year collaborative research endeavour by the University of California Davis, Bowdoin College, and the Greenland National Museum and Archives (Darwent et al. 2007). In an effort to better understand the impacts of population movements and cultural contact on local communities, the project concentrated its efforts on archaeology dating to the later prehistoric to historic time period (LeMoine and Darwent 2010). The fieldwork component of this project took place between 2004 and 2009. While Rasmussen's (1921) early surveys provided some idea of the distribution of archaeological sites in the area, there were substantial gaps (Darwent et al. 2007). Thus, one of the primary objectives of ILAP was to conduct an intensive systematic survey of Inglefield Land and construct a complete picture of the region's archaeology and resources (Darwent et al. 2007). The ILAP has produced several publications on their findings including Darwent and Foin's (2010) zooarchaeological analysis of a Late Dorset and an Thule Inuit house structure from Cape Grinnell. Trine Bjørneboe Johansen (2012) has recently completed her doctoral dissertation that focused on changes in subsistence practices through time at Iita using zooarchaeological and ethnographic research.

9.3 The Environment of Qeqertaaraq

Qeqertaaraq is a 1 km long peninsula found on the northern half of Hatherton Bay forming the eastern border of Smith Sound (Figure 9.1; Appelt and Gulløv 1999; Appelt et al. 1998). The Peninsula is located within the southern boundary of Inglefield Land, northwest Greenland. Inglefield Land is separated from more southern regions by the Greenland ice cap and ice-free land is restricted to narrow areas along the coast. Today, the nearest town is Siorapaluk in Prudhoe Land, approximately 60 km south of Qeqertaaraq. Inglefield land as a whole is composed of a vast, cliff-bounded highland plateau (Hansen et al. 2006). Qeqertaaraq is composed of rocky knolls and beach ridges that are broken by small shallow ponds and streams (Appelt and Gulløv 1999; Appelt et al. 1998); no more than 3 km from the coast the land rises to over 200 metres. It forms part of a crystalline shield, specifically the Palaeoproterozoic Inglefield mobile belt (Dawes 2004). The peninsula is sparsely vegetated, with stunted shrubs such as the arctic willow, however the surrounding area does support a flourishing flora, including lichens, ferns, grasses, sedges, and a variety of flowering plants (Hansen et al. 2006). This is surprising since summers are short and the sun stays below the horizon (recorded at Iita) from 24 October until 18 February (Hansen et al. 2006). However, the fecal matter of the large colonies of seabirds in the region contributes to a thick distribution of lichens along the cliffs of southern Inglefield Land (Hansen et al. 2006).

The High Arctic climate of this region has an average January to March temperature of -30° C and an average July temperature of 7° C, although temperatures will often reach above 15° C during the summer and can drop below -50° C in the winter (Hansen et al. 2006). A combination of wind warmth and direction has resulted in warmer temperatures here on the east side of the NOW, where the annual mean is -9° C, in comparison to a -14°C annual mean on the western side of the NOW (Barber et al. 2001). On average, Inglefield receives a total of 120 mm of precipitation yearly, most of which falls as snow (Hansen et al. 2006). During late March/early April, the polynya expands along the coast spreading southward and westward (Barber and Massom 2007). During November, freeze-up occurs and an ice bridge in Nares Strait/Smith Sound is created (Barber et al. 2001). This ice bridge combined with a northerly flow of strong winds, forms this latent-heat polynya (Barber and Massom 2007). Historically, the sea ice on this side of the NOW is thinner relative to the Ellesmere coast by approximately 30-50 cm, this thickness and warm currents contribute to an early sea melt near Greenland (Barber and Massom 2007).

As well, this side of the NOW has a slightly richer animal life in comparison to the western border, a fact that has been linked with the earlier ice breakup and inflow of nutrient rich and warm currents from southern Greenland (Vibe 1950). As a result, sea mammals including bowhead whale (*Balaena mysticetus*), beluga (*Delphinapterus leucas*), narwhal (*Monodon monoceros*), and walrus (*Odobenus rosmarus*) can be found in larger numbers earlier in the spring. These species are found throughout the summer, but their numbers shrink during the winter when many migrate to more southerly locations (Finley and Renaud 1980; Richard et al. 1998). Historical records suggest that the frequency of walrus during the winter was higher in the past. Elisha Kane (1877), an American explorer, spent two winters near Iita, between 1853-1855; he noted that walrus "frequent the half-broken ice-margin throughout the year". Isaac Hayes (1867), another American explorer, who overwintered in the area between 1860-1861, stated "walrus had been very numerous in the open waters outside the harbor all through the winter, and their shrill cry could be heard at almost any time from the margin of the ice".

Ringed seals (*Pusa hispida*) and bearded seals (*Erignathus barbatus*) can be found year-round feeding on the region's arctic cod population (Vibe 1950). Harp seals (*Pagophilus groenlandicus*) can be found here during the summer when they migrate up the northwest coast of Greenland, however Inglefield Land is the most northerly extension of the harp seal migration (DFO 2011) and their frequencies are highly variable (Born et al. 2004; Sergeant 1991; Vibe 1950). Harbour seals (*Phoca vitulina*) are another year-round resident found along the shallow coasts of Greenland. This is also the most northerly extension of their distribution, and today they are rarely seen in the area (Teilmann and Dietz 1994).

Along southern Inglefield Land large colonies of dovekies (*Alle alle*) and thick-billed murres (*Uria lomvia*) can be found (Pedersen and Falk 2001), as well as black Guillemots (*Cepphus grylle*), black- legged kittiwakes (*Rissa tridactyla*) and glaucous gulls (*Larus hyperboreus*) (Hobson et al. 2002). When Kane (1856) visited the area in 1854, glaucous gull, arctic tern (*Sterna paradisaea*) and eider species (*Somateria* sp.) bred along the margins of Hatherton Bay.

Today, caribou (*Rangifer tarandus groenlandicus*) are found in Inglefield Land throughout the year, however, the caribou population of Northwest Greenland has witnessed rapid rise and fall cycles since at least the 1700's and likely earlier. In the 1970's, 100,000 caribou were recorded but within ten years this number decreased to between 7000-9000 (Roby and Thing 1985). Less then ten years later caribou populations exceeded all previous records (Cuyler 2006). When Hayes (1867:237) spent a year at Iita, caribou were hunted year-round, he recalls “the reindeer had grown very poor during the winter, and their flesh was tough and almost tasteless but this did not discourage the hunters, and several captures were made”. Hayes (1867) also described the predominance of arctic fox in the area, which included both blue and white varieties, one of each he kept in his cabin.

Today, muskoxen (*Ovibos moschatus*) are not found in Inglefield Land (Bennike and Andreasen 2005; Vibe 1981), although their bones have been identified on archaeological sites that date prior to the mid 1800s (Bennike and Andreasen 2005; Darwent et al. 2007; Steensby 1917; Vibe 1981). These animals would likely have been available year-round offering larger yields of meat during the summer and fall when their fat supplies are high (Steensby 1910). Muskoxen do not appear to have been heavily relied upon by the Iita Inughuit as they contributed very little (less then 1% of the identified mammal) to the faunal assemblages that date from the Thule Inuit to Historic periods (Johansen 2012:200). Arctic fox (*Alopex lagopus*) and arctic hare (*Lepus arcticus*) are available throughout the year (Vibe 1981), and contributed moderately high proportions to the Thule Inuit faunal samples excavated from Iita (Johansen 2012). Arctic wolves (*Canis lupus*) have also been sighted in this area (Kane 1856; MacMillan 1918), however it is believed these wolves migrated across the winter ice from Ellesmere Island and are infrequent visitors to the region (Dawes et al. 1986; Vibe 1967).

9.3.1 Qeqertaaraq, Inglefield Land

Across Qeqertaaraq, 315 structures have been identified dating to the Late Paleo-Inuit and Thule time periods. These include eight Late Dorset houses, two Thule *qarmat*, 125 tent rings, 120 caches, and 60 additional features (Appelt and Gulløv 1999). These additional features include numerous middens, caches, fox traps, fireplaces, boat supports, cairns, and play-houses (Appelt and Gulløv 1999). Two Thule Inuit artefacts, a musk ox horn doll and an antler arrowhead, were recovered from a Late Dorset semi-subterranean house (H4) at the South West Point Site and imply possible contact between the Late Dorset and Thule Inuit who lived in the region (Appelt and Gulløv 1999). Appelt and Gulløv (1999), who excavated the sites at Qeqertaaraq, posit that Late

Dorset and Thule Inuit groups in this region overlapped for between 50 and 100 years. Qeqertaaraq is suggested to have been Dorset territory, with areas located to its north and south, including Skraeling Island, to have been occupied by Thule Inuit groups (Appelt and Gulløv 1999).

9.3.2 South West Point Site, Qeqertaaraq

The South West Point Site is located at the south west margin of the peninsula between a rocky coast and cliff wall that measures no more than 4 metres high (Appelt and Gulløv 1999; Appelt et al. 1998). The site spans an area of 100 by 130 metres and consists of ten beach ridges. Six Late Dorset semi-subterranean house structures are found scattered across the beach ridges between 5-6 metres above sea level, and a large number of tent rings, middens, caches, shelters or windbreaks, shooting blinds, and several fox traps and cairns have been identified (Figure 9.2). This study focuses on House 1 (H1) and the associated midden deposit, found in the western section of the site 5.5 metres above sea level on a gravel terrace (Appelt and Gulløv 1999; Appelt et al. 1998).

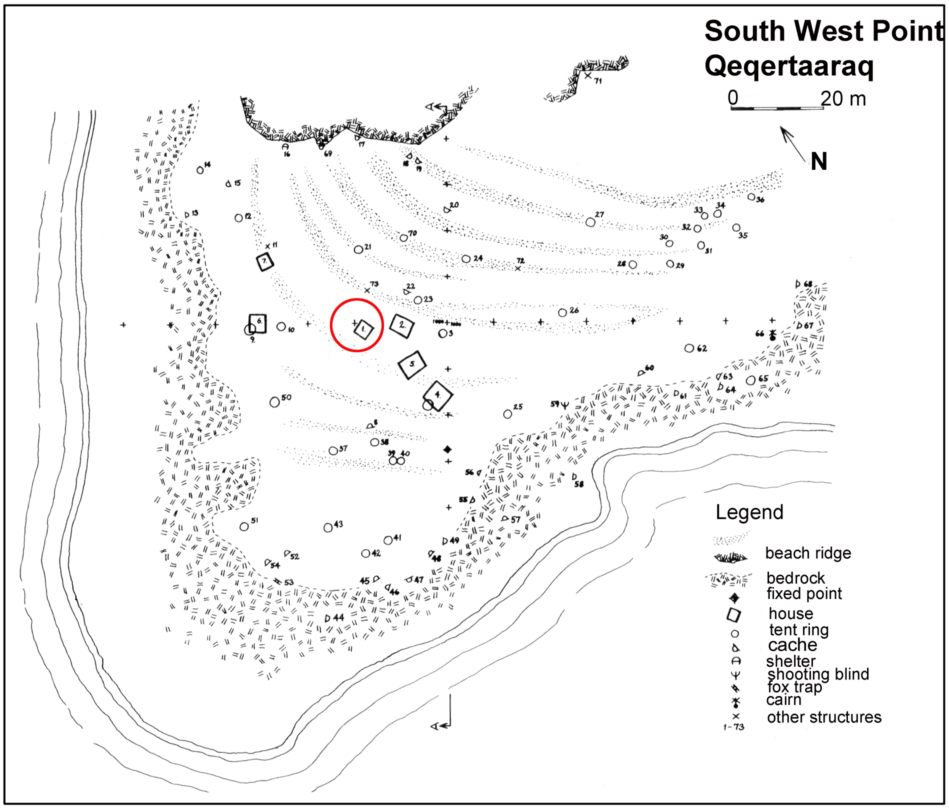


Figure 9.2 Map of the South West Point site, H1 is outlined in red (after Appelt and Gulløv 1999).

9.3.2.1 Archaeological Features

H1 is a semi-subterranean house structure that appeared on the surface as a roughly rectangular depression measuring 4 by 5 metres in diameter (Appelt and Gulløv 1999; Appelt et al. 1998). The longitudinal axis is oriented NW-SE (Figure 9.3). The site was excavated in 50 x 50 cm^2 units. A total of 22.25 square metres were excavated from the house and surrounding area. The excavation of the structure did not provide a clear understanding of the layout of the house, although it appeared to be repeatedly used and three phases of occupation were identified totaling 11 distinct layers (Appelt and Gulløv 1999; Appelt et al. 1998; Figure 9.3). In Phase 1, three features were identified including a semicircular platform area, a lamp stone with a concentration of burnt blubber, and a distinct inner wall of layered turf. This layered turf wall could only be clearly distinguished along the northwestern and western border of the house. The entrance was built up 10-15 cm above the floor level and was interpreted as a rudimentary cold trap. In Phase 2, the house extended in the southeast corner where a low stonewall was found. In Phase 3 the final occupation, including a flagstone floor, was identified in the northwestern part of the structure. Three radiocarbon dates on muskox bone from Phase 3 produced dates falling between 1040-1150 cal CE (950 ± 45 BP), 980-1161 cal CE (985 ± 46 BP) and 1025-1207 cal CE (920 ±45 BP) (dates at 2 sigma calibrated using CALIB 7.1; Appelt and Gulløv 1999:12). A fourth date on walrus bone produced a later date falling between 1300-1443 cal CE (545± 50 BP). Accepting the three dates from muskox bone, in addition to the artefactual evidence, the house would have been occupied between approximately 1000-1150 cal CE (Appelt and Gulløv 1999). Although the upper two phases were not radiocarbon dated, the house's stratigraphy suggests the Phase 2 occupation occurred soon after Phase 1, however, a larger time gap was interpreted to have occurred between Phase 2 and Phase 3 as a gravel berm had collapsed (Appelt and Gulløv 1999). Whether these time gaps between the upper two phases represent several years or one season is not known; nevertheless, all the artefacts were from the Late Dorset period. For consistency with the two earlier case studies, in addition to the difficulty in determining the time gaps between the different phases in the house, the faunal material recovered from all three phases are aggregated and considered together in the following analysis.

The associated midden was found several metres south of the house (Figure 9.3). The midden deposit was extensive, covering an area of approximately 40 square metres, of which 16 square metres were excavated. Radiocarbon dates are not available for the midden feature, however its proximity to H1, as well as the large number of Late Dorset artefacts it produced, suggest the midden was of Late Dorset origin. For this study, faunal material from 11 square metres from within the structure and from a 1 metre square unit of the midden feature was analyzed (Figure 9.3). Time constraints prevented analysis of all units from the house, therefore those with the densest concentration of bone material, representing each area within the structure, were selected.

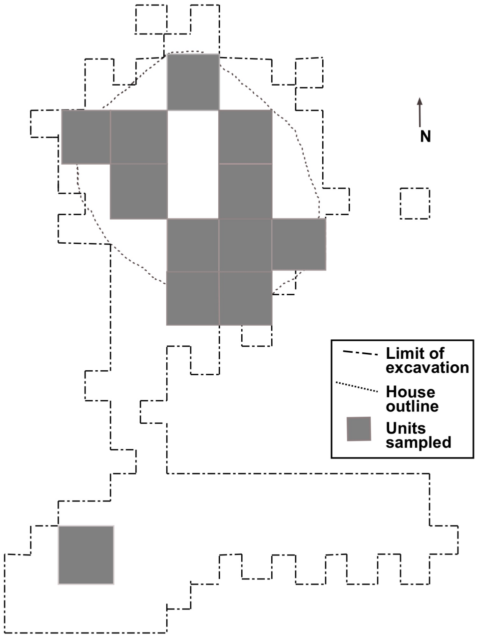


Figure 9.3 Outline of H1 and its associated midden at the South West Point Site (Bendix 2000:82).

9.3.2.2 Zooarchaeological Analysis of the South West Point Site

A total of 2814 bone specimens were identified from the house and midden; 83.7% of these specimens were identified to at least class and 55.4% were identified to family (Table 9.1). These specimens were well preserved, with the majority indicating early stages of weathering (Stages 1 & 2; Behrensmeyer 1978).

9.3.2.2.1 Taxonomic Frequencies

Class distribution was quite similar between the house and midden. Mammal bones are most frequent in both features comprising 86.5% of the specimens identified to class within the house, and 79.9% within the midden (Figure 9.4). Bird bones comprise a significant portion of the faunal material from both features. Fish specimens, however, were rare. They are absent in the house and there was a single fish bone in the midden.

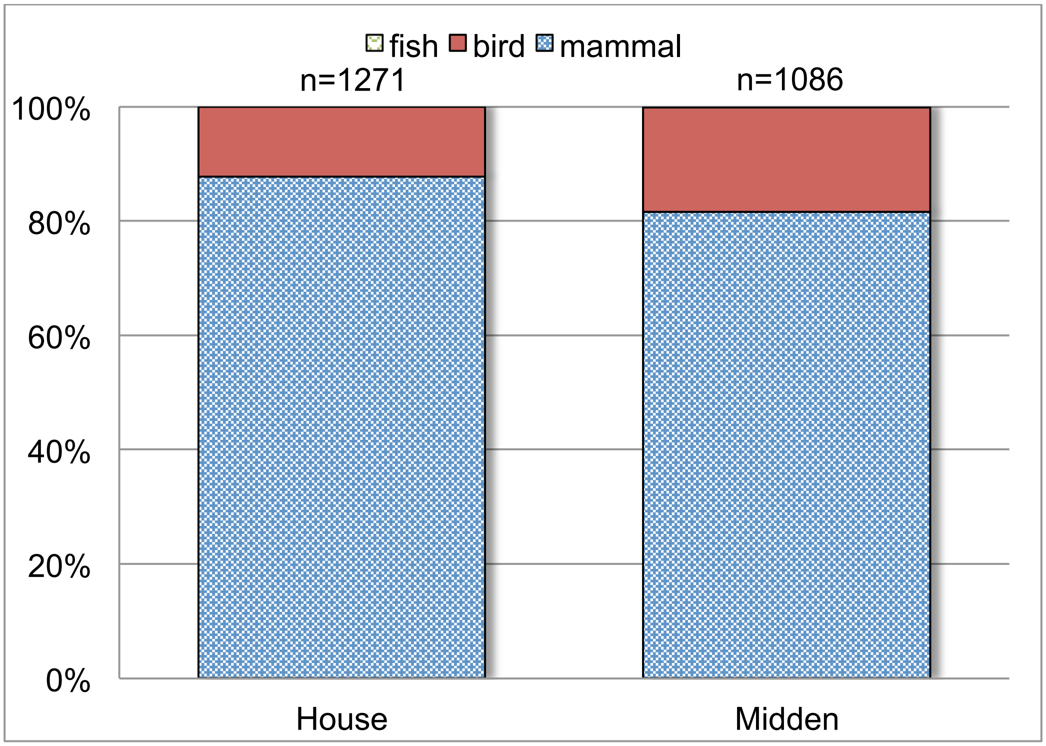


Figure 9.4 Class frequencies in the Late Dorset archaeofaunas from the South West Point site expressed as %NISP.

Table 9.1 Taxonomic frequencies from the Late Dorset contests at the South West Point site.

Taxon	**House 1**		**Midden**		**Total**	
	NISP	%[1]	NISP	%	NISP	%
Indeterminate fish	0		1	100	1	
Total Fish[6]	0	0	1	0.1	1	>1
Brant goose	0		1	0.7	1	0.4
Goose	3	3.3	0		3	1
Eider	15	16.3	54	38	69	29.5
Long-tailed duck	0		1	0.7	1	0.4
Duck	3	3.3	12	8.5	15	6.4
Glaucous gull	28	30.4	15	10.6	43	18.4
Iceland gull	2	2.2	0		2	0.9
Glaucous gull/Iceland gull	0		4	2.8	4	1.7
Gull	4	4.3	0		4	1.7
Common raven	9	9.8	7	4.9	16	6.8
Dovekie	27	29.3	47	33	74	31.6
Black guillemot	1	1.1	1	0.7	2	0.9
Bird indeterminate	79		75		154	
Total Bird[6]	171	12	217	17.9	388	16.5
Bowhead whale	1	0.1	1	0.2	2	0.2
Whale	2	0.3	0		2	0.2
Arctic fox	448	56.4	263	49.2	711	53.4
Arctic hare	77	9.7	5	0.9	82	6.2
Polar bear	12	1.5	7	1.3	19	1.4
Bearded seal	2	0.3	2	0.4	4	0.3
Large seal/Walrus	2	0.3	0		2	0.2
Ringed seal	13	1.6	5	0.9	18	1.4
Harbour seal	0		1	0.2	1	0.08
Harp seal	1	0.1	3	0.6	4	0.3
Small seal	97	12.2	164	30.7	261	19.6
Walrus	46	5.8	47	8.8	93	7
Caribou	6	0.1	9	1.7	15	1.1
Muskox	88	11.1	29	5.4	117	8.8
Sea mammal	6		0		6	
Large sea mammal[2]	27		20		47	
Large terrestrial mammal[3]	1		5		6	
Large mammal[4]	113		111		224	
Mammal indeterminate	158		196		354	
Total Mammal[5]	1100	87.9	868	79.9	1968	83.5
Indeterminate	236		221		457	
Total		**1507**		**1307**		**2814**

[1] Individual taxon percentages are calculated by class, not by total sample.

[2] Large sea mammal includes large seal, walrus, and whale species.

[3] Large terrestrial mammal includes caribou, muskox, and polar bear.

[4] Includes large sea mammal and large terrestrial mammal.

[5] Class percentages are calculated using the total sample

9.3.2.2.1.1 Fish

A single fish specimen was identified at the site in the midden deposit. This specimen was categorized as fish indeterminate and could not be identified to element. However, the nature of the specimen including the horizontal bone growth and translucency clearly identified it as fish.

9.3.2.2.1.2 Bird

Bird distribution is quite variable between the two features (Figure 9.5). In the house, high frequencies of gull (36.9%), dovekie (29.3%), and Anatidae (23.2%) were identified. In the midden, Anatidae specimens, largely eider species, are most frequent (47.2%), a large proportion of dovekie (33%) was identified, and gull species comprise 13.4% of the identified specimens. Common raven is present in both features, however they are twice as frequent in the house as in the midden. In addition, auk species, primarily black guillemot, are found in both features but contributed less than 5% of the identified bird specimens.

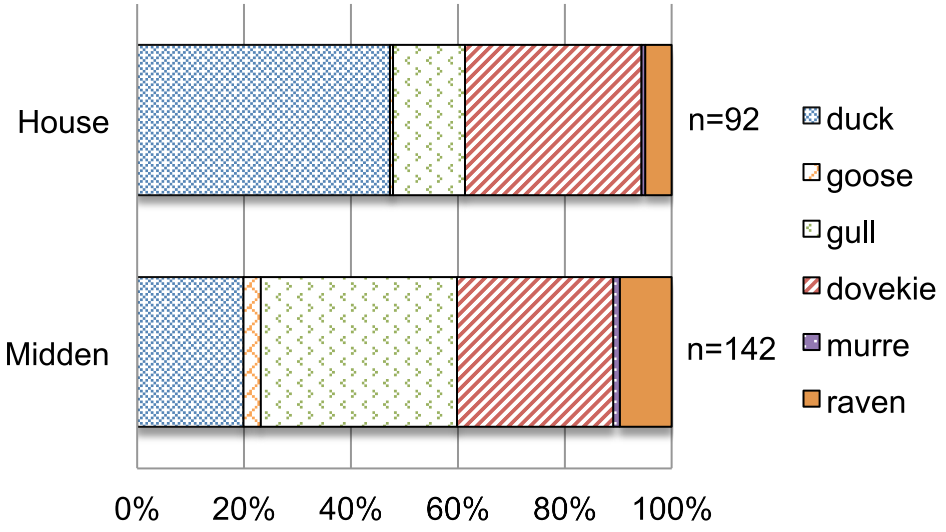


Figure 9.5 Distribution of bird in the Late Dorset archaeofaunas from the South West Point site expressed as %MAU.

9.3.2.2.1.3 Mammal

Fox is the most common mammal species identified at the site, comprising 56.4% of the identified mammal bones in the house and 49.1% of the fauna from the midden (Figure 9.6). Despite the predominance of arctic fox, the small size of the animal and its low meat yield suggests it was not the primary food resource. Historically, foxes were only eaten during the winter when their fat stores are high, as during the summer their fat stores are depleted and the meat is less palatable; and they were only eaten when other resources were scarce (Freuchen and Salomonsen 1958).

Seal is the second most common species in both the house and midden, and likely served as the primary food source for the Late Dorset at the site. In the house, seal bones contribute 14.3% of the identified mammal specimens, and are more than twice as frequent in the midden, where they contribute 32.6%. Several seal species were identified including bearded seal, ringed seal, harbour seal, and harp seal; however these are present in small frequencies and the majority of seal specimens came from small seals that could not be identified to species (Table 9.1).

Muskox and arctic hare bones are moderately frequent in the house, contributing 11.2 % and 9.8% of the identified mammal bones. In the midden, however, muskox bones are half as frequent and arctic hare is rare. Walrus comprised a slightly higher proportion of the identified mammal specimens within the midden, where it contributed 8.8%, which is 1.5 times more frequent than it is in the house. Caribou, polar bear, and whalebones were also identified in both features but comprise less than 2% of the identified mammal bones.

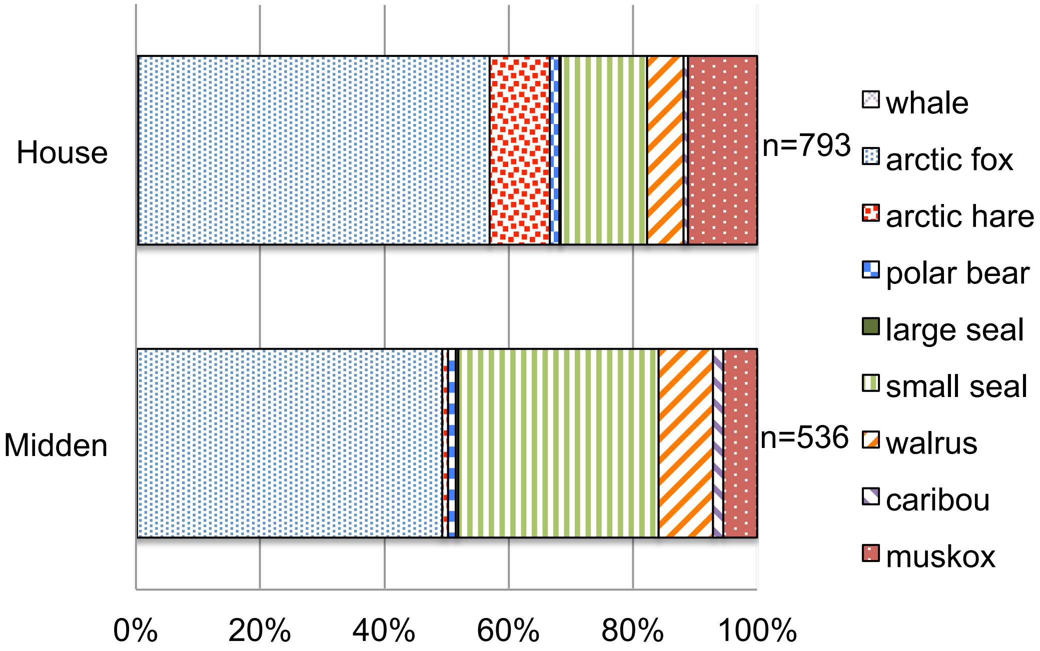


Figure 9.6 Distribution of mammal in the Late Dorset archaeofaunas from the South West Point site expressed as %NISP.

9.3.2.2.2 Animal Element Distribution

In this section the distribution of animal elements is considered in detail for arctic fox and small seal. A general discussion of the distribution of bird skeletal elements in addition to less frequent resources is also included. The raw numbers can be found in Appendix C.

9.3.2.2.2.1 Arctic Fox

Arctic fox bones were the most frequent mammal bones at the site (n=711), and their distribution is similar in both the house and midden samples. Generally, since arctic fox could easily have been transported whole to the site, it is unlikely that the differential transportation of skeletal elements played a major role in the distribution of fox elements at the site (Novecosky and Popkin 2005). The distribution of fox elements, however, could be related to taphonomic factors, food sharing, differences in the utilization of skeletal elements, or disposal practices. In the absence of available Bone mineral density (BMD) values for arctic fox, those recorded for red fox (*Vulpes vulpes*) are used as a proxy (Novecosky and Popkin 2005). The MAU of arctic fox elements exhibit no relationship to density in either the house (r_s=0.289,p=0.19) or midden (r_s=-0.073, p=0.75), indicating density-mediated attrition did not play a significant role in the distribution of arctic fox elements at the site. When the %MAU of arctic fox elements from the house and midden are compared, essentially the same pattern is apparent, with an emphasis on crania, mandibles, scapulae, and long bones (Figure 9.7)

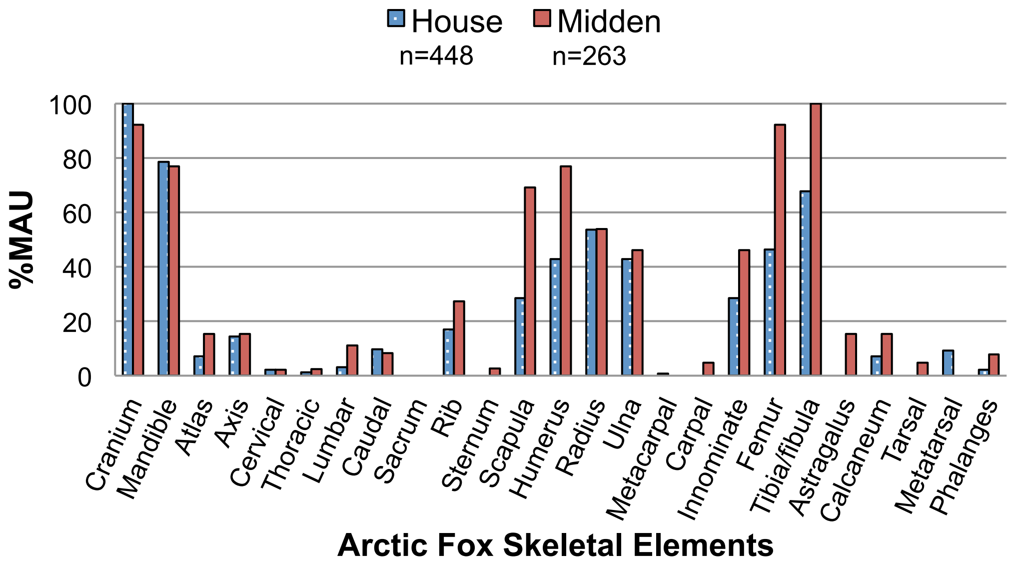
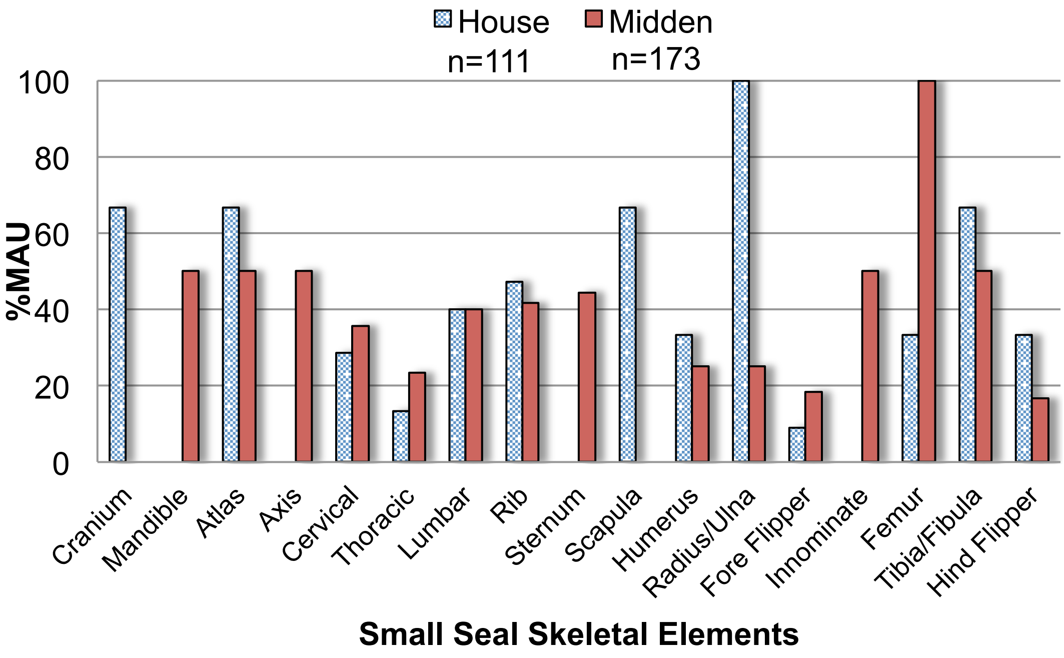


Figure 9.7 Distribution of arctic fox skeletal elements in the Late Dorset archaeofaunas from the South West Point site expressed as %MAU.

9.3.2.2.2.2 Small seal

The distribution of small seal elements is somewhat variable between the two features, probably at least in part due to sample sizes. In the house, elements from the front part of the skeleton, including scapulae, humerii, and radii/ulnas are more frequent (Figure 9.7). Innominates and femora are more abundant in the midden, however tibiae and fibulae are more abundant in the house, as are hind flipper bones (Figure 9.8).

The MAU of small seal elements was compared with the bone mineral density of small seal in order to determine whether density mediated attrition impacted the distribution of elements at the site. In order to determine whether higher meat utility elements were preferred to low meat utility elements, small seal element %MAU's are compared with the Food Utility Index (FUI) for small seals (Lyman et al. 1992). No correlation is found between the distribution of elements in the house (r_s=0.24, p=0.41) or the midden (r_s=0.08, p=0.78) samples, thus food utility does not seem to have impacted the distribution of small seal skeletal elements at the site. There was also no significant correlation between the small seal Bone Mineral Density Index (Lyman 1994) and small seal %MAU's in the house (r_s=-0.23,p=0.29) or the midden (r_s=0.12,p=0.60). Therefore, bone mineral density does not appear to have significantly impacted the distribution of small seal elements in either feature. No correlation was found between food element preference and the %MAU of small seal elements within the house (r_s=-0.15, p=0.66), yet a moderate and slightly significant correlation was identified between food element preference and the %MAU of small seal elements in the midden (r_s=0.49, p=0.12). This correlation is not easily explained, since there is no obvious explanation for why preferred elements would be more frequent in the midden. Because this index (see Chapter 2) generally ranks hind limbs higher than fore limbs, other factors may be more likely to have influenced this pattern. For example, it is possible that household cleaning practices resulted in these items being removed from the house and re-deposited into the midden, or that butchery practices resulted in these seal parts being introduced to the house less frequently.



*The fore flipper and hind flipper categories include metacarpals, carpals, and front phalanges, and metatarsals, tarsals, and hind phalanges, respectively.

Figure 9.8 Distribution of small seal skeletal elements in the Late Dorset archaeofaunas from the South West Point site expressed as %MAU.

9.3.2.2.2.3 Other Species

Various bird species were identified within the house and midden. High frequencies of dovekies were identified in both features. In the house, several parts of the dovekie skeleton are missing, however in the midden, apart from the cranium, the entire skeleton is found. The majority of the gull skeleton was identified in the house, however in the midden gull specimens were limited to wing and leg bones. An identifiable pattern was not found in the distribution of Anatidae in either feature (see Appendix C). In both features, walrus crania and bacula are most abundant, and various parts of the front and hind limb bones are present (see Appendix C). Although not included in the NISP's, a high number of fragments of walrus ivory were identified in both features and the data can be found in Appendix C. Muskox skeletal elements are equally represented in both the house and midden, with the majority of the skeleton identified. Various polar bear elements are found in both features with no particular patterning. Caribou elements were rare, with only ribs found in the house, and parts of a cranium, rib and scapula found in the midden. A large part of the arctic hare skeleton is found in the house, however only fragments of a scapula, innominate and metapodial were identified in the midden.

9.3.2.2.3 Modification Frequencies

This section discusses all modifications made to mammal bones, and the less robust fish and bird bones are excluded (Table 9.2).

Table 9.2 Modification frequencies on mammal bone from the Late Dorset contexts at the South West Point Site.

Modification[1]	House	Midden	Total
Cut marks	31	38	69
% cut marks	2.8%	4.4%	3.5%
Gnaw marks	21	11	32
% gnaw marks	1.9%	1.3%	1.6%
Burn marks	7	0	7
% burn marks	0.6%	0	0.4%
%fragmentary	73.5%	78.9%	75.7%
Fragmentation (NISP:MNE)[2]	2.8	2.6	2.7
NISP[3]	948	664	1612
MNE	499	340	839
Whole elements	251	140	391

[1] Percentages are calculated using total mammal NSP (excluding ivory specimens) for each sample see Table 9.1.

[2] Whole elements are excluded from this calculation.

[3] This NISP is used for calculating fragmentation and excludes mammal bone specimens that could not be identified beyond class.

In the house and midden samples, cut marks are found on specimens belonging to every mammal species. They are found on 2.8% of the identified mammal specimens from the house, and are almost twice as frequent in the midden, where they are found on 4.4%. The higher frequency of cut marks in the midden may suggest that animals were primarily processed and disposed of outside the house. However, it is equally possible that animals were processed inside the house but cleaning practices resulted in the removal of these bones from the house and their eventual disposal in the midden. Generally, gnaw marks are infrequent at the site and all gnaw marks from the house were puncture marks that ranged from 2-3 mm in diameter. In the midden, the majority of gnaw marks were also punctures ranging from 2-3 mm in diameter, and furrows were identified on one bone specimen. The small size of the puncture marks suggests arctic fox were responsible for the majority of them (see Darwent 2004). Generally, burning is quite infrequent. It is found on 0.6% of mammal bone from the house and is altogether absent from the midden. The %fragmentary, or the proportion of the sample that represent fragmented elements, is slightly higher in the midden. The intensity of fragmentation (NISP:MNE) is consistently low, indicating mammal bones at the site are fragmented into a similar number and size of pieces. The slightly higher %fragmentary in the midden is perhaps related to a differential impact of taphonomic factors (see Friesen and Betts 2006). For instance, in the midden bones would have had greater exposure to weathering processes and additional taphonomic factors that would have impacted the bone's structural integrity, leading to increased fragmentation.

Overall, cut marks are the most frequent bone modification on the samples, however they vary. Gnawing and burning, however, have had little impact on the samples, and both samples are largely comprised of fragmented bone elements.

9.3.2.2.4 Seasonal Indicators and Prey Demography

The faunal list provides some indication of the season(s) in which the animals were killed and when the site may have been occupied. Summer migrants such as dovekie, gull, duck, and goose species dominate the identified bird at the site. At least one juvenile gull was identified in the house and one juvenile gull and two juvenile ducks were identified in the midden, placing their occupations sometime during July or August. Harp seal, another summer migrant, was also identified although in low frequencies (Table 9.1).

The fusion sequence for small seals was also considered. At least two individuals in the house, and one in the midden were killed before they were six months old, placing their death sometime between April and September. Table 9.3 presents the data recorded for each age group. While this type of data does not translate directly into prey demography it does indicate which age groups were harvested. In the house, all the small seal elements were from young individuals. The few elements that were fused or fusing, indicate juvenile and young adults were harvested in addition to yearlings.

Additional immature animals were also identified at the site. Using the epiphyseal fusion sequence in red fox (*Vulpes vulpes*) (Harris 1978:111-112) as a proxy for arctic fox, a minimum of two immature arctic fox contributed to the house and a minimum of one immature fox contributed to the midden. One left humerus with an unfused proximal epiphysis, and two left humerii with unfused proximal and distal epiphyses suggest at least three individuals were killed before they reached 6 weeks of age. Arctic fox tend to be born in June, thus these data suggest one animal was killed sometime between June and August. Presuming pinnipeds have similar epiphyseal fusion sequences, at least one immature walrus was identified at the site (unfused metatarsal I). Since calves are born between mid-April and mid-June (Jefferson et al. 2008), the animal was likely killed sometime between April-November. Additional unfused elements, possibly representing immature animals, were also identified at the site, however the absence of known epiphyseal sequences and tooth eruption data prevent further interpretation regarding time of death (muskox:1 unfused innominate, 1 mandible with an erupting M2; polar bear: unfused scapula).

Migratory bird species, and the epiphyseal fusion data of fox, seal, and walrus suggest many species were taken during the spring or summer. Faunal indicators for winter kills are lacking, however, this does not mean Late Dorset were not present through the winter, but simply it is more difficult to establish occupation for this time of year. Because the house is well positioned in order to access seals throughout the winter and due to the semi-subterranean nature of the structure suggesting it was occupied during the cold season, it is probable that Late Dorset spent some part, if not all, of the winter in the house, and resided there through spring. While it is possible Late Dorset lived in the house during the summer, it is equally possible, if not more probable, that Late Dorset moved into tents for the warmer season and that the summer kills in fact represent stored food.

Table 9.3. MNE frequencies for unfused elements of small seal for each age category from the Late Dorset contexts at the South West Point site.

Seal element	**SWP Site**			
Age Fusion Sequence	unfused	fusing	fused	total
Y: metatarsal 1, dis.	1	0	0	1
Y: pelvis, acetabulum	1	0	1	2
Y: scapula, supraglenoid tubercle	2	0	0	2
Total	4	0	1	5
% unfused	**80%**			
J: femur, prox.	1	0	0	1
J: radius, prox.	3	0	0	3
J: humerus, dis.	1	0	0	1
Total	5	0	0	5
% unfused	**100%**			
YA: femur, dis.	4	0	0	4
YA: humerus, prox.	0	0	0	0
YA: ulna, prox.	0	0	1	1
YA: tibia/fibula, prox.	4	0	0	4
Total	8	0	1	9
% unfused	**88.9%**			
OA: ulna, dis.	0	0	0	0
OA: metatarsal 1, prox.	0	0	0	0
OA: radius, dis.	0	0	0	0
OA: tibia/fibula, dis.	3	0	0	3
Total	3	0	0	3
% unfused	**100%**			

Y=yearling, J=juvenile, YA=young adult, OA=old adult

9.4 The Environment of Skraeling Island

Skraeling Island is a small island situated just north of the Johan Peninsula, Ellesmere Island, at the mouth of Alexandra Fjord in Buchanan Bay (Figure 9.1). The Island comprises two distinct areas that are separated via a narrow gravel ridge that is submerged during high tides. The early explorer Sir George Nares (1878) initially called the Island the Three Sisters, after the three conical high points on the Island that are visible from the mainland. Otto Sverdrup (1904) gave the Island its present name when he visited the area in the 19th Century. The geology of the area was largely formed by the glacial retreat, which occurred in this part of Ellesmere Island between ca. 8500 and 6500 BP (Blake 1992). The landscape consists of large bays and fjords sheltered by steep cliffs upwards of 600 m high that are interrupted by few small lowland valleys (Nares 1878:66; Ring 2001). The general area including Skraeling Island is a part of the Precambrian Shield that consists of Paleozoic dolomites, limestones, and sandstones (Watts 1975).

Skraeling Island's topography is rugged, with boulder fields and steep cliffs, two ranging over 170 metres in height (Schledermann 1990). Arctic willow, arctic heather, and mosses are present but sparsely distributed across the Island. Average temperatures and precipitation on Skraeling Island have not been recorded, however the Island's climate is characteristic of a polar desert, exhibiting a mean annual temperature of approximately -20° C and a mean annual precipitation of less then 150 mm (Callaghan et al. 2005).

The western portion of the Smith Sound/Kane Basin has several areas of ice-free waters throughout the year. The NOW is formed between November and March when an ice bridge extends from Ellesmere Island to northwestern Greenland (Barber et al. 2001; Stirling 1980). A second very important polynya in the region is the Flagler Bay Polynya, located north of the Island in Flagler Bay (Hannah et al. 2009). Skraeling Island itself is often surrounded by several secondary, less stable polynyas, which extend north of the NOW into the Kane Basin and south of the Flagler Bay Polynya into Hayes Fjord (See Figure 9.1). As a result, several important marine resources are accessible year-round. The summer melt of sea ice occurs on a gradient beginning in early spring on the Greenland side and moving northwest to the area surrounding Skraeling Island where the water is largely ice free during the month of August (Barber et al. 2001).

During the summer, when the ice breaks up, bowhead (*Balaena mysticetus*), beluga (*Delphinapterus leucas*), narwhal (*Monodon monoceros*), and walrus (*Odobenus rosmarus*) enter the waters surrounding Skraeling Island. Recent studies show that approximately 15,000 belugas populate the NOW during the summer months (COSEWIC 2004). While many of the whales and walrus travel to more southerly locations for the winter, small groups are known to overwinter in the region (Finley and Renaud 1980; Richard et al. 1998; Stirling 1980).

Ringed seal (*Pusa hispida*) and bearded seal (*Eriganthus barbatus*) are year-round residents. Harp seals (*Pagophilus groenlandicus*) can be found offshore near pack ice between late July and August during their summer migration (DFO 2011; Greely 1886; Lavigne 2002; Rosendahl 1961; Sergeant 1991). On occasion harbour seals (*Phoca vitulina*), who are year-round residents of Baffin Bay, will also make their way into the NOW (Mansfield 1967). Polar bears (*Ursus maritimus*) can be found during the summer and are also abundant along the edge of the local polynyas in the winter months (Finley and Renaud 1980; Stirling 1980).

Birds are plentiful, and a variety of ducks and geese including eiders (common eider, *Somateria mollissima*, and king eider, S. *spectablilis*) and long-tailed ducks (*Clangula hyemalis*) nest on the island (Schldermann 1980). Various jaeger species (e.g., long tailed jaeger, *Stercorarius longicaudus*, and the parasitic jaeger, *Stercorarius parasiticus*), gull species (e.g., Glaucous gull, *Larus hyperboreus*, and, Thayer's gull, *L. thayeri*), common raven (*Corvus corax*), arctic terns (*Sterna paradisae*), red-throated loons (*Gavia stellata*), and snow geese (*Chen caerulescens*) are also common. In addition, the NOW is an important breeding ground for the rare ivory gull (*Pagophila eburnean*) (Karnovsky et al. 2009). Although the NOW hosts a large number of sea birds, including dovekie (*Alle alle*), and black guillemots (*Cepphyus grille*), northern fulmars (*Fulmaris glacialis*), thick-billed murres (*Uria lomvia*), and black-legged kittiwake (*Rissa *tridactyla*), their colonies are concentrated south of Skraeling Island, nearer Greenland (Karnovsky and Hunt 2002). In addition, marine fish are available throughout the area.

The inhabitants of Skraeling Island also may have had access to a plentiful supply of muskox (Greely 1886; Peary 1907), primarily found along Sverdrup Pass and to a lesser extent along the Knud, Bache and Johan Peninsulas (Schledermann 1990). Today, caribou are infrequent in the region and past zooarchaeological research in the area suggests they were never a major resource for local inhabitants (McCullough 1989; Schledermann 1990; Schledermann and McCullough 2003b). Arctic wolves (*Canis lupus arctos*) are found in low frequencies throughout the northeastern part of Ellesmere Island as are small mammals including arctic fox (*Vulpes lagopus*) and arctic hare (*Lepus arcticus*).

9.4.1. Skraeling Island Archaeology

Skraeling Island is a small Island comprised of many raised gravel beach ridges. The close proximity to the regions' polynya concentrations made it an attractive location to past Arctic peoples as they provided access to animal resources year-round. There are two large Thule winter sites on the island: the Sverdrup Site, located on the northwestern corner of the larger portion of the island, and the Skraeling Island site, located on the southern part of the island (Schledermann 1990). At least 15 Early Paleo-Inuit settlements, and one Early Dorset site, were identified. One substantial Late Dorset occupation, the Oldsquaw Site, is located on the smaller portion of the Island approximately 200 metres north east of the present study site (Figure 9.9). Unfortunately, the Oldsquaw Site yielded very few animal bones making it unsuitable for the present study (McCullough 1989). Numerous Thule, and possibly Dorset, summer camps are also found along the Island's coast.

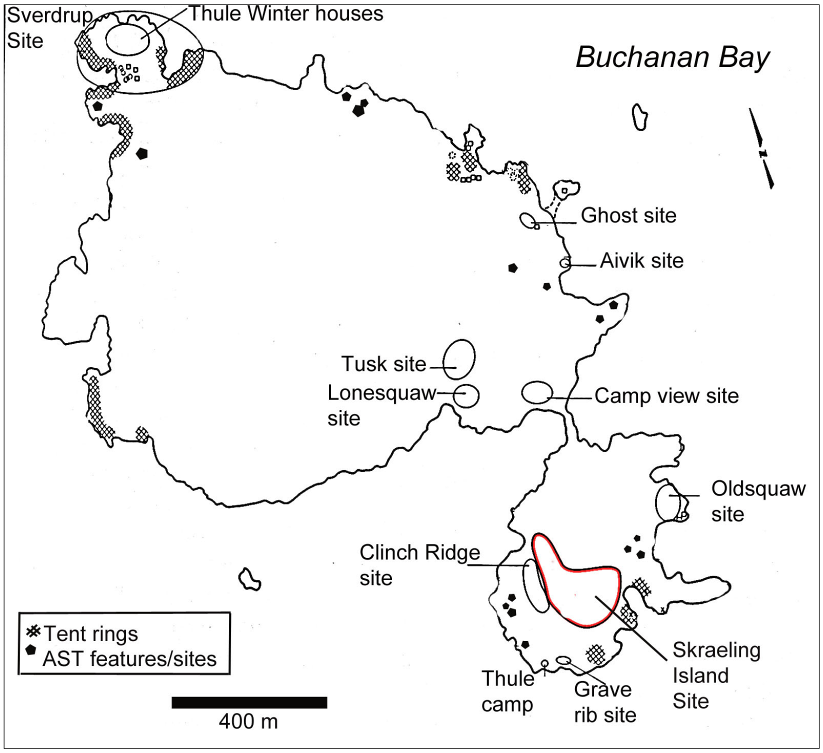


Figure 9.9 Skraeling Island site Distribution (after Schledermann 1990:15).

9.4.2 The Skraeling Island Site

The Skraeling Island site has been recognized as one of the earliest eastern Arctic Inuit occupations, and is a part of the Ruin Island phase of the Thule culture (Friesen and Arnold 2008; Gulløv 1997; McCullough 1989; Morrison 1999; Schledermann and McCullough 1980). Archaeological investigation between 1978 and 1980 by Schledermann and McCullough uncovered several sites from this period on the East coast of Ellesmere Island, including the Skraeling Island Site (McCullough 1989; Schledermann 1978b; Schledermann and McCullough 1980).

At this site a total of 23 Thule house ruins, and numerous tent rings, kayak and *umiak* supports, and food caches have been found (Schledermann and McCullough 1980; McCullough 1989). Seventeen of the Thule winter houses appear in five clusters, with the remaining six structures staggered across the site. All houses were at the least partially excavated (McCullough 1989). The following analysis includes archaeofaunas excavated from one cluster of house structures, H14, H15, and H16, which are situated on a beach ridge ten metres above sea level (Figure 9.10; McCullough 1989:51). In addition, fauna from two associated midden deposits, H15 midden and the H14/16 midden, was analyzed. A communal house, H13, was identified to the west of H14 (McCullough 1989), however, comparable faunal data for this structure has not yet been generated and therefore has been omitted from the present discussion.

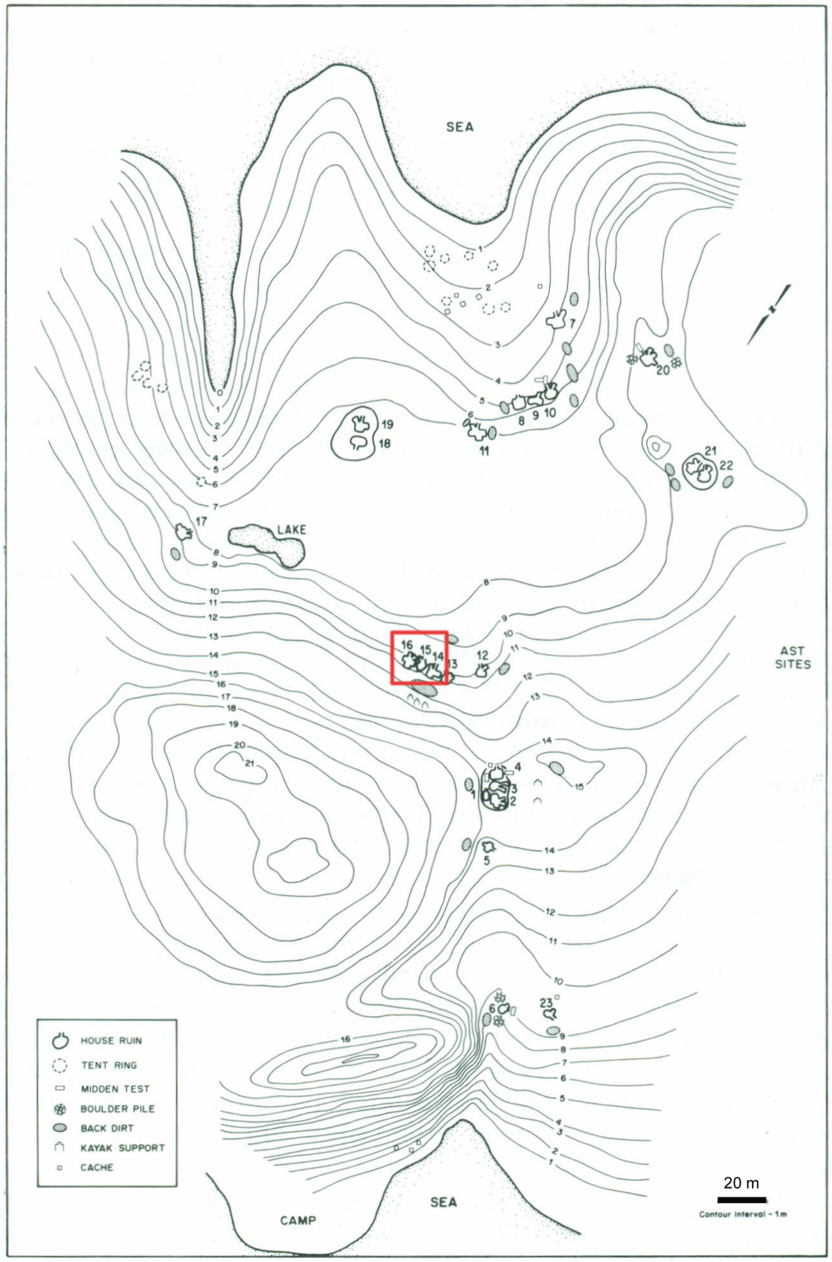


Figure 9.10 Skraeling Island Site Map (McCullough 1989:24).

9.4.3 Archaeological Features

H14 had a central floor area measuring 2.6 x 2.3 m, and a side room that extended on the west of the structure measuring 1.5 x 2.2 m (Figure 9.11; McCullough 1989). Few flagstones paved the floor of either room and raised sleeping platforms were absent. A circular pit was identified in the compact floor near the entrance to the kitchen. The kitchen measured 2.6 x 1.4 m. Its floor was paved with flagstones, and a cooking platform and two hearth areas were identified at the rear. The majority of the structure's interior was excavated, however permafrost conditions only allowed the excavation of part of the entrance tunnel. A willow sample recovered from the house produced a radiocarbon date falling between 1262 -1423 cal CE at 2 sigma (800±70 BP; GSC3033; calibrated using CALIB 7.1).

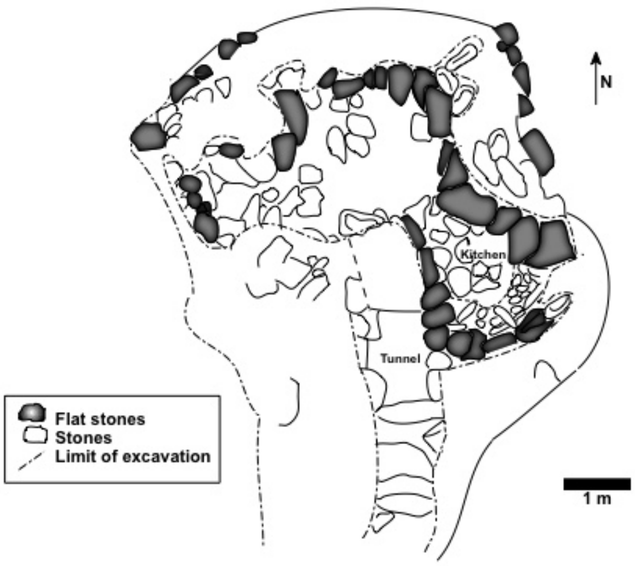


Figure 9.11 Plan of H14, the Skraeling Island site (after McCullough 1989:52).

H15 possessed a substantial superstructure and incorporated the largest quantity of whalebone in comparison to all other structures at the site. McCullough (1989:54) estimated a minimum of two bowhead whales were used to construct the house. This house had a single room which measured 3.9 x 3.4 m, of which the front portion was flagged with stone and whale scapula and mandible fragments (Figure 9.12; McCullough 1989). A sleeping platform was identified at the rear of the structure where the flagging stone ends and a raised gravel berm appears. In front of the platform were two whale rib uprights, which likely served as roof supports. Two additional sleeping platforms appear to have extended on each side of the central floor, however, these platforms were largely disturbed by the intruding walls of the adjacent structures (McCullough 1989:54). Walrus bones were also incorporated into the construction; seven skulls and mandibles were embedded within the north wall. A substantial kitchen extension was built to the east of the house. The kitchen tunnel measured 1.3 m long x 75 cm wide and approximately 60 cm high (McCullough 1989). The kitchen itself measures 2.9 m x 1.8 m and the rear-cooking platform had three separate hearth units (McCullough 1989). An alcove was identified at the south end of the kitchen, which presumably functioned as a meat locker (McCullough 1989:54). With the exception of part of the entrance tunnel, which was left unexcavated, all the animal bones recovered from H15 were analyzed for the present study. The upper levels of this house formed the midden for the two later structures, H14 and H16, which were built into the sides of H15 (McCullough 1989). Three radiocarbon dates were obtained from the structure. A sample of Norse wool produced a date between 1180-1303 cal CE (750±50 BP, GSC3038); a willow sample produced a date between 1262-1423 (640±70 BP; GSC2924); and, a heather sample dated between 1380-1441 cal CE (550±50 BP; GSC3059; dates are at 2 sigma calibrated using CALIB 7.1; McCullough 1989:241). These dates, in addition to several early Thule Inuit artefacts, including fragments of pottery forged in Alaska (Schledermann and McCullough 1980), suggest that Thule Inuit occupied the house sometime during the 12th-15th centuries.

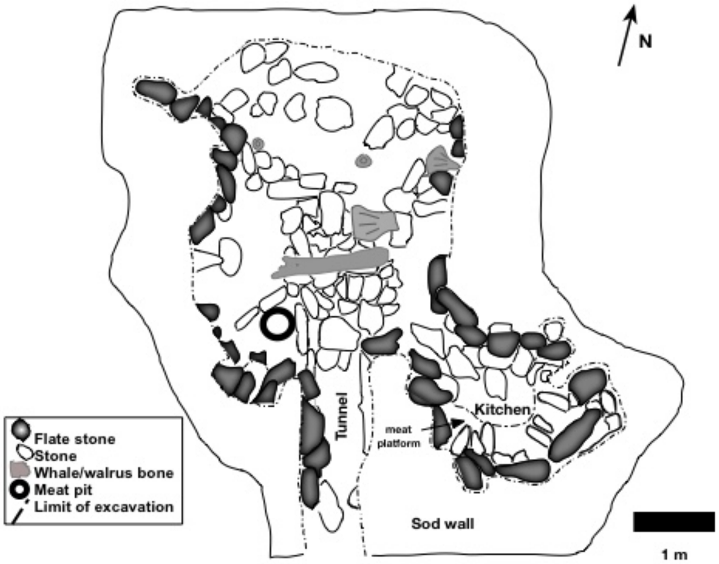


Figure 9.12 Plan of H15, the Skraeling Island site (after McCullough 1989:55).

H16 was quite similar in construction to H14 and was only partially excavated. A 2 x 1 m test unit was excavated from the central room and the entire kitchen was excavated (McCullough 1989). This structure did not appear to have a flagstone floor, but instead the floor was composed of hard-packed sand. The central room measured 2.7 x 4.8 m and a kitchen extended to the east of the house (McCullough 1989). At least two capstones covered the kitchen tunnel, which measured 1.1 m long, 90 cm wide, and 76 cm high. The kitchen itself measured 2.8 m x 1.4 m with an elevated cooking platform at the rear, which was divided into two separate hearths (Figure 9.13; McCullough 1989). In part, the tunnel roof was removed exposing the stone lined walls and capstones that were lined with whale and walrus bones, however, the floor was not excavated (McCullough 1989). No radiocarbon dates were obtained from this structure. The artifacts and house style, however, suggest it to be an early Thule Inuit occupation.

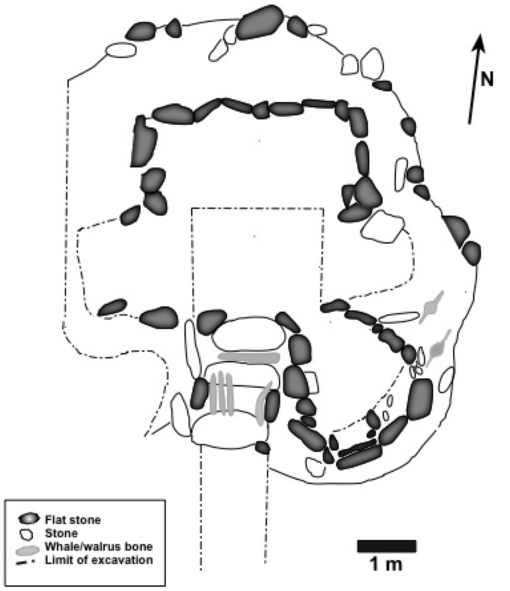


Figure 9.13 Plan of H16, the Skraeling Island site (after McCullough 1989:58).

9.4.4 Faunal Samples

The three houses and two middens were excavated by trowel, however none of the material was screened. Within H14, H15, and the two middens, the faunal material was collected by square metre, and within H16 it was collected by feature (e.g., entrance) (McCullough 1989:261). All of the faunal material was collected and bagged by level.

The H14 faunal sample was excavated from the floor level of the structure Unfortunately, all the faunal material from H14 was not available for the present analysis since approximately 40% of the fauna was identified in the field and subsequently left behind. This portion of the H14 fauna was largely identified as unidentified mammal (McCullough 1989:260), as a result their absence from the H14 taxonomic frequencies discussed here is assumed to have had minimal impact. The H15 faunal sample was excavated from the floor level, from the sleeping platform, and from below the flagstones. The faunal remains recovered from level 2, or labeled as fill, were not included in the H15 faunal sample, which contributes to disparities between the H15 NISP's described by McCullough (1989:263) and that described for H15 in the present analysis. The upper levels of H15, including that labeled fill, were identified, and are referred to here as H14/16 midden faunal sample. The H16 faunal sample includes all fauna collected from the floor level of the structure. In addition, six square metres of a midden were excavated in front of H15’s entrance tunnel; this fauna was also analyzed and is referred to in the following discussion as the H15 midden sample.

9.4.5 Zooarchaeological Analysis

A total of 2882 specimens were identified, all of which were identified to at least class and 93.7% of which were identified to family (Table 9.4). All the faunal remains were exceptionally well preserved with the majority of bone specimens exhibiting periosteum, cartilage, and in some cases fur.

9.4.5.1 Taxonomic Frequencies

In each feature, mammals are the most numerous class, comprising at least 95% of the identified fauna at the site (Figure 9.14). Fish are absent from all features. Bird specimens are rare and their distribution is somewhat variable amongst the features, contributing between 0 and 5.1% of the identified fauna.

Table 9.4 Taxonomic frequencies from the Thule Inuit contexts at the Skraeling Island site.

Taxon	**House 15**		**H15 Midden**		**House 14**		**House 16**		**H14/16 Midden**		**Total**	
	NISP	%[1]	NISP	%	NISP	%	NISP	%	NISP	%		
Goose	1	2.1	1	100	0		2	28.6	0		4	5.4
Eider	1	2.1	0		0		1	14.3	1	5.3	3	4.1
Thayers' gull	0		0		0		0		2	10.5	2	2.7
Glaucous gull	0		0		0		0		1	5.3	1	1.4
Medium gull	0		0		0		0		1	5.3	1	1.4
Large gull	0		0		0		0		2	10.5	2	2.7
Common raven	45	95.7	0		0		4	57.1	12	63.2	61	82.4
Bird indeterminate	2		0		0		0		0		2	
Total Bird[2]	49	5	1	0.3	0	0	7	3.6	19	1.2	76	2.7
Small whale	1	0.1	1	0.4	2	0.5	3	1.7	8	0.8	15	0.6
Bowhead whale	5	0.6	2	0.8	2	0.5	0		10	1.0	19	0.7
Whale	11	1.2	9	3.7	9	2.4	0		10	1.0	39	1.5
Dog	23	2.6	2	0.8	10	2.7	0		40	4.1	75	2.8
Dog/Wolf	124	14.1	3	1.2	23	6.3	1	0.6	46	4.7	197	7.5
Arctic fox	6	0.7	0	0	33	9.0	5	2.9	6	0.6	50	1.9
Arctic hare	1	0.1	1	0.4	1	0.3	2	1.2	0		5	0.2
Polar bear	27	3.1	1	0.4	13	3.5	5	2.9	20	2.1	66	2.5
Bearded seal	2	0.2	2	0.8	2	0.5	3	1.7	4	0.4	13	0.5
Grey seal	1	0.1	0		0		0		3	0.3	4	0.2
Large seal	25	2.8	10	4.1	20	5.4	0		25	2.6	80	3
Large seal/Walrus	7	0.8	0		0		0		0		7	0.3
Ringed seal	40	4.5	34	13.9	26	7.1	15	8.7	72	7.4	187	7.1
Harbour seal	1	0.1	1	0.4	0		0		1	0.1	3	0.1
Harp seal	3	0.3	1	0.4	0		0		8	0.8	12	0.5
Small seal	557	63.2	126	51.6	205	55.7	116	67.1	635	65.5	1639	62
Walrus	45	5.1	40	16.2	18	4.9	19	11.6	71	7.3	193	7.3
Caribou	1	0.1	0		1	0.3	2	1.2	0		4	0.2
Muskox	8	0.9	11	4.5	3	0.8	1	0.6	10	1.0	33	1.2
Large sea mammal[3]	4		10		4		11		5		34	
Large terrestrial mammal[4]	0		0		1		0		1		2	
Large mammal[5]	15		14		3		4		13		49	
Mammal indeterminate	20		24		7		3		26		80	
Total Mammal[2]	927	95	292	99.1	383	100	190	96.4	1014	98.2	2806	97.4
	976		295		383		197		1033		2882	

[1] %NISP's are calculated by class, not by total sample. [2] Class % is calculated using the total sample. [3] Large sea mammal includes large seal, walrus, and whale. [4] Large terrestrial mammal includes caribou, muskox, and polar bear. [5] Large mammal includes large sea mammal and large terrestrial mammal.

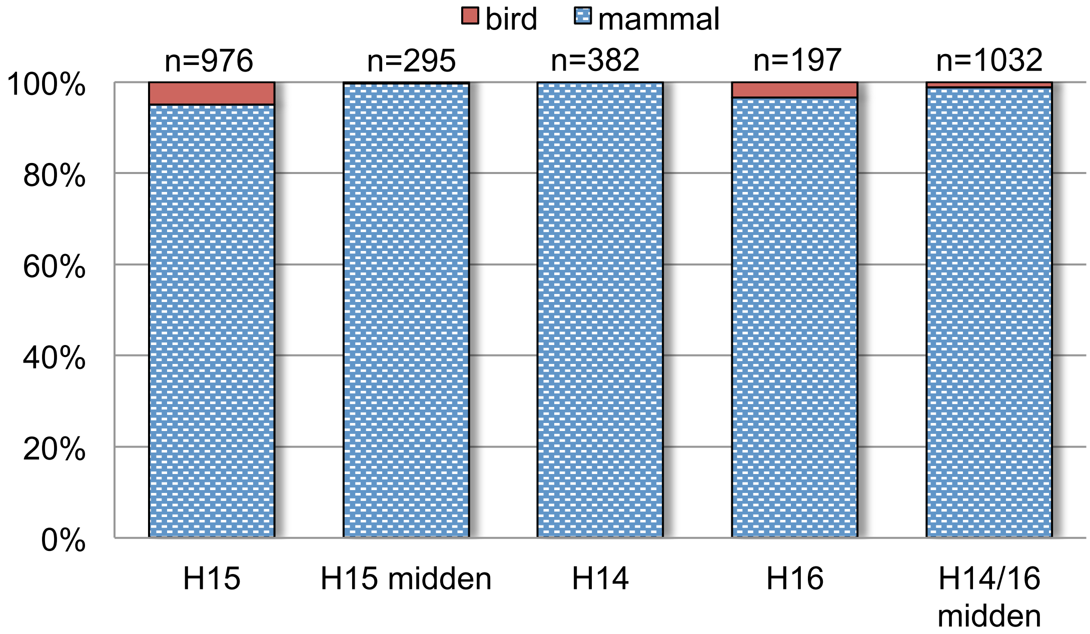


Figure 9.14 Class frequencies in Thule Inuit archaeofaunas from the Skraeling Island site expressed as %NISP.

9.4.5.1.1 Bird Distribution

Identified bird species at the site include Anatidae species, gull species, and common raven. Common raven specimens dominated the identified bird in H15, H16 and the H14/15 midden, but the single bird bone from the H15 midden was that of a goose (Table 9.5; Howse 2013). The largest variety of bird species was found in the H14/16 midden, where various gull species were identified in addition to eider and common raven.

9.4.5.1.2. Mammal Distribution

Small seal is the most frequent taxon in all contexts (Figure 9.15). Small seal bones contribute between 68.2% (H14) and 78.4% (H16) of the identified mammal specimens at the site. Several seal species were identified, and where species could not be determined they were categorized as either large or small seal. Small seal is most frequent throughout the different contexts. Of the identified seal species, ringed seal is most frequent. However, low frequencies of bones belonging to harbour seal, harp seal, bearded seal, and grey seal were also identified (Table 9.4).

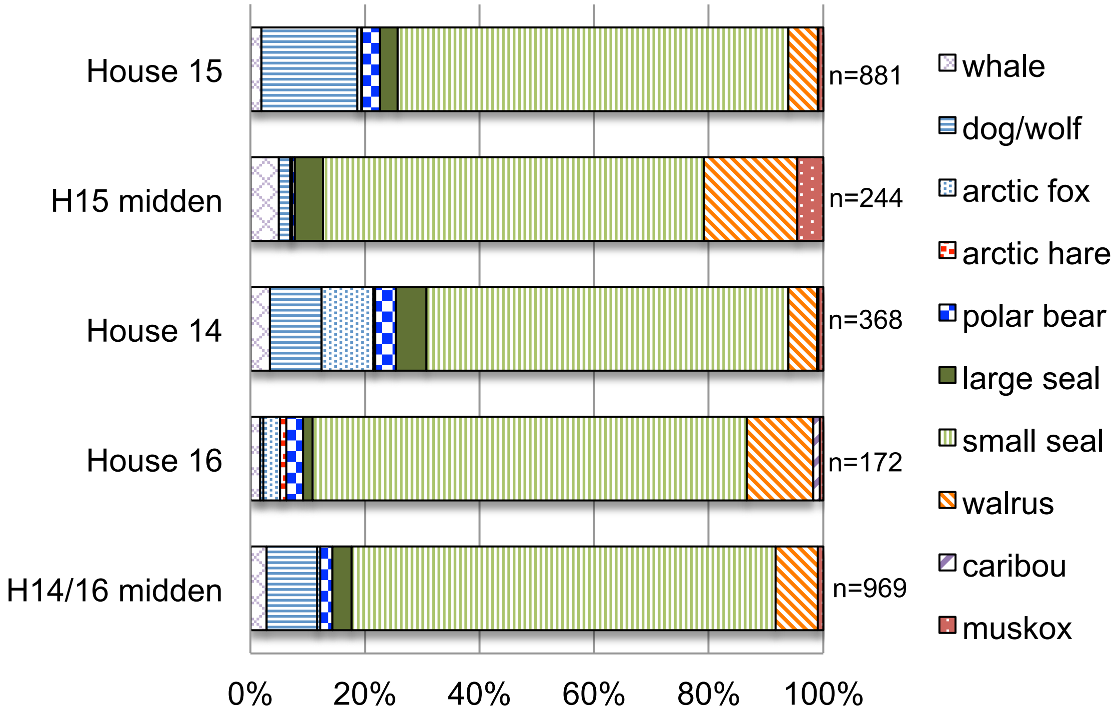


Figure 9.15 Distribution of mammal in the Thule Inuit archaeofaunas from the Skraeling Island site expressed as %NISP.

The distribution of the remaining mammal species is quite variable. Dog/wolf bones comprise a large portion of the identified mammal from H15 (16.9%), and were moderately frequent in H14 (9%) and the H14/15 midden feature (8.8%), but rare in the H15 midden and H16. Walrus specimens contributed 5.1% of the identified mammal in H15, but were three times more frequent in the H15 midden. In the remaining features walrus specimens represent between 4.9% and 11.6% of the identified mammal. Arctic fox bones are moderately frequent in H14 (9%), but they contribute less then 3% in the remaining features. Specimens belonging to polar bear, bowhead whale, muskox, caribou, and arctic hare were also identified but comprise no more than 5% of the identified mammal.

9.4.5.2 Animal Element Distributions

The skeletal element distribution of small seals, which include specimens identified to the small seal category as well as those identified as ringed and harbour seal, is presented in detail in the following section. A general discussion of the element distribution of other species is also included. The raw data can be found in Appendix C and the various indices applied in this section are described in Chapter 2.

9.4.5.2.1 Small seals

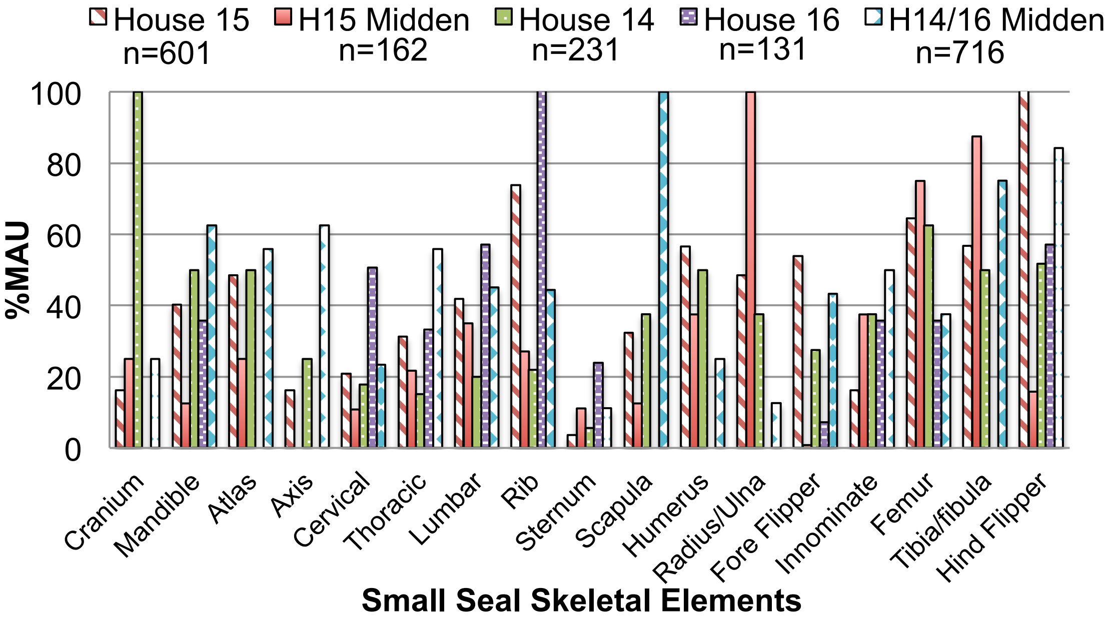
Small seal elements have been quantified as %MAU's and are presented in Figure 9.16. The distribution of small seal skeletal elements is highly variable amongst the features, though sternebrae are consistently infrequent and the majority of the seal skeleton can be found in each sample. Crania are abundant in H14 but are rare or absent in the remaining features, and hind flipper bones are more abundant than fore flipper bones.

The underrepresentation of crania in all features except H14 is not easily explained. As has been noted elsewhere (e.g. Cooper 1981:15; McCullough 1989:279; Staab 1979:355), the low frequency of crania in the majority of the features may be attributed to the fragile nature of the seal cranium, which tends to fragment into many small pieces, and the difficulty in identifying small cranial fragments. As discussed in the next section, however, taphonomic processes do not appear to have had a greater impact on the H14 sample and in fact a larger proportion of mammal specimens are whole elements in this sample in comparison to the others. Therefore, it is unclear what activities resulted in the abundance of crania in H14. The distribution of flipper bones at the site is potentially attributed to several activities. It is possible this pattern is related to food sharing practices. The sharing of hind flippers is ethnographically well known by Inuit of the Central Arctic (Balikci 1964; Damas 1972; Van de Velde 1976), and Diamond Jenness (1922:87) has stated that "often within a community one man will show special courtesy to another by sending him the hind flippers of every seal he catches. This is a very delicate mark of attention for the flippers are parts that are most esteemed for food". Thus, the predominance of small seal hind flippers in the features may reflect meat-sharing practices between this group of households and those that possibly occupied other houses at the site, simultaneously. McCullough (1988), however, has noted that a lower frequency of fore flipper bones in comparison to hind flipper bones at the site may be explained by the tendency for these elements to be retained on sealskin floats. Thus, the higher abundance of hind flipper bones in comparison to fore flipper bones may in fact be related to fore flipper bones being removed from these features during processing.

In order to determine whether the meat utility of different skeletal parts impacted the distribution of seal skeletal elements at the site, the distribution of small seal elements was compared to the food utility index (FUI) for small seal (Lyman et al. 1992). No correlation was found between the FUI for small seals and the %MAUs from H15 (r_s =-0.14,p=0.62), the H15 midden (r_s =0.19,p=0.5), H14 (r_s =-0.04,p=0.88), or H16 (r_s=0.2,p=0.5), however a slight positive correlation exists between the FUI and the %MAUs of the H14/16 midden (r_s=0.43,p=0.1). In this midden, the distribution of small seal elements is characterized by a slight predominance of high utility elements. Ethnographic sources suggest that small seals were typically transported whole, using a dogsled for most of the year and by boat during the warmer months (Nelson 1969; Smith 1991; Van de Velde 1976; Wenzel 1991), although initial butchery of small seals at the kill site is not unknown (Lyman et al. 1992; Riewe and Amsden 1979; Whitridge 1992). The proximity of the site to the likely kill location, however, suggests this was not the case. If other houses at the site were indeed occupied at the same time as those discussed here, the higher frequency of high utility elements in the H14/16 midden may result from meat-sharing practices.

No correlation was found between bone density and the distribution of small seal elements from any of the features at the site (H15 r_s =0.14, p=0.54; H15 midden r_s =-0.11,p=0.64; H14 r_s =0.14, p=0.51; H16 r_s =-0.28,p=0.2; or H14/16 midden r_s =-0.18,p=0.42). This suggests taphonomic factors, such as chemical and mechanical processes, were not responsible for the seal element distribution in any of the samples.

A statistical correlation was not found between the preference-ranking index and small seal MAU's from H15 (r_s =0.24, p=0.47), H14 (r_s =0.17,p =0.62), H16 (r_s =-0.14, p=0.68), or the H14/16 midden (r_s =-0.01, p=0.95). A strong positive significant relationship, however, exists between the preference-ranking index and small seal MAU's for the H15 midden (r_s =0.73, p=0.01). Why preferred elements are more frequent in this midden feature in comparison to the rest of the features is difficult to discern. It is possible that the higher abundance of tibiae/fibulae and femora in this feature represent stored food. For instance, if the house was occupied during the winter months, the fauna at the site were likely in part captured during the summer months. The practice of storing food from summer kills for winter consumption was typical amongst historic Inuit groups (e.g., Eckblaw 1928; Savelle 1984), and in all likelihood this was also the case for Thule Inuit.



*The fore flipper and hind flipper categories include metacarpals, carpals, and front phalanges, and metatarsals, tarsals, and hind phalanges, respectively.

Figure 9.16 Distribution of small seal skeletal elements in the Thule Inuit archaeofaunas from the Skraeling Island site expressed as %MAU.

9.4.5.2.2 Other Species

As previously mentioned, common raven elements were unbroken, and the majority of the skeleton was found in H15 and the H14/16 midden. Anatidae and gull specimens were limited to various parts of the skeleton. The dog/wolf skeleton was well represented in H14, H15, and the H14/16 midden, where most skeletal parts were identified, however they were limited to few skeletal parts in the H15 midden and to ribs in H16. Various parts of the walrus skeleton were identified amongst the samples. Walrus crania were found in all features, but vertebrae were generally underrepresented, as were fore and hind flipper bones. Notably, in H15, the walrus specimens from the appendicular skeleton that could be attributed side (n=18) are all from the left part of the skeleton (see Appendix C). It seems this pattern is not the result of poor bone preservation, and there is no known ethnographic information that explains this particular element distribution. Historically, meat-sharing practices involved the sharing of particular body parts, not the entire side of an animal (see Damas 1972). While it is possible this pattern resulted from meat-sharing practices, it is equally possible the pattern resulted from butchery and storage practices. Assuming H15 represents a winter occupation (see below for further discussion) and the walrus (MNI=1) was killed in the summer, the left portion of the animal was perhaps removed and cached for winter consumption, ultimately resulting in the element distribution in the house. An assortment of fragments belonging to arctic fox, arctic hare, polar bear, caribou, muskox and bearded seal were also identified in the features, but they are found in low frequencies and full skeletons are lacking.

9.4.5.3 Modification Frequencies

All modifications on the bone specimens, including cut marks, burning, and gnaw marks were recorded and are presented in Table 9.8. Fragmentation rates, including the extent of fragmentation and the intensity of fragmentation (following Lyman 2008), were also considered. Only mammal bones are included in the following discussion.

Table 9.5 Modification frequencies from the Thule Inuit contexts at the Skraeling Island site.

Modification	House 15	H15 midden	House 14	House 16	H14/16 midden	Total
Cut marks	87	7	14	5	88	201
% cut marks[1]	9.4%	2.4%	3.7	2.6	8.7	
Gnaw marks	106	11	16	14	41	188
% gnaw marks	11.4%	3.8%	4.2	7.3	4	
Burn marks	3	0	3	0	8	14
% burn marks	0.3%	0	0.8	0	0.9	
%fragmentary	46.7%	82.4%	55.7%	63%	45.7%	52%
Fragmentation (NISP:MNE)[2]	1.2	1.6	2.0	1.4	1.2	1.6
NISP[3]	888	244	368	173	969	2645
MNE	821	166	262	140	872	2261
Whole bones	473	43	163	64	526	1269

[1] Percentages are calculated using total mammal NSP for each sample see Table 9.4.

[2] Whole numbers are excluded from this calculation.

[3] This NISP is used for calculating fragmentation and excludes mammal bone specimens that could not be identified beyond class.

Cut marks are found on small and large seal, dog/wolf, polar bear, walrus, and whale specimens. Cut marks are almost four times more frequent in H15 than in the H15 midden. They are at least twice as frequent in the H14/16 midden, however, in comparison to the associated houses. The difference in the distribution of cut marks could be related to a variation in processing activities or household cleaning. For instance, the higher frequency of cut marks in H15 in comparison to the H15 midden may suggest the majority of animal processing activities, including consumption and meat removal, took place within the structure where the bones were deposited, and only cut marks resulting from initial dismemberment were found in the midden (see Howse 2013). In contrast, the higher frequency of cut marks found in the H14/16 midden associated with the two other houses might reflect cleaning activities. In this scenario, bones may have been processed in the houses, but later removed and redisposed in the midden.

Gnaw marks were three times more frequent in H15 in comparison to its associated midden (Table 9.8). The frequency of gnaw marks was similar in H14 (4.2%) and the H14/16 midden (4%), however they were one and a half times more frequent in H16. These marks varied and included punctures, scores, pitting, and furrows. Puncture marks ranged in size, several measure between 2 and 3 mm in diameter and others measure between 5 and 6 mm in diameter. The higher frequency of gnaw marks in the two houses may indicate dogs were kept inside the dwellings, giving them easy access to any bones deposited in these features (see Friesen and Betts 2006). It is, however, also possible they were inflicted after the dwelling was abandoned. If the smaller puncture marks were inflicted by foxes and the larger ones were made by dogs, and assuming foxes were not kept as pets, the latter explanation is perhaps most likely. In this case, the lower frequency of gnaw marks in the midden features may have resulted from depositional factors, since the quick accumulation of middens would result in the top layers protecting the lower layers from scavenging activities.

Burn marks were rare or absent in the samples. This may indicate boiling was a favoured cooking practice amongst the site occupants (Friesen and Betts 2006). Two measures of fragmentation were calculated: the %fragmentary, which indicates the proportion of the sample that are fragmented specimens; and the intensity of fragmentation (NISP:MNE), which quantifies the number and size of fragments a single element is broken into. The %fragmentary is low in the majority of the features, with the exception of the H15 midden, where 82.4% of the sample represents fragmented elements. This suggests that overall all taphonomic processes had little impact on the faunal samples, although it would seem the H15 midden feature was subject to further processing prior to being deposited. The intensity of fragmentation (NISP:MNE) is consistently low across the features, indicating elements were fragmented into similar size and number of pieces in across the site.

Overall, modification frequencies had a variable impact on the faunal samples. Cut marks had the greatest impact on the H15 and H14/16 midden samples. Gnaw marks were the most frequent modification on the H15 sample, however, and they were the most frequent modification on the specimens from the remaining samples. Burning consistently had minimal impact on the samples, but fragmentation rates were quite variable. The majority of the H15 and H14/16 samples are whole skeletal elements, as are just under half of the H14 sample. In addition, a large proportion of the H14 sample, and the majority of the H15 midden sample are comprised of fragmented material.

9.4.5.4 Seasonal Indicators and Prey Demography

Low frequencies of summer migrants including harp seal, geese, eider, and gull species are found in all features, except H14 where they are absent. However, year-round residents including ringed seal, bearded seal, and walrus, comprise the majority of the identified fauna from each feature (Table 9.4).

The age distribution of small seals was analyzed in order to estimate the age of the animals at death. Assuming the same people contributed to the H15 and the H15 midden fauna, these samples have been combined. However, because the occupants of H14 and H16 were likely to have both contributed to the H14/16 midden fauna, these samples are considered separately. Both H15 and H14 contain the remains of yearlings killed before they were six months, placing their death sometime between April and September. Table 9.6 presents the fusion data for small seals including the relative frequencies of unfused elements in each age group. In the three houses, young and old adults are most frequent, although in H15 a larger proportion of old adults are found. In the H14/16 midden relatively higher frequencies of juveniles are found, and they are more frequent then all other age categories.

Ringed seal femur metrics were also assessed for age at death estimates. Figures 9.16 and 9.17 show the size distribution of ringed seals from the combined sample. The metric data presented in Figure 9.17 represents at least 13 individuals and Figure 9.18 represents nine individuals. These data suggest the majority of ringed seals harvested were adults.

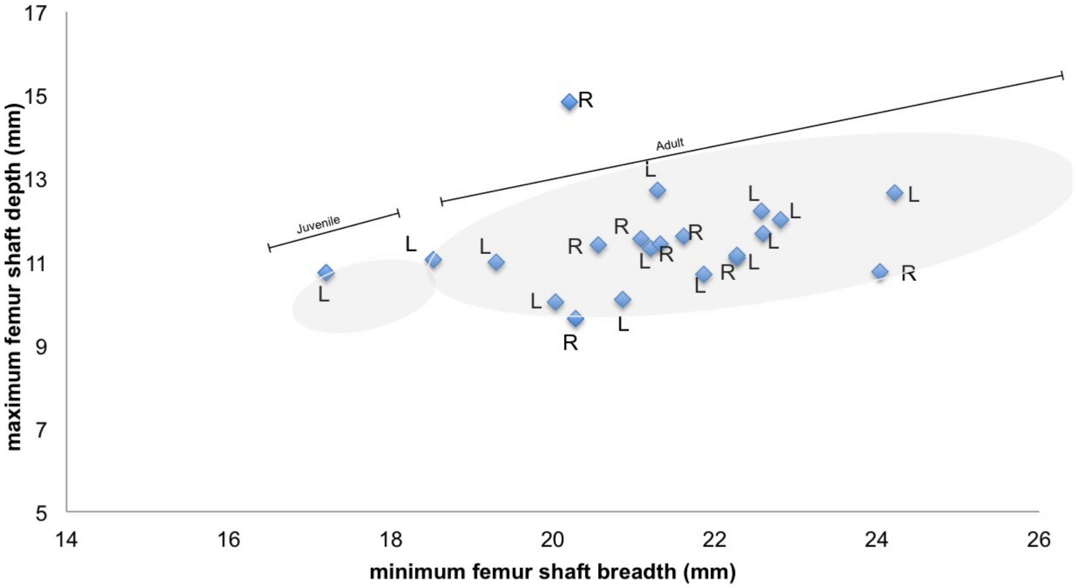


Figure 9.17 Ringed seal femur shaft depth vs. shaft breadth in the Thule Inuit archaeofaunas from the Skraeling Island site. Shaded areas represent measurement clusters observed in the NRM ringed seal sample (L=left, R=right; Storå 1994; 2002).

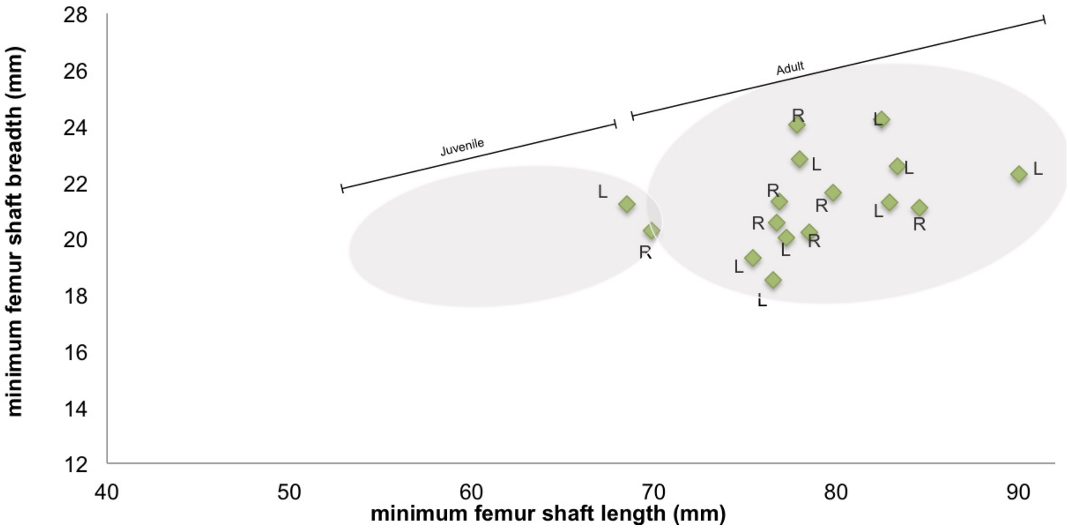


Figure 9.18 Ringed seal femur shaft breadth vs. shaft length from the Thule Inuit contexts at the Skraeling Island site. Shaded areas represent measurement clusters observed in the NRM ringed seal sample (L=left, R=right; Storå 1994; 2002).

Several unfused elements from other species, that possibly represent immature animals, were also identified at the site. In the combined H15 and H15 midden, at least 1 immature muskox (radius distal epiphysis fusing, 1 unfused ulna), 1 immature walrus (mandible and mandibular condyle unfused), and 1 immature polar bear (unfused metacarpal 1), however the absence of known epiphyseal fusion sequences for these species prevents further age at death estimates at this time. In H16, at least one immature walrus was identified (unfused metatarsal I), and based on the fusion sequence of skeletal elements in seals this animal was likely killed sometime between April and November.

Faunal data suggest animals were largely captured during the summer. There is no clear evidence that animals were taken during other seasons, however, the robust nature of the structure, along with the few bird bones at the site, makes it most logical that the house was a winter occupation where stored food was consumed.

Table 9.6 MNE frequencies for small seal elements from the Thule Inuit contexts at the Skraeling Island Site.

	H15 Total				**H14**				**H16**				**H14/16 Midden**			
Age Fusion Sequence	unfused	fusing	fused	total	unfused	fusing	fused	total	unfused	fusing	fused	total	unfused	fusing	fused	total
Y: metatarsal 1, distal	2		10	12	1		3	4			1	1	0	0	16	16
Y: pelvis, acetabulum			7	7			6	6			1	1	0	0	0	0
Y: scapula, supraglenoid	1		5	6			3	3			1	1	0	0	0	0
Total	3		22	25	1		12	13					0	0	16	16
% unfused	12%				7.7%				0%				0%			
J: femur, proximal	1	1	10	12	2		4	6			1	1	2			2
J: radius, proximal	3		6	9			3	3				0				
J: humerus, distal	2	1	6	9			2	2			1	1	1			1
Total	6	2	22	30	2		9	11			2	2	3			3
% unfused	26.7%				18.2%				0%				100%			
YA: femur, distal	4	1	10	15	3		3	6	2		1	3	1			1
YA: humerus, proximal	2	2	6	10	2	1		3	1		1	2	1			1
YA: ulna, proximal	5	1	4	10			1	1	1		1	2			2	2
YA: tibia/fibula, proximal	2	2	4	8	4		1	5			1	1			2	2
Total	13	6	24	43	9	1	5	15	4		4	8	2		4	6
0% unfused	44.2%				66.7%				50%				33.3%			
OA: ulna, distal	5	1	3	9	1		1	2	1		1	2			2	2
OA: metatarsal 1,	10		5	15	3		2	5			1	1	6	4	9	19
OA: radius, distal	9		5	14	1		1	2				0			2	0
OA: tibia/fibula, distal	7	1	1	9	4		1	5			1	1	2			4
Total	31	2	14	47	9		5	14	1		3	4	8	4	13	25
% unfused	65.9%				64.3%				25%				48%			

Y=yearling, J=juvenile, YA=young adult, OA=old adult

9.5 Comparing Late Dorset and Thule Inuit Faunal Remains from Smith Sound

The Late Dorset of the South West Point Site, Qeqertaaraq, and the Thule Inuit of Skraeling Island occupied the Smith Sound region between the 11th and 13th centuries CE. Because these two sites are located 65 km a part, access to animal resources was undoubtedly somewhat variable. This will be given careful consideration when interpreting any patterns in the faunal record. As shown previously, intra-site variation occurs at both the South West Point and the Skraeling Island sites (see also Bendix 2000a,b; McCullough 1989), however in this section the faunal material at each site is aggregated in order to highlight the variability between the two groups that may reflect culturally distinct patterns of human-animal interaction. Because this study region is quite large, there is some variation in resource structure and availability between the sites, and this is considered when interpreting the faunal data. In order to best understand how Late Dorset and Thule Inuit interacted with animals in the Smith Sound region, several potential, and often interdependent, influencing factors are taken into account. These include taphonomic processes, season(s) of occupation, storage practices, and variable technologies.

9.5.1 Class Distribution

A total of 5696 individual bone specimens were analyzed from the Smith Sound region, quite evenly divided between the Late Dorset and Thule Inuit samples (Tables 9.1 & 9.4). In the Late Dorset contexts, mammal accounted for 83.5% of the identified fauna, bird 16.5%, and fish >1% (Figure 9.25). In the Thule Inuit contexts mammals comprise the majority of the assemblage and birds are notably less frequent than they are in the Late Dorset features, contributing 2.7% of the identified fauna, and fish were absent (Figure 9.19). Class distribution is somewhat variable throughout the different features at both sites. In the Late Dorset features, bird is least frequent in the house where they comprise 13.5% of the identified fauna (Figure 9.4), however this is at least two and a half times greater than the greatest proportion of bird found at the Thule Inuit site in H15, where it comprises 5%. Also, at the Thule Inuit site bird is most frequent in the houses, whereas at the Late Dorset site they are most frequent in the midden. The differences between the distribution of mammal, bird, and fish from the Late Dorset and Thule Inuit contexts are considered statistically significant ($X^2= 262.39$, $p<0.01$).

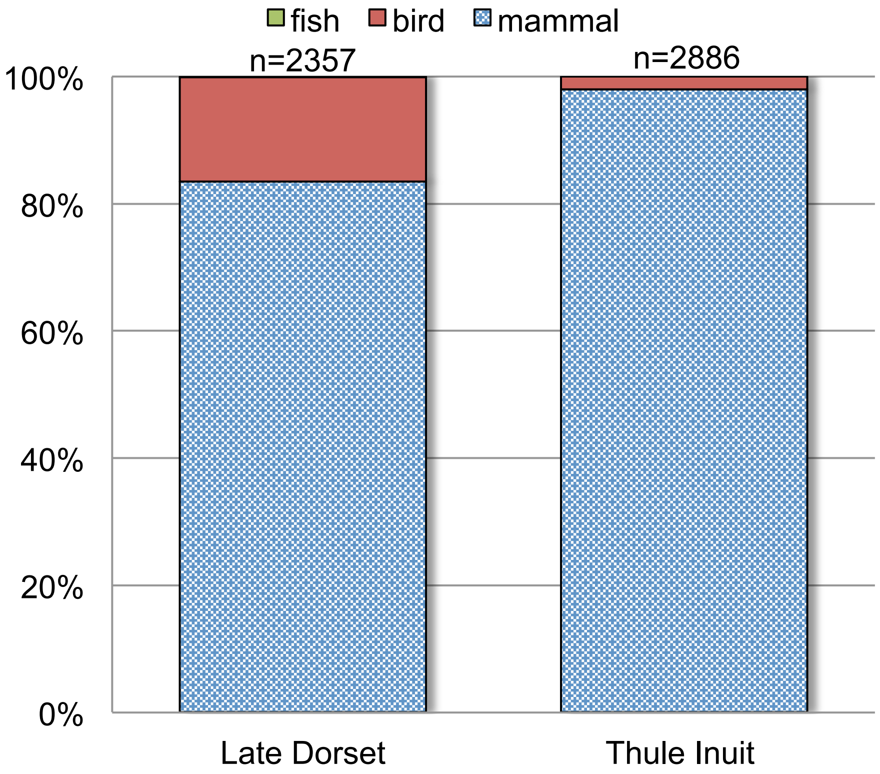


Figure 9.19 Class frequencies in the Smith Sound archaeofaunas expressed as %NISP.

9.5.2 Bird Distribution

There are several differences in the distribution of bird species at the two sites (Table 9.1 & 9.4). A greater diversity of bird species (NTAXA) contributed to the Late Dorset assemblage in comparison to the Thule Inuit assemblage where only eider, goose, gull and common raven were identified (Figure 9.20). Anatidae species and dovekies dominate the Late Dorset assemblage, comprising 37.7% and 31.6%, respectively, of the identified bird specimens. Gull specimens are also quite frequent, comprising 22.6% of the identified bird, and common raven specimens contribute 6.8%. In the Thule Inuit assemblage, the small sample of identified bird specimens (n=74) consists primarily of common raven (82.4%), with the remaining specimens representing Anatidae species (9.5%) and gull species (8.1%). Overall, the distribution of bird species is more even, and no species is particularly dominant, in the Late Dorset assemblage. In the Thule Inuit assemblage, the distribution of bird species is less even and the sample is strongly dominated by raven.

Table 9.7 Taxonomic richness and taxonomic evenness of bird species in the Smith Sound assemblages.

Diversity Measure[1]	Late Dorset	Thule Inuit
Taxonomic richness	12	7
Shannon index of heterogeneity	1.72	0.76
Shannon Index of evenness	0.46	0.31
The reciprocal of Simpsons index	0.77	0.31

[1] See Appendix C for the categories and numbers used for this table.

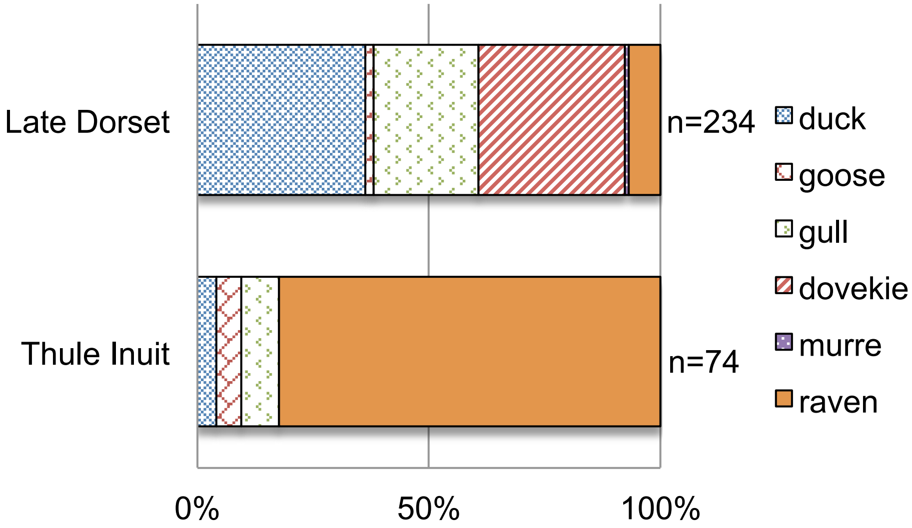


Figure 9.20 Distribution of bird species in the Smith Sound archaeofaunas expressed as %NISP.

9.5.3 Mammal Distribution

A similar range of species is found at both sites (NTAXA), however dog/wolf bones are found in the Thule Inuit assemblage but not in the Late Dorset assemblage. Overall, there are considerable differences in mammal frequencies between the Late Dorset and Thule Inuit archaeofaunas. In the Late Dorset features, arctic fox is the most frequent mammal comprising 53.4% of the identified mammal. However, it comprises only 1.9% of the Thule Inuit assemblage. Although arctic fox bones predominate the identified mammals in the Late Dorset assemblage, fox have a low meat yield. Therefore, it is most likely that sea mammal, including seal and walrus, were the primary food resources of the Late Dorset people who inhabited the South West Point site even though they only comprise 29.7% of the identified mammal. Comparably, small seal remains dominate the Thule Inuit assemblage from Skraeling Island where they comprise 72.5 % of the identified mammal (Figure 9.21). Ringed seal, harbour seal, harp seal, and bearded seal were identified in the Late Dorset assemblage (Table 9.1). These species, in addition to grey seal, were also found in the Thule Inuit assemblage. Large seal, which includes bearded and grey seal, were six times more frequent in the Thule Inuit assemblage than in the Late Dorset assemblage where they account for less then 1% of the identified mammal. Walrus specimens, however, are equally distributed at the sites, accounting for approximately 7% of the identified mammal. Caribou bones are infrequent in both the Late Dorset and Thule Inuit assemblages, however muskox remains are seven times more frequent in the Late Dorset assemblage where they comprise 8.8% of the identified mammal in comparison to the Thule Inuit assemblage. Arctic hare are also three times more frequent in the Late Dorset assemblage where they account for 6.2% of the identified mammal, in comparison to the Thule Inuit assemblage where they comprise less than 1%. However, dog/wolf specimens contribute 10.2% of the identified mammal in the Thule Inuit assemblage, but are absent in the Late Dorset assemblage. Polar bear and whalebones are found in both the Late Dorset and Thule Inuit archaeofaunas, but contribute less than 5% of the identified mammal. Measures of evenness indicate the Late Dorset assemblage to be more even and less dominated by a single species than the Thule Inuit assemblage, where small seal dominates.

Table 9.8 Taxonomic richness and taxonomic evenness of mammal species in the Smith Sound assemblages.

Diversity Measure[1]	**Late Dorset**	**Thule Inuit**
Taxonomic richness	13	17
Shannon index of heterogeneity	1.46	1.39
Shannon Index of evenness	0.33	0.24
The reciprocal of Simpsons index	0.66	0.56

[1] See Appendix C for the categories and numbers used for this table.

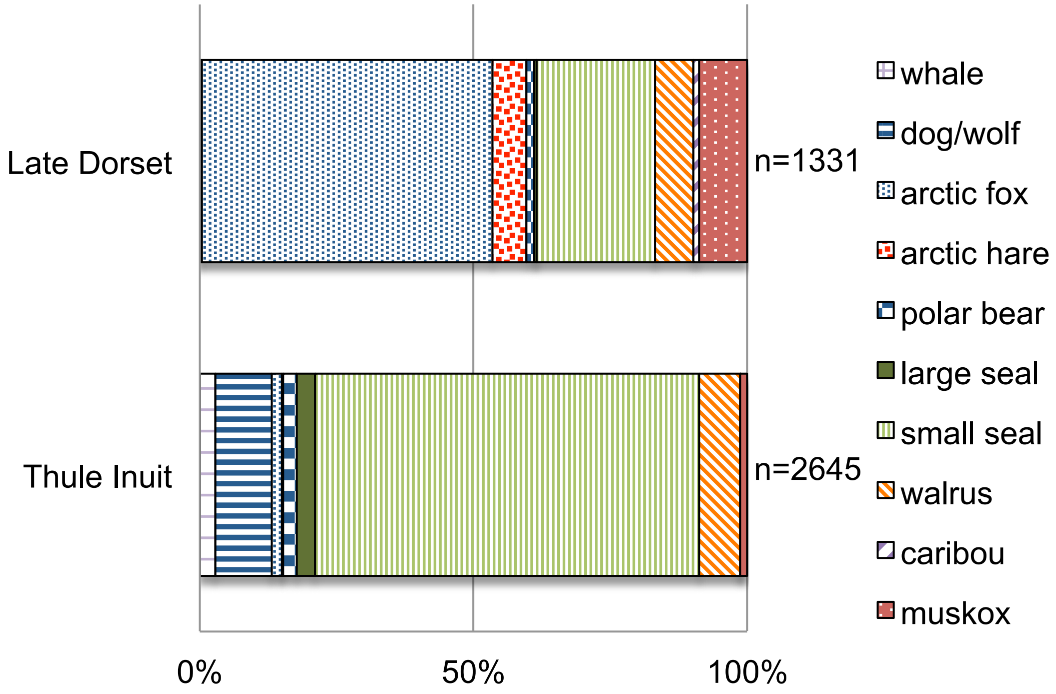


Figure 9.21 Distribution of mammal species in the Smith Sound archaeofaunas expressed as %NISP.

9.5.4 Animal Element Distribution

The distribution of small seal elements is variable throughout the Late Dorset and Thule Inuit contexts. The majority of the small seal skeleton is found at each of the sites. Generally, however, hind flipper bones are much more common in the Thule Inuit features in comparison to the Late Dorset features, where both fore and hind flipper bones are infrequent. This may suggest the two groups processed the animals somewhat differently, and that at the South West Point site, flipper bones were perhaps removed before the animals were introduced into the house for consumption. At both sites, the food utility of different skeletal parts does not appear to impact the distribution of small seal elements, with the possible exception of the H14/16 midden sample. Density mediated attrition also does not appear to have played a role in the distribution of small seal elements at either site. However, the distribution of seal elements in the Late Dorset midden and the Thule Inuit H15 midden have a slight positive and a strong positive correlation with the Iñupiat preference for small seal elements, respectively. As previously mentioned, this distribution of elements, in which hind limbs are more frequent, does not necessarily reflect taste preference but instead it may reflect butchery practices, household cleaning activities, or perhaps the consumption of stored food. For instance, the higher frequency of hind limbs in these two features may indicate these elements tended to be removed prior to being introduced to the house, or that they were more frequently cleaned from the house and re-deposited in the midden. It may also indicate the consumption of stored food, since historically, Inuit commonly stored the hind portion of seals killed in the summer for winter consumption (e.g., Eckblaw 1928; Savelle 1984).

Bird elements are variable between the two sites; the small sample of bird specimens in the Thule Inuit assemblage does not allow for reliable interpretations. However, notably near-complete common raven skeletons, representing at least eight individuals, were identified in the Thule Inuit sample and only incomplete elements of wings and legs belonging to common raven were identified in the Late Dorset sample. The majority of the arctic fox skeleton is found in both the Late Dorset and Thule Inuit assemblage. Generally, more parts of the muskox and caribou skeleton are found in the Late Dorset archaeofaunas, in comparison to the Thule Inuit archaeofaunas where specimens are more limited, however the small sample sizes of these species at both sites makes it difficult to determine whether or not this pattern is valid. The distribution of walrus elements at the sites is relatively similar with crania and bacula being most abundant, although vertebrae are absent from the Late Dorset samples. Fragments of walrus ivory, however, are much more abundant in the Late Dorset samples than in the Thule Inuit samples (see Appendix C). In addition, walrus ivory is more frequent than caribou antler at both sites (see Appendix C).

9.5.5 Modification Frequencies

There are several differences in modification frequencies between the identified mammal bone from the Late Dorset and Thule Inuit assemblages. Overall, 7.2% of the mammal bones from the Thule Inuit features display cut marks, which is twice as frequent than they are in the Late Dorset features. This may suggest a difference in processing methods. In both assemblages, all mammal species displayed cut marks indicative of different activities, including disarticulation, when cut marks are found near joints; skinning, when cut marks encircle the shafts of lower limb bones or are found at the base of antlers, ears, mouth and chin; and, meat removal, when cut marks are found at the mid-diaphysis (Binford 1981). In the Late Dorset assemblage 30.8% of the cut marks appear to result from disarticulation, 16.9% from skinning activities, and 52.3%

from meat removal. Comparably, in the Thule Inuit assemblage 38.4% of the identified cut marks resulted from disarticulation, 4.3% from skinning, and 57.3% from meat removal. In the Late Dorset assemblage, skinning marks are predominately found on fox bones, which are much less abundant in the Thule Inuit assemblage, as are fur-bearers in general (see Figure 9.20), which perhaps explains the higher proportion of cut marks indicative of skinning in the Late Dorset assemblage. However, the distribution of cut mark types does not appear to explain the higher frequency of cut marks on the Thule Inuit mammal bones. Cut marks appear on bones for a multitude of reasons and are impacted by several factors including the experience of the butcher, what type of material a blade is made from, and how sharp or dull it is (see Chapter 2 for further discussion). Thus, based on the available data it is unclear what activity resulted in this difference between the two sites.

Gnaw marks are four times as frequent on the mammal bones from the Thule Inuit archaeofaunas, where they are found on 6.7% of the identified mammal remains, in comparison to those from the Late Dorset features. The presence of dogs in Thule Inuit society and their potential absence in Late Dorset society likely explains this difference. Gnaw marks, including puncture marks and furrows were identified on the specimens from the Late Dorset assemblage. These puncture marks range between 2 and 3 mm in diameter, suggesting a small mammal, likely arctic fox, inflicted them. In comparison, the bone from the Thule Inuit assemblage exhibit punctures ranging from 2-3 mm and from 5-6 mm in diameter, suggesting both fox and dogs were scavenging bones at the site. In addition, many of the gnawed bones contained scores, furrows and pits.

There is little variability between the frequencies of burnt material, since at both sites burn marks are found on less than 1% of the mammal bones. This pattern differs from the findings of Darwent and Foin (2010) at Cape Grinnell, and from the two earlier case studies (see Chapter 7 and 8), where burnt marks are found to be higher on mammal bones from the Thule Inuit features. The low frequencies in burning at both sites may suggest similarities in cooking or cleaning practices at these two sites.

The %fragmentary frequencies are quite different between the two sites. Approximately half of the Thule Inuit assemblage represents fragmented elements, indicating almost half the sample is comprised of whole elements. In comparison, 75.7% of the Late Dorset assemblage is fragmented. It is possible the higher fragmentation in the Late Dorset contexts reflects more intensive food processing. This higher %fragmentary may have also resulted in fewer identifiable cut marks on the specimens, which may explain the discrepancy between the frequency of cut marks found on the Late Dorset and Thule Inuit specimens.

The fragmentation intensity is generally low, although it is higher in the Late Dorset assemblage, indicating elements were fragmented into a slightly similar size and/or higher number of fragments at the South West Point site.

Table 9.9 Modification frequencies on mammal bones from the Smith Sound archaeofaunas.

Modification[1]	**Late Dorset**	**Thule Inuit**
Cut marks	69	201
% cut marks	3.1%	7.2%
Gnaw marks	32	188
% gnaw marks	1.4%	6.7%
Burn marks	7	14
% burn marks	0.3%	0.4%
%fragmentation	75.7%	52%
Fragmentation (NISP:MNE)[2]	2.7	1.6
NISP[3]	1612	2645
MNE	839	2262
Whole elements	391	1269

[1] Percentages are calculated using total mammal NISP for each sample see Tables 8.1 & 8.4

[2] Whole elements are excluded from this calculation.

[3] This NISP is used for calculating fragmentation and excludes mammal bone specimens that could not be identified beyond class.

9.5.6 Seasonality and Prey Demography

While summer migrants were found at both sites overall both assemblages are largely comprised of species that are available throughout the year. The distribution of species is quite similar at both the Late Dorset and Thule Inuit sites, however slight differences may suggest some variation in the duration each group occupied their respective houses.

Late Dorset relied more heavily on spring and summer residents, including duck and goose species, seabirds, and gulls. At least two juvenile ducks and three juvenile gulls were identified at the Late Dorset site, and were likely killed in July or August, however no immature bird was found in the Thule Inuit assemblage. At the Late Dorset site, the age distribution of small seals indicates they harvested at least three yearlings that were killed between April and September, and the fusion data from immature fox suggests they were taken sometime between June and August. The Thule Inuit at the Skraeling Island site captured at least two seal yearlings, although the femoral metric data suggests the majority of the ringed seals harvested were adults, and no other immature mammal was identified. Migratory harp seal was also taken in low frequencies at both sites. These animals are generally found in the NOW during the summer, however, they may have arrived earlier to the Greenland side of the Smith Sound near the Late Dorset site since the sea ice begins to melt in this part of the NOW a month or two before it does on the Skraeling Island side (Finley and Renaud 1980; Richard et al. 1998), opening the way for early migrants. While faunal indicators for a winter occupation are absent at both sites, it should be noted that, in general, winter kills are not as visible in the faunal record as summer kills, since migratory species are present in the summer and birthing takes place in the spring. However, the faunal assemblages from both sites were collected from semi-subterranean structures, suggesting they were, at least partially, occupied during colder months.

While the summer kills may suggest the Late Dorset occupied the house at the South West Point site during the summer, it is also possible that they moved into tent rings during this period and that the summer kills represent stored food. Because of the semi-subterranean nature of the house architecture and that the site is ideally positioned to capture seals on the sea ice, it is probable that the house was occupied during the winter and throughout the spring, when the migratory of bird and young seals were likely captured. Comparably, at Skraeling Island, migratory bird species are much less common. The Thule Inuit houses were quite robust, suggesting they were likely occupied throughout the winter and that the spring and summer kills represent stored food. Again, it is also possible Thule Inuit stayed in the houses during the warmer weather (see Nagy 1994), however it is more likely they moved into tents for the warm season, since several tent rings are found nearby (Figure 9.9 and 9.10).

Table 9.10 Seasonal indicators for Late Dorset and Thule Inuit at the Smith Sound sites.

Seasonal indicator	**Month**	**Late Dorset**	**Thule Inuit**
Summer migrants (bird)	May-August	93.2% of identified fauna	19.7% of identified fauna
(harp seal)	July-August	>1% of identified mammal	>1% of identified mammal
Seal Metric data	April-September	MNI 3 yearlings	MNI 2 yearling
Immature bird	July-August	MNI 5	0
Immature fox	June-August	MNI 2	0
Immature walrus	April-November	MNI 1	MNI 1

9.5.7 Discussion and Conclusion

Overall, there are a few similarities and several differences between the subsistence and settlement patterns of Late Dorset and Thule Inuit in the Smith Sound region. The faunal analyses indicate there is some discrepancy in the impacts of taphonomic processes at the two sites. The higher frequency of gnawing, and the differences in the size and types of gnaw marks, on mammal bones from the Skraeling Island site indicate that dogs impacted the Thule Inuit samples. The degree of their impact, however, is not easily discerned. Similar frequencies of small seal elements are found at both sites implying dogs did not inordinately impact the distribution of small seal bones. Dogs potentially impacted the distribution of bird frequencies, since a much lower frequency is found at the Thule Inuit site in comparison to the Late Dorset site. However, this may also be a result of a difference in site seasonality. The %fragmentary measure is much higher in the Late Dorset contexts in comparison to the Thule Inuit contexts where almost half of the assemblage consists of whole elements. This suggests that dog-scavenging activities did not greatly impact the nature of the faunal assemblage at the Skraeling Island site. In comparison, the higher percentage of specimens representing fragmented elements at the Late Dorset site may indicate more intensive processing activities.

Differences in the local ecosystem appear to have had some impact on the faunal samples at each site. The high frequencies of dovekie in the Late Dorset samples and absence in the Thule Inuit samples is undoubtedly linked to the closer proximity between the South West Point site and the large concentration of dovekie colonies. Bird frequencies in general, however, are much lower at the Skraeling Island Site, where the most frequent species was common raven (MNI=8). This species was traditionally only eaten when other foods were scarce (Bennett and Rowley 2004), however the meat remaining on many of the bones suggests this was not the case. In addition, the majority of common raven elements were found whole and many were articulated. If dogs or foxes caught these birds their bones would likely be more fragmentary (see Howse 2013). The raven bones at the site were recovered from three contexts, H15, H16, and the H14/16 midden. In H15 the raven bones were concentrated in the central eastern portion of the house, and in H16 they were recovered from the tunnel. There is no record they were arranged in any particular manner; however they are the only species with near complete skeletons concentrated in specific locations in these structures, perhaps suggesting they were intentionally deposited, whole, in these locations. While it is possible that these birds died of natural causes, their presence may have had a more symbolic purpose. Ravens are found in Inuit mythology from across the Arctic, and a number of ethnohistoric sources refer to ravens being used as amulets (Boas 1901; Nelson 1900; Rasmussen and Worster 1921). At Point Barrow, John Murdoch (1892) describes the whaling *umialiks* having used dried ravens to ensure the success of a hunt. Similarly, Regitze Søby (1968/70:49) has noted that the raven's skin was typically worn hung down the back of the *umialik*. At Kotzebue Sound, Frederick Beechey (1831) describes the Inuit he encountered as having "some skins of ravens with them, upon which they placed a high price".. and that "on several occasions we had noticed the beaks and claws of these birds attached to ornamental bands for the head and waist, and they were evidently considered valuable". These ethnographic descriptions suggest these birds were perhaps not captured for sustenance, but rather they may have been captured for more symbolic purposes and that their frequency and the complete nature of the specimens at the site may in fact reflect their position within Thule Inuit cosmology.

There are several differences in the distribution of mammal species at the sites. Arctic fox is the most frequent mammal species in the Late Dorset contexts. This is unusual since the most frequent resource in all known Late Dorset archaeofaunas from across the eastern Arctic, with the exception of the Bell Site (e.g., Howse 2008), is seal (e.g., Darwent 1995, 2001; Darwent and Foin 2010; Helmer 1981; Mary-Rousselière 1976; Murray 1996; Schledermann 1990). This high yield of arctic fox has only been identified at the South West Point site (Bendix 1998, 2000a, b). Notably, along the coast of Inglefield Land, arctic foxes with blue coats are more frequent than those with white coats (Freuchen and Salomonsen 1958; Vaughan 1991; Vibe 1981), however the blue variety is quite rare across the majority of the eastern Arctic (Sage and Danks 1986). While it is not possible to determine the coat colour of foxes from their skeletal morphology, if the remains represent individuals who had blue coats, their rarity may have served as an extra incentive to acquire as many as possible, perhaps for trade. At the South West Point site, caribou bones comprise 1.1% of the identified mammal, which may suggest caribou populations were low when the site was inhabited. As a result, the winter coat of the arctic fox would have been very valuable for the construction of winter clothing. In north Greenland, fox skins were traditionally used for outer parkas, women's short trousers, children's hoods and men's stockings; and fox tails were used on the hoods and wrists of the parkas (Holtved 1967; Kaalund 1983; Storrie et al. 2005). Ethnographic sources indicate the Inuit of Point Barrow used five fox skins to make a parka (Spencer 1959), and in Greenland at least 10 skins were used to make the outer parker (National Museum of Denmark 1955:50). Although clothing production undoubtedly differed between Late Dorset and Thule peoples, if they used a similar number of skins, the remains of fox recovered at the site (MNI=22) would have provided the fur for a minimum of two outer parkers or four lighter parkas. While it is possible that arctic foxes were more common in Inglefield Land than they were on or near Skraeling Island, and this potentially influenced the higher frequency of arctic fox in the Late Dorset archaeofaunas, fox is also found in low frequencies at additional Thule Inuit sites located in Inglefield Land (Darwent and Foin 2010; Johansen 2012). For instance, at Iita, arctic fox account for 9.7% of the identified mammal specimens (Johansen 2012:60), and at Cape Grinnell fox comprises 1.9% of the identified mammal specimens (Darwent and Foin 2010:324). Since arctic fox would have been similarly available to these groups, it appears the Late Dorset people at the South West Point site, Qeqertaaraq, were specifically targeting this resource, more so than Thule Inuit who occupied sites nearby. Interestingly, however, in three additional houses at the Skraeling Island site, previous analysis indicates fox comprised a much higher proportion of the identified mammal bone (McCullough 1989). In H20 they account for 67.2% of the mammal bone in H20, 49.1% in H22, and 30.9% in H21 (McCullough 1989:266). At the site, these houses are located to the south of the H14, H15 and H16, on an adjacent beach ridge (see Figure 9.); and, all of these houses have yielded radiocarbon dates that fall between 1150 and 1370 CE, thus it is possible they were occupied simultaneously (McCullough 1989:241). If this was the case, it would seem that fox hunting activities were household specific.

Although arctic fox was the most frequent resource at the Late Dorset site, the small amount of meat on these animals suggests they were not the primary food resource, which was likely small seal. Small seal is the most frequent mammal species identified in the Thule Inuit assemblage, which is consistent with the majority of Thule Inuit occupations throughout the eastern Arctic (e.g., Darwent and Foin 2010; Mathiassen 1927; McCullough 1989; Park 1989; Sabo 1981; Taylor 1972; Whitridge 1992). Despite this, at many of these sites small seal might not have been the primary food resource. At many Thule Inuit sites across the eastern Arctic bowhead whalebones are prevalent, suggesting bowhead hunting was likely very important within Thule society. Because bowhead hunting required a great deal of preparation, this practice would have played a focal role in the arrangement of seasonal activities. Estimating the harvest numbers of bowhead and the degree to which they were relied upon for food, however, is fraught with difficulties (McCartney 1980). Savelle (2010) has recently developed a new model in order to estimate bowhead harvest numbers. Thus far, this research indicates that Thule Inuit whale harvesting was actually much higher in some regions than once thought. Regardless, small seal would have been an essential food resource, particularly in years when whales were not harvested or when stored meat spoiled.

At both sites, a variety seal species were identified including ringed seal, harbour seal, harp seal, and bearded seal. Specimens belonging to grey seal were also identified at the Thule Inuit site. The identification of grey seal bones at the Skraeling Island site is unexpected, since this species typically occupies more temperate waters (Rice 1998). Today, its geographic range includes the area surrounding Sable Island, the Gulf of St. Lawrence, the northeast Atlantic off Iceland, Norway, and Ireland, and the Baltic and White seas (Hall 2002). However, their presence in Greenland is not completely unknown. The 18th century Danish missionary and zoologist Otto Fabricius described the seal in his *Detailed Description of the Seals of Greenland* on the basis of an Inuit name for the species (Kapel 2005), although he never encountered one himself, or met a hunter who had. The 19th century Scottish explorer Robert Brown (1868) claimed to have collected a grey seal skull found near Disko Island, yet the seal skull was destroyed and its species identity could not be confirmed. The first confirmed sighting of a grey seal in Greenland occurred in 2009 when a lone grey seal was recorded near the coast of Southeast Greenland (Rosing-Asvid et al. 2010). The presence of grey seal bones at the Skraeling Island site suggests that this species at least occasionally made trips further north than previously noted. Since the site was occupied during the Medieval Warm Period, the northern waters along the east coast of Ellesmere Island would have remained ice-free longer, and the high productivity of the Flagler Bay and North Water polynya systems would have made the area an attractive respite for a wandering grey seal.

The distribution of small seal elements differs somewhat within and between the sites, although the majority of the skeleton was identified in both assemblages. An underrepresentation of flipper bones at the Late Dorset site may indicate this part of the animal was removed prior to being introduced into the features.

The seasons during which Late Dorset and Thule Inuit inhabited the sites is not easily resolved. The much higher frequency of migratory birds and immature birds acquired by the Late Dorset suggest they inhabited the site when these animals were readily available during the spring and summer, faunal data also suggests they may have stayed at the site throughout the fall. The semi-subterranean nature of the house suggests it was occupied sometime during the cold season, possibly for part of the winter. Comparably, the lower frequencies of migratory bird in the Thule Inuit assemblage may indicate they were not living at the site during the spring and summer when these species are available, and that fauna killed during the spring and summer represent stored food. When this is considered alongside the robust nature of the Thule Inuit houses and the presence of nearby tent structures, it seems most logical that the houses were primarily occupied during the winter months.

Again, the impacts of disparate technologies on the archaeofaunas are difficult to deduce. In this region, technological differences between Late Dorset and Thule Inuit appear to have had greatest impact on the scheduling of hunting activities. Whale is more frequent at the Thule Inuit Skraeling Island Site than it is on the Late Dorset site. Furbearers and large terrestrial mammals, however, are most frequent at the Late Dorset South West Point Site. The Late Dorset lack of whale hunting technologies and open-water hunting technologies in general, may explain the faunal distribution. For instance, the majority of the seals and walrus at the South West Point site were probably hunted in early spring on the sea ice, and during the warmer months without the use of open water hunting technologies they switched their focus to capturing small furbearers, and bird species. Thule Inuit , however, would have been able to continue hunting sea mammals throughout the warm season in the open water .

Chapter 10

Synthesis and Discussion

10.1 Introduction

In order to achieve a more nuanced understanding of the role of cultural factors in human-animal interaction in the eastern Arctic, this dissertation has explored aspects of how two very different societies, Late Dorset (500 CE to 1300 CE) and Thule Inuit (1200 CE to 1500 CE), interacted with their environments in common geographical areas. Technologies, specifically hunting technologies, have been used to access cultural differences; this is because they are highly visible in the archaeological record, they have been the focus of many Arctic archaeological studies (D'Altroy and Earle 1985; Desrosiers 2009; Desrosiers and Sørensen 2012; Houmard 2011; Riddle 2011; Ryan 2009; Wells 2012), and there are distinct differences between Late Dorset and Thule Inuit hunting technologies (see Chapter 4-6). These differences and associated hunting practices, along with animal behaviour, have been used to formulate a number of zooarchaeological expectations (Chapter 6). This chapter draws together the analyses presented in Chapters 7 to 9 to present an inter-regional comparison of the data and to discuss the overall differences between the Late Dorset and Thule Inuit archaeofaunas. It is organized into three parts. First, confounding factors including taphonomy, differences in regional ecosystems, and seasonality are addressed; second, the data are presented and any regional patterns are summarized; and third, the zooarchaeological expectations presented in Chapter 6 are compared with the results of the zooarchaeological analyses in order to understand how hunting technologies have impacted Late Dorset and Thule Inuit subsistence economies. For comparison purposes, at each site the faunal material excavated from individual features has been combined. However, because animal element distributions are quantified using derived measurements (MNE's and MAU's) that are dependent upon how the data are aggregated, simply adding the distributions from different contexts together does not provide an accurate representation of the data. In this chapter, in order to retain the most reliable reconstruction of past human decisions animal element distributions are referred to by feature and briefly summarized.

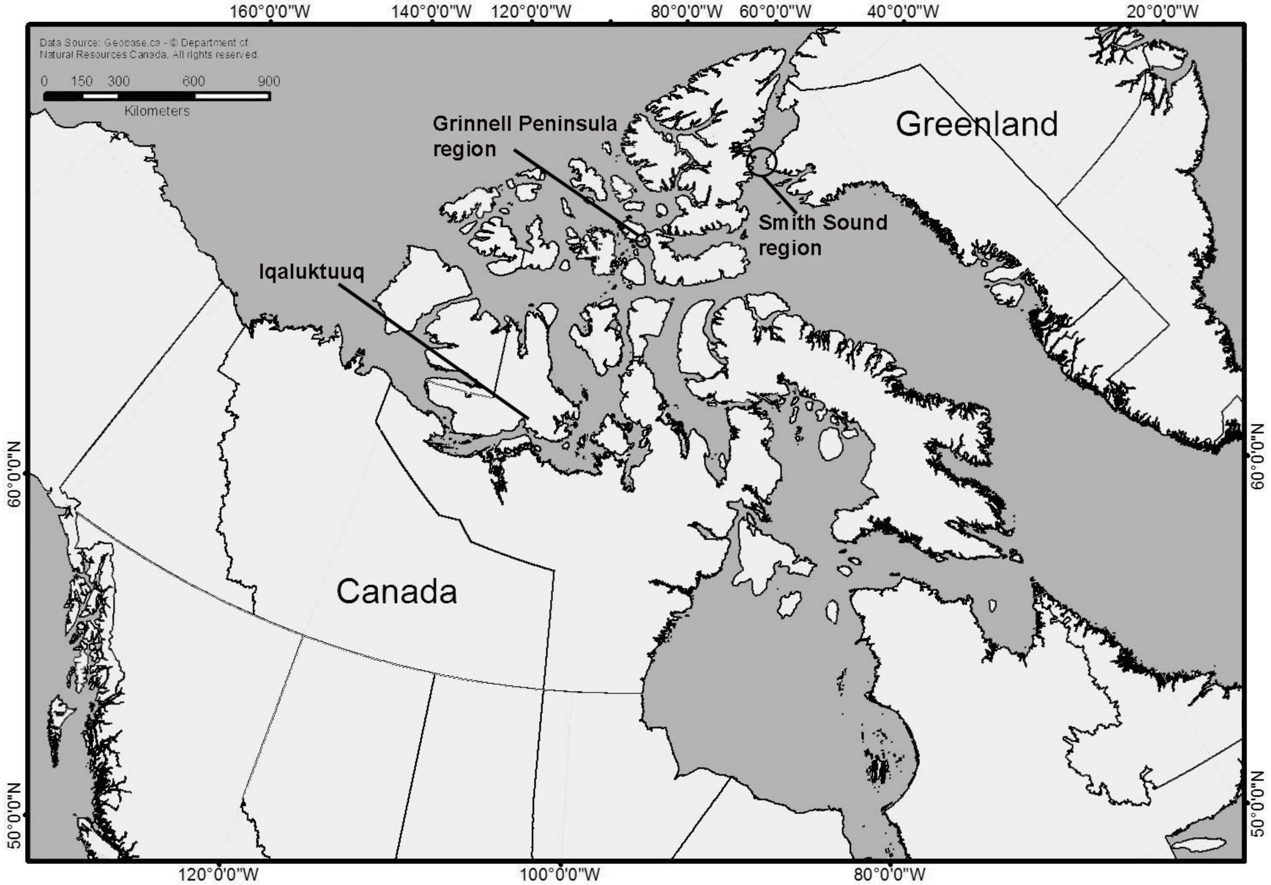


Figure 10.1 Map of the eastern Arctic highlighting the three study regions.

10.2 Addressing Confounding Factors

Archaeofaunas are influenced by a number of non-cultural factors; thus, in order to highlight which patterns reflect cultural differences and reconstruct an accurate picture of past human behaviours, these factors and their impact must first be examined. This section begins by addressing the taphonomic history of the study samples by comparing bone modification frequencies. This is followed by the examination of variations amongst the regional ecosystems, and concluded with a discussion of seasonality.

10.2.1 Taphonomy

Taphonomic processes vary somewhat between and within regions (Table 10.1). The majority of the bone specimens in the study assemblages indicate early stages of weathering (Stages 1-3), though the Late Dorset faunal assemblage from the Grinnell Peninsula included a significant proportion of specimens displaying middle stages of weathering, with coarse and rough bone surfaces and the occasional bone splintering (Behrensmeyer 1978). Specimens from the Thule

Inuit assemblage from Smith Sound were best preserved, and periosteum and fur was often still attached to the bones.

The %fragmentary measure, which indicates the proportion of the sample that was fragmentary (elements that were not whole), was lowest at the Smith Sound sites, where just under half of the Thule Inuit specimens were complete skeletal elements, and just under one third of the Late Dorset specimens were complete elements. As a region, the Grinnell Peninsula mammal bones were the most fragmented, however the Thule Inuit mammal bones from Iqaluktuuq were also largely comprised of fragmented elements. When the intensity of fragmentation (NISP:MNE) is compared, however, there is no distinguishable pattern, since in all regions, in both Late Dorset and Thule Inuit assemblages, mammal bones are fragmented into similar numbers and sizes of pieces.

Gnawing is the most common modification across the samples. Within each region, gnaw marks are most frequent on the mammal bone from the Thule Inuit samples. Because the size of punctures on the Thule Inuit mammal specimens are generally 5-6 mm in diameter, and because dogs figured prominently in Thule Inuit society (Maxwell 1985), dog activity would have had a significant impact on the Thule Inuit archaeofaunas. In comparison, in the Iqaluktuuq and Smith Sound Late Dorset archaeofaunas, the gnaw marks on mammal bones included punctures ranging from 2-3 mm in diameter, suggesting arctic fox inflicted them. This is consistent with previous zooarchaeological studies of Dorset archaeofaunas, where punctures appear to be made by fox (Darwent 2004; Darwent and Foin 2010). The Grinnell Peninsula samples had the largest proportion of bone with gnaw marks. In this region, punctures were of various sizes indicating the marks were made by a number of carnivores, including arctic fox, bears, and possibly wolves and/or dogs. Since gnaw marks were at least twice as frequent in the house structures than in the midden at the Late Dorset site, and due to the lack of evidence of dog use in Late Dorset society (Morey and Aaris-Sørensen 2002), it is likely that the majority of gnaw marks were inflicted after the houses were abandoned. Similarly, gnaw marks were more frequent on the mammal bones from the Thule Inuit houses in comparison to the middens, also suggesting they were made by scavenging dogs or wolves after the houses were abandoned, though it is possible this pattern is the result of Thule Inuit keeping their dogs inside their houses (see Betts and Friesen 2006).

At Iqaluktuuq, the slightly higher frequency of gnaw marks and the greater proportion of fragmented elements in the Thule Inuit assemblage is also likely the result of dog activity.

Cut marks were generally uncommon but were more frequent on the mammal bone from the Smith Sound sites, and were most frequent at the Thule Inuit site on Skraeling Island. There is no clear explanation for this pattern since cut marks appear on bones for a number of reasons (see section 2.3.5.1 for discussion). Burning is generally infrequent on the samples, with the exception of the Thule Inuit sample from the Grinnell Peninsula where it is between two and a half to eight times more common than it is in the other samples. It is possible that the Thule Inuit at Porden Point were burning their bones as a method of trash disposal (Cain 2005; Howse 2008; Spennemann and Colley 1989), or perhaps as fuel, and thus it resulted in a higher proportion of burn marks in comparison to the other. There is no regional or cultural trend in regards to burn marks, since at the Smith Sound sites burning is also slightly more frequent on the bones from Thule Inuit assemblage, but at Iqaluktuuq burning is more frequent on the Late Dorset material.

These data indicate that, in general, taphonomic processes similarly impacted the study samples with one exception—dog activities. Consistently, dog activities have a greater impact on the Thule Inuit archaeofaunas in comparison to the Late Dorset archaeofaunas. This is carefully considered in the following sections in order to make informed interpretations of any zooarchaeological trends.

Table 10.1 Modification frequencies on mammal bones from the study assemblages.

	Iqaluktuuq		Grinnell Peninsula		Smith Sound	
Modification[1]	Late Dorset	Thule Inuit	Late Dorset	Thule Inuit	Late Dorset	Thule Inuit
Cut marks	86	36	40	1	69	201
% cut marks	1.1%	0.5%	2.2%	>0.1	3.5%	7.2%
Gnaw marks	75	165	145	112	32	188
% gnaw marks	1.6%	2.5%	8.2%	10.3%	1.6%	6.7%
Burn marks	278	150	13	97	7	14
% burn marks	3.6%	2.3%	0.7%	8.9%	0.4%	0.5%
%fragmentary	66.4%	87.4%	96.4%	82.9%	75.7%	52%
Fragmentation (NISP:MNE)[2]	2.5	2.9	1.4	1.6	2.7	1.6
NISP[3]	2933	1679	1337	656	1612	2645
MNE[4]	1832	713	945	458	839	2261
Whole elements	985	213	48	112	391	1269

[1] Percentages are calculated using total mammal NISP for each sample see Table 10.1

[2] Whole elements are excluded from this calculation.

[3] This NISP is used for calculating fragmentation and excludes mammal bone specimens that could not be identified beyond class.

[4] At each site the MNE's from the different contexts were added together to make the total.

10.2.2 Variation in Regional Ecosystems

The local ecosystems in each of the study regions were very different from one another. Most different is Iqaluktuuq, where terrestrial and riverine resources are most abundant and are the focus of economic activity (Friesen 2002a; Howse 2008). In comparison, in both the Grinnell Peninsula and Smith Sound regions the sites are located on the coasts where marine resources are most plentiful, large terrestrial resources such as caribou are less dependable, and riverine resources are not substantial (Jenkins et al. 2011; Roby and Thing 1985). Marine mammals, including bowhead, beluga, walrus, and seal are frequent in both areas. However, their availability varies somewhat throughout the year. In the Smith Sound region, harp seals only visit during the summer; and, in both regions whales and walrus are less plentiful during the winter, and ringed seal populations remain stable year-round.

There are, however, several differences between the resource structure in these locations, and between the sites within the Smith Sound region. These differences are largely related to the productivity of the North Water polynya (NOW), which attracts greater numbers of marine mammals than the polynyas found in the Grinnell Peninsula region (Barber and Massom 2007). Therefore, the occupants of the Smith Sound region would have had access to a greater number of predictable resources for a greater period throughout the year, in comparison to the occupants of the Grinnell Peninsula region. In the Smith Sound region, however, the eastern border of the NOW, which is on the Greenland side, is also known to have a richer animal life in comparison to the western border, which is adjacent to Skraeling Island; and large sea mammals are plentiful earlier in the spring on the Greenland side in comparison to the western border where they are not found in dense concentrations until early summer (Finley and Renaud 1980; Richard et al. 1998). On the Greenland boarder of the NOW, the ice begins to break up in late March/early April and it is largely ice free in May (Barber et al. 2001). This earlier ice breakup, which results in a longer period of nutrient-rich currents flowing in from southern Greenland, is believed to contribute to its more productive marine life (Vibe 1950). Sea birds, for instance, are plentiful throughout the NOW but the largest colonies are located on the Greenland side near the Late Dorset South West Point site (Karnovsky and Hunt 2002).

Undoubtedly, these variations between the local ecosystems had some bearing on the subsistence practices of each society and their archaeofaunas. By carefully considering this variation when interpreting results, cultural trends should be distinguishable from regional patterns.

10.2.3 Seasonality

As shown in Chapters 7-9 seasonality somewhat varied between the Late Dorset and Thule Inuit occupations in each region. While in some regions both groups appear to have occupied the study sites during a similar time of year, variation is found in the duration of their stay, with one group arriving earlier or staying later.

At Iqaluktuuq, both Late Dorset and Thule Inuit took advantage of the upstream char run occurring from mid-August to mid-September, and the southward caribou migration, occurring mainly in September and October. Data indicate the majority of kills were made during the fall, with the exception of a single mandible from a Late Dorset context that appears to indicate a winter/early spring kill. However, there are more spring indicators, including at least one bird specimen with medullary bone and a single fetal/newborn seal bone, in the Late Dorset archaeofaunas, suggesting they may have arrived earlier at the site than Thule Inuit. Overall, Thule Inuit captured higher frequencies of both fish and caribou, indicating they primarily targeted late summer and early fall resources. It is unclear whether or not Late Dorset remained at the site during the winter months. During the winter caribou are not frequent in the area, and in the absence of fishing technology that would allow Late Dorset to capture fish through the lake ice, at some point they probably moved to a coastal region where they would have access to seals through breathing holes. It is possible they persisted at the site during the beginning of the winter subsisting on their fall harvests, since their houses were semi-subterranean and were likely inhabited during part of the cold season. However, without a dependable food source it is perhaps probable Late Dorset moved to the coast to hunt seals once the large migrations of caribou left the area and any stragglers had passed sometime mid winter. The higher proportion of lake trout in the Thule Inuit archaeofaunas may indicate they were staying later at the site, perhaps for part, if not all, of the winter fishing on the lake ice. Therefore, it can be suggested tentatively that Late Dorset arrived at the site earlier than Thule Inuit and left sometime during the fall, or early winter; whereas Thule Inuit perhaps arrived sometime during the summer before the large char run, they remained at the site hunting caribou during the large migrations in the fall, and into the winter fishing on the lake.

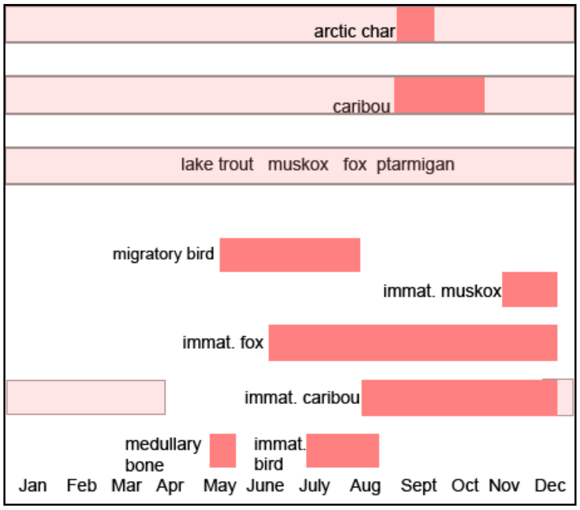


Figure. 10.2 Seasonal indicators for Late Dorset at Iqaluktuuq.

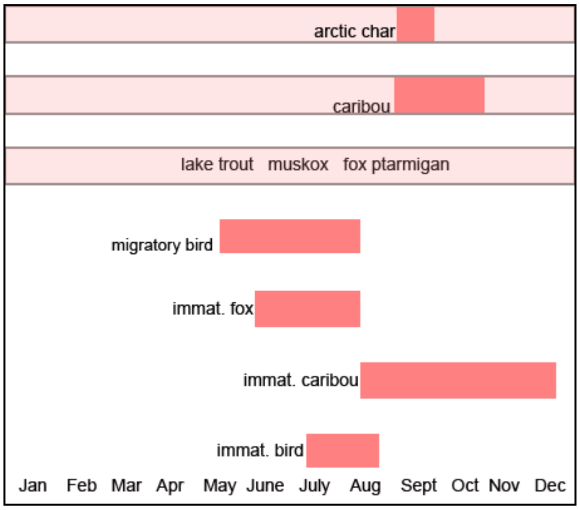


Figure 10.3 Seasonal indicators for Thule Inuit at Iqaluktuuq.

In the Grinnell Peninsula region, both groups captured year-round resident species and spring/summer migrants. Again, there are slight differences between the Late Dorset and Thule Inuit archaeofaunas, and more spring indicators are found in the Late Dorset archaeofaunas, including immature bird, at least one fetal/newborn seal specimen, and at least nine ringed seal yearlings (Figure 10.4). Femoral metric data suggest Late Dorset were harvesting more young seals, particularly yearlings, that would have been taken on the sea ice during the spring in comparison to Thule Inuit who captured higher frequencies of adults that could have been taken on the sea ice or by boat in the summer. The lack of float technologies, and the rarity of throwing harpoons and evidence of boat use in the Late Dorset toolkit (e.g., Maxwell 1985), would have made staying at the site when the sea was ice free difficult; Late Dorset likely left the site after the ice break-up in late June when seals could no longer be taken on the ice. In comparison, summer migrants are more frequent in the Thule Inuit archaeofaunas, particularly murre species that could have easily been captured by boat when hunting for seals. It is unclear based on the faunal evidence whether or not Late Dorset occupied the site during the winter months, though it is perhaps likely, since their houses were semi-subterranean and they would have been well positioned to easily hunt seals at breathing holes through the sea ice. While the semi-subterranean nature of the Thule Inuit houses implies they were occupied at least in part during the colder months, perhaps early spring or late fall, it is most likely Thule Inuit moved into the more robust winter houses located at sites nearby for the coldest winter months (Park 1989). Generally, it seems Late Dorset were primarily hunting at the site during the spring, and perhaps during the winter. Thule Inuit also appear to have been in the region hunting seals during the spring but perhaps concentrated most of their seal hunting efforts in the summer when seals could be taken by boat, and likely abandoned the houses sometime in the winter.

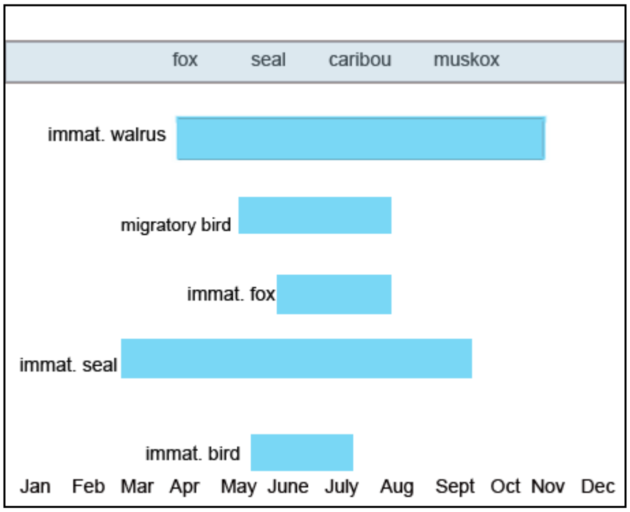


Figure 10.4 Seasonal indicators for Late Dorset in the Grinnell Peninsula region.

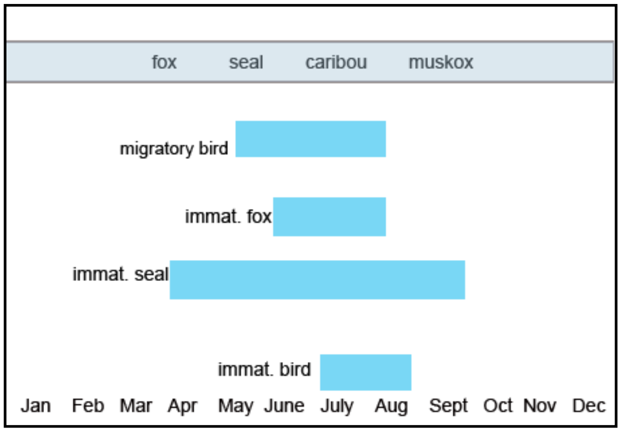


Figure 10.5 Seasonal indicators for Thule Inuit in the Grinnell Peninsula region.

In the Smith Sound region, summer migrants and year-round resident species were found in both the Late Dorset and Thule Inuit archaeofaunas. There are only slight differences in the faunal assemblages that suggest differences in seasonality at the sites. Late Dorset relied more heavily on a variety of spring/summer migrants, and their archaeofaunas have higher frequencies of migratory bird, immature bird, small seal yearlings, and immature arctic fox. In the Thule Inuit archaeofaunas, although migratory bird species were present they were much less common, and there were fewer seal yearlings. A few harp seal bones were found in both assemblages. Faunal indicators of a winter occupation is lacking at both sites. Similar to the Grinnell Peninsula, the Late Dorset site in the Smith Sound region is well positioned for capturing seals on the sea ice during the winter, and the house is also semi-subterranean, implying it was occupied at some point during the colder months, potentially throughout the winter. Although it is possible Late Dorset occupied the house during the summer, it is just as likely they moved into tents at this time of year and that the fox and perhaps bird were stored for winter/spring use. As noted in the previous section the sea ice on the eastern border of the NOW, adjacent the Late Dorset site in Greenland, begins to melt in early spring, but on the western border near the Thule Inuit site the sea ice is stable until late spring (Finley and Renaud 1980; Richard et al. 1998). This potentially allowed for some migratory species, such as harp seal, to arrive on the Greenland side of the NOW earlier in the season, perhaps in late spring. Thus, Late Dorset may have captured harp seal prior to abandoning the house. The robust architecture of the Thule Inuit houses also suggest these structures were primarily inhabited during the colder winter months and it is most likely small seal yearlings and harp seal in the Thule Inuit assemblage represent summer catches that were stored and consumed during the winter (Figure 10.7; see also McCullough 1989;

Howse 2013). Overall, it seems most probable that Late Dorset occupied the house at the South West Point site for most of the winter and spring, and that the Thule Inuit inhabited the study houses during the winter months, with both groups moving into tents for the summer.

Since many species throughout the Arctic are only seasonally available or abundant, the varying seasons during which each group occupied each of the study regions would have directly impacted their subsistence practices at the study sites. Thus, it is expected that some of the variation between the archaeofaunas within each region is the direct result of seasonal differences. In order to differentiate which aspects of the archaeofaunas are largely the results of cultural behaviours, particularly those relating to technologies, seasonality differences are considered when making interpretations.

Table 10.2 Ringed seal age at death based on epiphyseal fusion data expressed as MNI.

Region	Late Dorset	Thule Inuit
Grinnell Peninsula	1 fetal/newborn 9 yearlings 2 old adults	1 yearlings 9 old adults
Smith Sound	3 yearlings No fused or fusing elements	2 yearlings 18 old adults

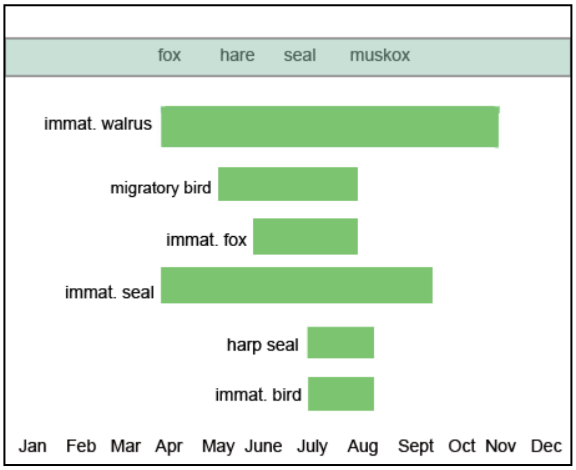


Figure 10.6 Seasonal indicators for Late Dorset in the Smith Sound region.

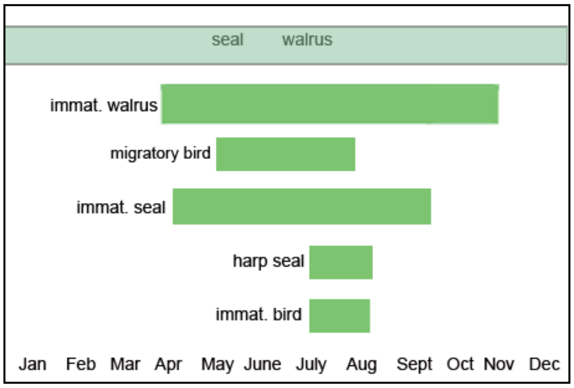


Figure 10.7 Seasonal indicators for Thule Inuit in the Smith Sound region.

10.3 Interregional Comparison of Late Dorset and Thule Inuit Archaeofaunas

This section presents a regional comparison of the archaeofaunas in order to better understand which patterns in the zooarchaeological record resulted from environmental differences between the study regions.

10.3.1 Taxonomic Frequencies

A total of 42, 518 animal bone specimens were identified for this research, 73% of which were identified to at least class. When the archaeofaunas from each region are compared, there is no definitive regional pattern in class frequencies apart from the large proportion of fish in the Iqaluktuuq archaeofaunas (Figure 10.8; Table 10.3). It is possible that biases in recovery methods affect fish and bird disproportionately due to their small size. The Iqaluktuuq faunal assemblages were screened with 3mm mesh, however the faunal assemblages from the Grinnell Peninsula and Smith Sound were not screened. Fish is also very susceptible to taphonomic processes, which often results in an under-representation of this resource in archaeological samples (Whitridge 2001). Regardless, fish comprises one third of the Late Dorset faunal assemblage and almost half of the Thule Inuit faunal assemblage from Iqaluktuuq, patterns that cannot be fully explained by variation in screening methods or taphonomy. As discussed in Chapter 7 (see also Friesen 2002, 2004; Howse 2008), fish was a major contributor to the diet at the site and this reflects the local resource structure at Iqaluktuuq.

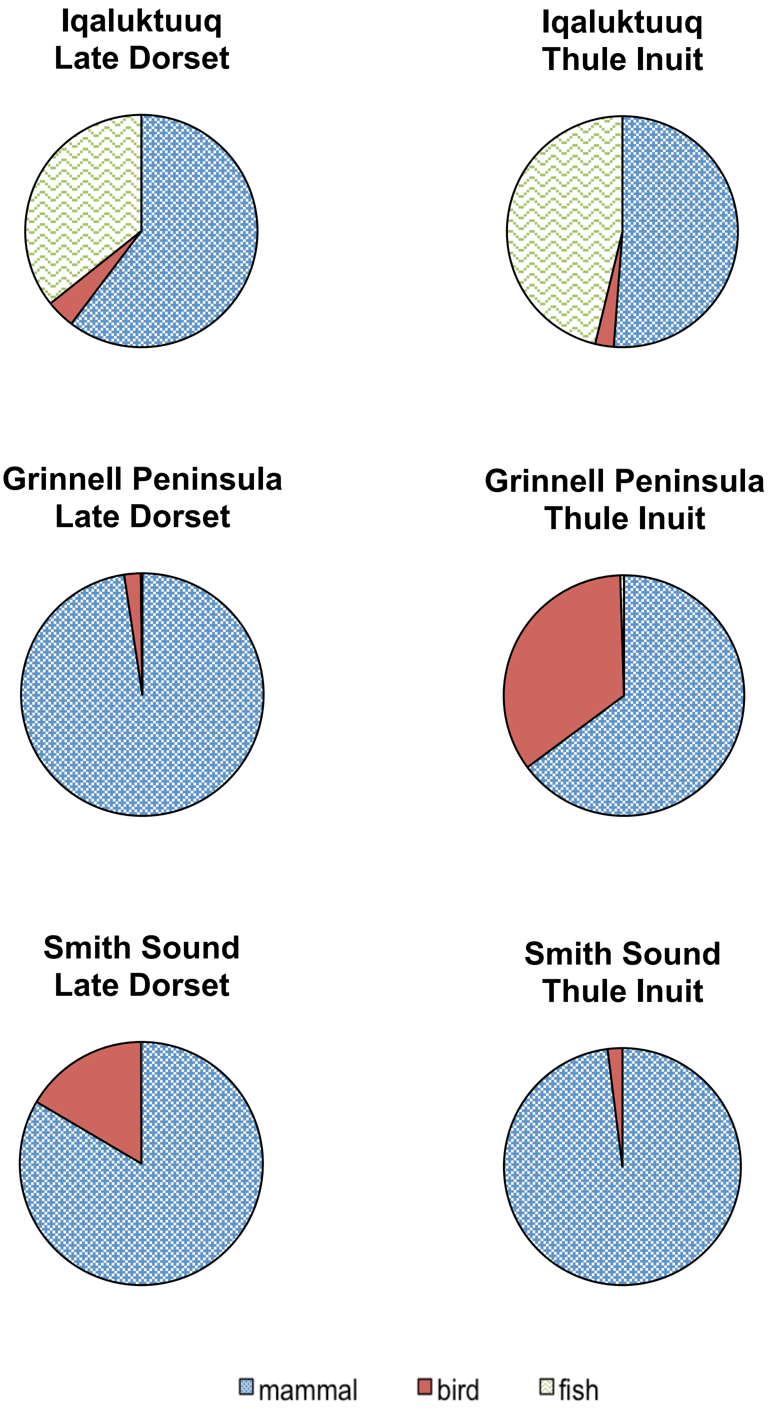


Figure 10.8 Class frequencies in the study assemblages expressed as %NISP.

Table 10.3. Taxonomic frequencies for the study assemblages.

	Iqaluktuuq				Grinnell Peninsula				Smith Sound			
	Late Dorset		Thule Inuit		Late Dorset		Thule Inuit		Late Dorset		Thule Inuit	
Taxon	NISP	%[1]	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%
Arctic char	100	8.7	116	7	0		0		0		0	
Lake trout	28	2.4	74	4.4	0		0		0		0	
Arctic char/ lake trout	1021	88.9	1456	87.6	0		0		0		0	
Salvelinus	0		0		3	100	3	100	0		0	
Sculpin	0		16	1	0		0		0		0	
Indeterminate fish	2286		4255		0		5		1		0	
Total Fish[2]	3435	35.7	5917	46.2	3	0.2	8	0.5	1	>0.1	0	
Canada goose	20	11.2	50	30.1	1	3.7	4	1.3	0	0	0	
Brant goose	0		0		0		0		1	0.4	0	
Snow goose	0		0		7	25.9	0		0	0	0	
Goose	58	32.4	47	28.3	2	7.4	38	12.1	3	1	4	5.4
Long-tailed duck	3	1.7	2	1.2	0		1	0.3	1	0.4	0	
Common Eider	9	5	0		0		40	12.7	0		0	
King Eider	17	9.5	0		0		0		0		0	
Eider	4	2	17	10.2	2	7.4	90	28.7	69	29.5	3	4.1
Pintail	4	2	0	0	0		0		0		0	
Duck	3	1.7	27	16.3	10	37	55	17.5	15	6.4	0	
Loon	0		0		0		5	1.6	0		0	
Trumpter swan	4	2	0	0	0		0		0		0	
Swan	2	1.1	7	4.2	0		0		0		0	
Glaucous gull	7	3.9	0		0		23	7.3	43	18.4	1	1.4
Thayers’ gull	0		0		0		0		0		2	2.7
Herring gull	1	0.6	0		0		0		0		0	
Iceland gull	5	2.8	0		0		0		2	0.9	0	
Glaucous gull/Iceland gull	0		0		0		0		4	1.7	0	
Common raven	0		0		0		0		16	6.8	61	82.4
Large gull	0		0		0		1	0.3	0		2	2.7
Medium gull	1	0.6	1	30.1	0		1	0.3	0		1	1.4
Small gull	1	0.6	0		2	7.4	8	2.5	0		0	
Gull	8	4.5	0		3	11.1	10	3.2	4	1.7	0	
Jaeger	1	0.6	0		0		0		0		0	
Arctic tern	2	1.1	0		0		0		0		0	
Sandhill-crane	1	0.6	0		0		0		0		0	
Ptarmigan	28	15.6	15	9	0		0		0		0	
Dovekie									74	31.6		
Black guillemot	0		0		0		1	0.3	2	0.9	0	
Thick-billed murre	0		0		0		3	0.9	0		0	
Murre	0		0		0		33	10.5	0		0	
Shorebird	0		0		0		1	0.3	0		0	
Bird indeterminate	204		168		14		267		154		2	*(cont.)*

Table 10.3 (*continued*)

	Iqaluktuuq				**Grinnell Peninsula**				**Smith Sound**			
	Late Dorset		Thule Inuit		Late Dorset		Thule Inuit		Late Dorset		Thule Inuit	
	NISP	%[1]	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%
Total Bird[6]	385	4	334	2.6	41	2.2	581	34.7	388	16.5	76	2.7
Small whale	0				2	0.1	2	0.3			15	0.6
Bowhead	0				1	0.1	7	1.1	2	0.2	19	0.7
Whale	0				0		0		2	0.2	39	1.5
Wolverine	15	0.5			0		0		0		0	
Dog	0		3	0.2	0		0		0		75	2.8
Wolf	0		2	0.1	7	0.5	0		0		0	
Dog/Wolf	4	0.1	16	1	1	0.1	1	0.2	0		197	7.5
Arctic fox	798	27.2	121	7.2	195	14.6	13	1.9	711	53.4	50	1.9
Arctic hare	5	0.2	5	0.3	11	0.8	1	0.2	82	6.2	5	0.2
Polar bear	4	0.1			17	1.3	3	0.5	19	1.4	66	2.5
Bearded seal	15	0.5	4	0.2	37	2.8	0		4	0.3	13	0.5
Grey seal	0				0		0		0		5	0.2
Large seal	0				11	0.8	15	2.3	0		79	3
Large seal/Walrus	0				2	0.1	0		2	0.2	7	0.3
Ringed seal	54	1.8	9	0.5	199	14.9	55	8.4	18	1.4	187	7.1
Harbour seal	0				0	0	0		1	0.08	3	0.1
Ringed/Harbour seal	0				0	0	1	0.2	0		0	
Harp seal	0				0	0	0		4	0.3	12	0.5
Small seal	97	3.3	17	1	771	57.8	542	82.6	261	19.6	1639	62
Walrus	0		0		18	1.3	1	0.2	93	7	193(4)	7.3
Caribou	1887	64.3	1492	88.7	53	4	5	0.8	15	1.1	3	0.1
Muskox	54	1.8	14	0.8	10	0.7	10	1.5	117	8.8	33	1.2
Sea mammal	0				18		0		6		0	
Large sea mammal[3]	2				19		1		47		34	
Large terrestrial mammal[4]	666		1327		19		13		6		2	
Large mammal[5]	21		528		0		20		224		49	
Mammal indeterminate	2169		3017		429		397		354		80	
Total Mammal[2]	5791	60.3	6555	51.2	1820	97.6	1087	64.9	2249	83.5	2810	97.4
Indeterminate	6631		3912		111	0	214		457		0	
Total	**16240**		**16716**		**1976**		**1890**		**2814**		**2882**	

[1] %NISP's are calculated by class not by total sample

[2] Class percentages are calculated using the total sample

[3] Large sea mammal includes large seal, walrus, and whale species

[4] Large terrestrial mammal includes caribou, muskox, and bear

[5] This category includes large sea mammal and large terrestrial mammal

10.3.1.1 Fish

As outlined in the previous section, fish specimens are rare in the Grinnell Peninsula and Smith Sound archaeofaunas, but they are a substantial food resource for the Late Dorset and Thule Inuit who inhabited Iqaluktuuq. The identified fish bones from Iqaluktuuq are predominantly *Salvelinus* species, including arctic char and lake trout (Table 10.3). The Thule Inuit assemblage also included a few bones belonging to sculpin.

10.3.1.2 Bird

The distributions of bird species within the study assemblages do not appear to be regionally distinctive, since there are many disparities between the Late Dorset and Thule Inuit archaeofaunas within each region. Large ranges of bird species were identified in the study assemblages, including goose, duck, swan, gull species, common raven, jaeger, sandhill crane, ptarmigan, shorebird, dovekie and murres (Table 10.3; Figure 10.9). Anatidae species are the most frequently identified bird taxon in each of the archaeofaunas, with the exception of the Smith Sound Thule Inuit sample where common raven is most common, comprising 82% of the identified bird specimens in this relatively small sample.

The Iqaluktuuq assemblages exhibit the greatest diversity of bird species, and they also include high frequencies of the year-round arctic resident ptarmigan, which is not found in the other samples (Table 10.3). Auk species, including various types of murres and dovekie, are prevalent in two of the study assemblages, each from a different study region. In the Thule Inuit assemblage from the Grinnell Peninsula, murre species, including black guillemot and thick-billed murre, form a significant proportion of the identified bird specimens. These species are known to visit the area, although their modern colonies are located farther south in Lancaster Sound (Gaston et al. 2012). In the Late Dorset assemblage from Smith Sound dovekies are quite frequent. This high percentage of dovekie specimens is likely related to the ecosystem of this sub-region since large colonies of dovekies are found on the eastern border of Smith Sound along Inglefield Land (Freuchen 1961). They are, however, not found in the Thule Inuit assemblage from this region, likely because large bird colonies are not found on the western side of Smith Sound. In comparison at the Thule Inuit sites at Iita, which is found on the eastern border near the Late Dorset study site, dovekies comprise 98.1% of the identified bird specimens (Johansen 2012).

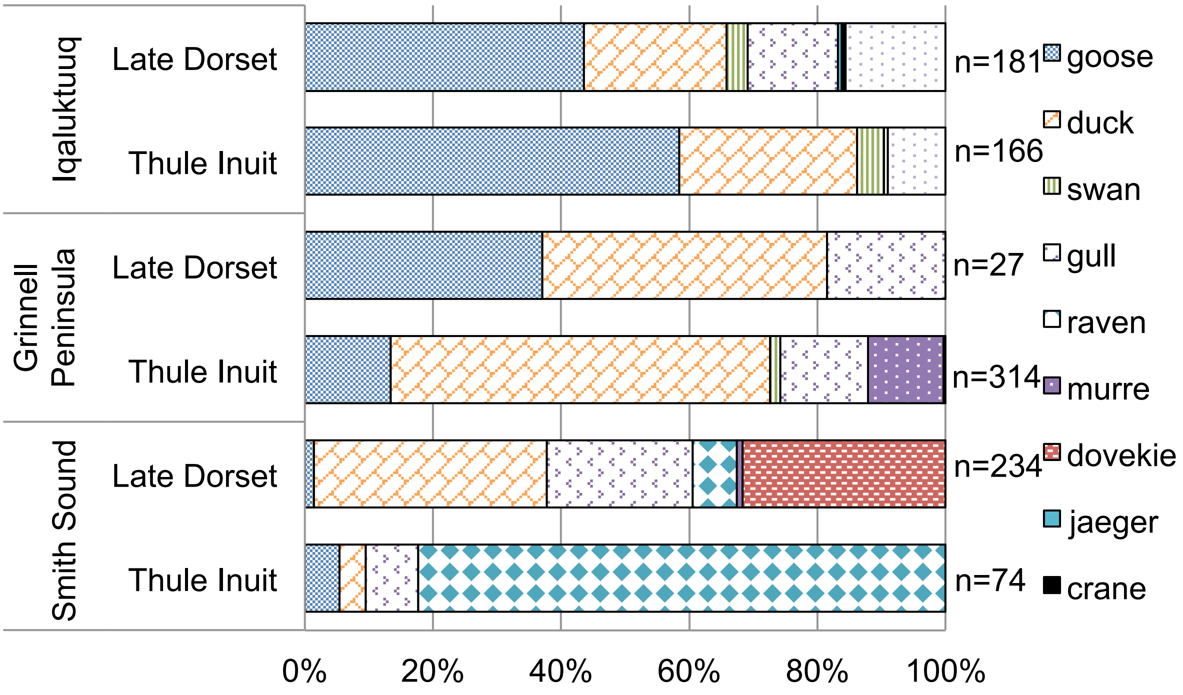


Figure 10.9 Distribution of bird species in the study assemblages expressed as %NISP.

10.3.1.3 Mammal species

The distribution of mammal species varies within and between the study regions, although there are a few regional distinctions (Figure 10.10). The most frequent species in the Late Dorset and Thule Inuit archaeofaunas from Iqaluktuuq is caribou, and at the Grinnell Peninsula sites it is small seal. At the Smith Sound sites, however, arctic fox bones are most frequent in the Late Dorset assemblage and small seal bones are most frequent in the Thule Inuit assemblage. A prevalence of bowhead bones has been identified at the Thule Inuit sites in both the Grinnell Peninsula and Smith Sound regions, suggesting that whale was an important part of the local diet and the focus of hunting activities in these locations (McCullough 1989, Park 1989). Quantifying the amount of food bowhead contributed to the diet, however, is not straightforward and there are two primary confounding factors. First, it is very difficult to estimate how many bowheads were harvested and to discern the degree to which whales were relied upon for food, since whalebones were frequently conserved as building materials (Park 1989). Second, large whalebones are not typically collected and brought south for analysis because of logistical issues (e.g. the weight and size of the bone makes them difficult to transport via boat or small plane from most site locations). Thus, the large proportion of bowhead bones observed at the Thule Inuit sites from the Grinnell Peninsula and Smith Sound regions are not included in the faunal samples analyzed here. Nonetheless, bowhead was likely the primary food resource at these sites, at least during some years. Although small seal would have been a food staple, in all probability it was often a secondary resource (see also Howse 2013; McCullough 1989; Park 1989).

Notably, at the Smith Sound sites, where the most frequent resource differs, the study sites were presumably occupied during a similar time of year, however they are located a greater distance from one another than in the other study regions (Figure 10.1). Perhaps more importantly, in this region the Thule Inuit site is located on a small island whereas the Late Dorset site is found on the Greenland mainland, factors that likely played a role in the disparity between the Late Dorset and Thule Inuit archaeofaunas in this region. While it is possible arctic fox were more common in Inglefield Land than on Skraeling Island, which potentially impacted their higher frequency in the Late Dorset faunal assemblage, additional Thule Inuit sites in Inglefield Land also exhibit low frequencies of arctic fox (Darwent and Foin 2010; Johansen 2012). This suggests the distribution of fox in the Smith Sound study assemblages may not result from environmental differences within the region. It is particularly interesting that in Inglefield Land arctic foxes with blue coats are more frequent than those with white coats (Freuchen and Salomonsen 1958; Vaughan 1991; Vibe 1981), but are quite rare across the majority of the eastern Arctic (Sage and Danks 1986). Although it is not possible to determine the coat colour of foxes from their skeletal morphology, if they were blue, their rarity may have served as an extra incentive to acquire as many as possible, perhaps to trade with groups in other regions. Regardless, the low meat yield of fox suggests small seal and perhaps walrus were likely the primary food resources of the Late Dorset who occupied the Smith Sound study site.

Ringed seal is the only small seal species identified in the Iqaluktuuq assemblages. The prevalence of ringed seal and the rarity of other small seal species in the Grinnell Peninsula region also suggest ringed seal largely formed the small seal category for this area. In both these regions, bearded seal is the only large seal species identified. Seal species diversity is greatest in the Smith Sound assemblages, where ringed seal, low frequencies of harbour seal and harp seal, and at least one grey seal, were also identified. The presence of these species at the Smith Sound sites is likely due to the highly productive North Water Polynya, which borders both sites (Barber and Massom 2007).

Although walrus bones are not prevalent in any of the regions, they are most significant at the Smith Sound sites where they form 7% of the identified mammal in the Late Dorset assemblage and 7.4% in the Thule Inuit assemblage (Table 10.1; Figure 10.5). In the

Grinnell Peninsula archaeofaunas walrus bones account for less than 2% of the identified mammal bones from both sites, and they are absent at Iqaluktuuq. The distribution of walrus in the archaeofaunas may be explained by the makeup of each region's local ecosystem. Walrus are not known to visit Wellington Bay or the Queen Maud Gulf, the coastal areas closest to Iqaluktuuq (Riewe 1992), but they are abundant in the Smith Sound region where the year-round walrus population is the third greatest concentration of walruses in Canada (Born et al. 1995). In the Grinnell Peninsula region, walrus are known to occupy the polynya systems located approximately 30 km west and south of the study sites throughout the year (Kiliaan and Stirling 1978; Stirling et al. 1983), however they are poorly represented in the archaeofaunas from these sites. Terrestrial haul-out sites are not found in the Grinnell Peninsula vicinity, and the closest are located along the southwest coast of Devon Island or on the eastern central portion of Bathurst Island (Born et al. 1995); but today's distribution suggests walrus could have been hunted at the ice edge during the winter or during the summer by boat. The fact that walrus are infrequent in the Grinnell Peninsula study assemblages, and are similarly rare at additional Thule Inuit sites and Dorset sites in the region (McGhee 1981b; Park 1989) suggests that the density of walrus was low in this region, and therefore they were never the focus of local subsistence practices.

Muskox bones and arctic hare bones are generally infrequent in the study assemblages, forming less than 2% of the identified mammal from the Iqaluktuuq and Grinnell Peninsula sites, and from the Thule Inuit site in the Smith Sound region. In the Late Dorset archaeofaunas from Smith Sound, however, muskox bones comprise 8.8% of the identified mammal specimens and arctic hare contribute 6.2%. It may be that muskox and arctic hare are more abundant in this area in comparison to the other study regions. As mentioned earlier, the terrestrial ecosystem of Inglefield Land was possibly quite different than that of Skraeling Island, and therefore contributed to the variation within this study region, however, there are several possible explanations. Darwent (2001) has noted that in higher latitude Arctic regions, where caribou tends to be less frequent, Dorset acquire higher frequencies of small furbearers such as arctic fox. Of the Late Dorset study assemblages, that from the Smith Sound region has the lowest frequency of caribou bones, accounting for just 1.1% of the identified mammal bones, while arctic fox bones are most frequent and account for 53.4%. Historically, caribou populations fluctuated dramatically in this region (Roby and Thing 1985). Thus, if caribou populations were low when the site was occupied it could explain the higher frequencies of muskox and arctic hare in addition to arctic fox at the site, because these alternative sources of fur may have been necessary for clothing production, in addition to these species' contributions to subsistence. Accordingly, the higher frequencies of these furbearers likely reflect how Late Dorset adapted to low caribou populations.

In comparison, caribou, arctic fox, arctic hare, and muskox were all infrequent in the Thule Inuit study assemblage from Smith Sound. Specimens identified as dog/wolf, however, account for 10.2% of the identified mammal. It is possible that these animals provided some of the fur needed for the winter months (Howse 2013). It is also noteworthy that although arctic fox bones were infrequent in the study assemblages, higher frequencies were found in three previously analyzed house assemblages from the Skraeling Island site, also winter occupations, where they comprised 67.2% (H20), 30.9% (H21), and 49.1% (H22) of the identified mammal bones (McCullough 1989:266). Radiocarbon dates are available for H21 and H22 and fall within the same time frame, somewhere between the 12th and 15th centuries, as those obtained from the houses sampled for the present analysis (see also Chapter 9; McCullough 1989:241)[1]. Thus, it is possible some of the houses were occupied simultaneously. While it is impossible to say for certain, if they were occupied contemporaneously, the task of acquiring arctic fox fur for clothing may have been delegated to specific households, such as H20, H21 and H22. Similarly, in the Grinnell Peninsula region, although arctic fox bones comprise a small proportion of the identified mammal in the Thule Inuit assemblage analyzed for this research (1.9%), assemblages from the nearby winter sites analyzed by Park (1989) have a much greater proportion of arctic fox bones (RbJr-1:15.9%; RbJr-4 6.3%; RbJr-5: 5%), more similar to that found in the Late Dorset study assemblage from the region. It is possible that seasonal differences between the Thule Inuit sites in Grinnell Peninsula region have contributed to the varied distribution of fox remains, since the study site likely represents a late spring/summer occupation whereas those analyzed by Park (1989) are winter occupations. However, at RbJq-5, another Thule Inuit 'warm weather' occupation located on Porden Point (Allison 1984), arctic fox bones comprise 7.6% of the mammal specimens (Howse unpublished data). Thus, because this variation is found at sites that were likely occupied during the same season(s), it would seem that seasonality differences are not the primary influencing factors. Regardless, because acquiring furs is essential to Arctic lifeways, it is plausible that these alternative furbearers

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[1] Radiocarbon dates from both H21 and H22, at the Skraeling Island site, were based on samples of heather. That from H21 yielded a date of 630 ±60 BP, which calibrates to 1275-1415 CE at 2 sigma; the sample from H22 yielded a date of 790 ±50 BP, which calibrates to 1154-1292 CE at 2 sigma (McCullough 1989:241). Both dates were corrected for C13/C12 ratios and calibrated with the program CALIB 7.1.

were relied upon more heavily for their fur in these regions due to unstable caribou populations.

Polar bear is generally infrequent in all the study assemblages, and is most abundant in the Thule Inuit archaeofaunas from Smith Sound, where it forms 2.5% of the identified mammal. The low frequencies of polar bear suggest this species was not a significant resource for either group in any of the study regions. Interestingly, while polar bear are rare in the region, polar bear specimens, including a complete skull, were identified in the Iqaluktuuq Late Dorset archaeofaunas (Banfield 1974). It is possible the specimens represent a lone polar bear that wandered into the region, which has occurred in recent history (see Riewe 1992). It is perhaps, however, just as likely the animal parts were brought to the site from outside Iqaluktuuq, which would suggest the animal held some sort of symbolic value. Furthermore, although polar bear specimens were not frequent in the Grinnell Peninsula region, the Late Dorset Hornby Head site did include several complete polar bear skulls on various beach ridges (Park 2001; see Chapter 8, Figure 8.2). While there is no direct evidence their placement resulted from human actions it is perhaps the most logical explanation. The prominence of Late Dorset bear carvings throughout the eastern Arctic, and the diversity of their forms (Hardenberg 2013) have led researchers to suggest an important relationship between polar bears and Dorset people (e.g. Betts et al. 2015). Thus, despite their infrequent occurrence in eastern Arctic archaeofaunas (see Cox and Spiess 1980; Damkjar 2000; Darwent 2001; Darwent 2003; Darwent and Foin 2010; Desjardins 2013; Desrosiers 2009; Friesen 2004b; Friesen 2007a; Gotfredsen and Møbjerg 2004; Hodgetts et al. 2003; Hodgetts 2005a; Hodgetts 2005b; Howse 2008; Jordan 1980; Mathiassen 1927a; McCullough 1989; Meldgaard 2004; Milne et al. 2012; Park 1989; Sabo 1981; Spiess 1978; Taylor 1972; Thompson 2011; Whitridge 1992), including the study assemblages discussed here, the presence of polar bear specimens in the Late Dorset assemblage from Iqaluktuuq, as well as the polar bear skulls distributed across the beach ridges at Hornby Head suggests the bones of these animals were perhaps treated in a special manner, further supporting the idea that polar bears were an important part of Late Dorset society and worldview (see Betts et al. 2015).

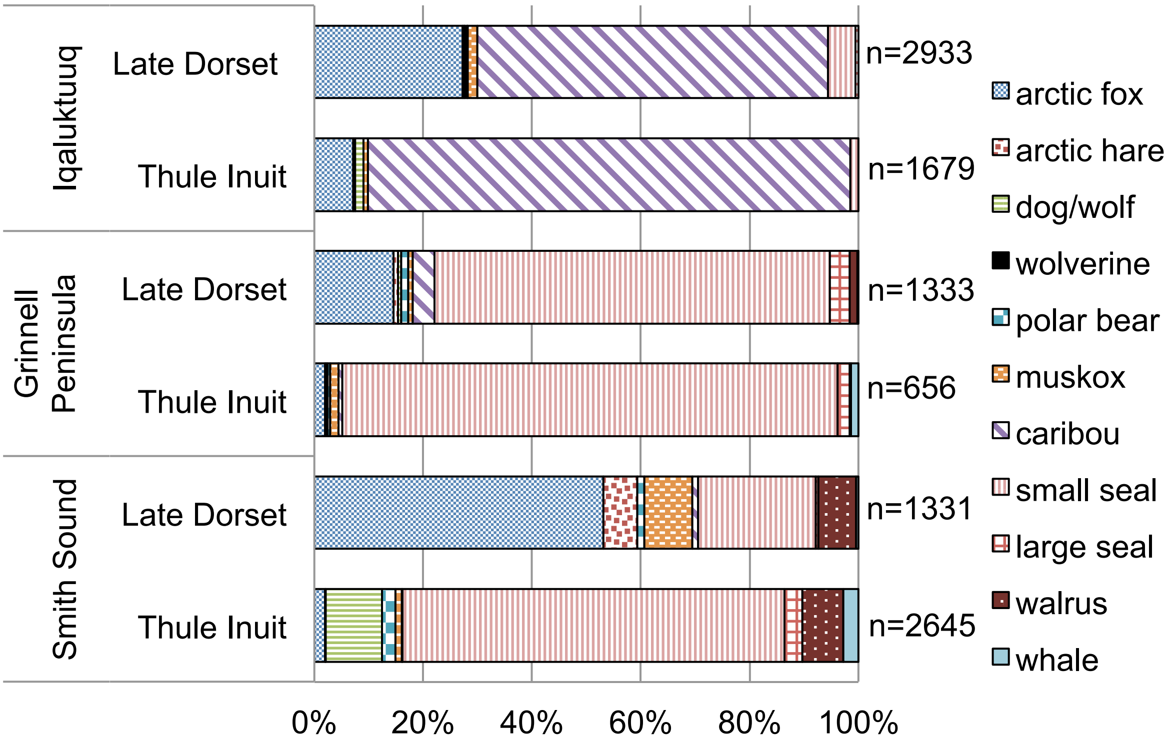

Figure 10.10 Distribution of mammal species in the study assemblages expressed as %NISP.

10.3.2 Element Distributions

There is no apparent pattern within or between regions to the distribution of elements amongst the study assemblages. At Iqaluktuuq, the Late Dorset and Thule Inuit archaeofaunas had similar caribou element distributions. Caribou element distribution and bone density are positively and moderately significantly correlated, suggesting they were impacted, to some degree, by taphonomic factors, and all features had negative but significant relationships with the meat-drying index (see Appendix A), possibly suggesting that caribou was dried at the site but then transported elsewhere for consumption. The distribution of *Salvelinus* specimens is somewhat variable between the Late Dorset and Thule Inuit contexts, and while patterns in the Late Dorset assemblage appear to relate to fish processing activities no patterns were found in their distribution in the Thule Inuit assemblage.

At the Grinnell Peninsula and Smith Sound sites, small seal element distribution is variable amongst the assemblages. In all samples, however, there is no relationship between bone density and the distribution of small seal elements (see Appendix B and C), and food utility was also not a factor in the distribution of small seal elements, with the possible exception of the Thule Inuit H14/16 midden sample from Skraeling Island, where a slight positive relationship was found (see Appendix C). The distribution of small seal bones in the midden features from both the Smith Sound Late Dorset and Thule Inuit sites and the Late Dorset feature, H3, from the Grinnell Peninsula are correlated with the preference-ranking index for small seals (Appendix B and C). Explaining these correlations, however, is not straightforward and they are possibly related to butchery practices, and cleaning practices, storage activities; and at the Thule Inuit site dog feeding practices may have had a role (see Chapter 8 section 8.3.2.3.1 and Chapter 9 sections 9.3.2.2.2 and 9.4.2.3.1).

10.3.3 Summary of Regional Patterns

Clearly, the differences between the regional ecosystems have influenced local subsistence strategies and archaeofaunas. Fish and caribou were the primary food resources at Iqaluktuuq, where these species are most abundant; but they are absent, or infrequent, in the Grinnell Peninsula and Smith Sound archaeofaunas, where sea mammals are more prevalent. Similarly, the presence of various auk species in the Grinnell Peninsula and Smith Sound archaeofaunas and absence in the Iqaluktuuq assemblages also reflects the geographic distribution of these species. Furthermore, the local ecosystems and resource structure undoubtedly influenced the greater diversity of small seal species and the relatively higher frequencies of walrus specimens that were found in the Smith Sound archaeofaunas, in addition to the low frequencies of walrus specimens in the Iqaluktuuq and Grinnell Peninsula archaeofaunas. This greater understanding of how environmental differences amongst the regions impacted the archaeofaunas now provides a baseline from which to compare how Late Dorset and Thule Inuit subsistence differed in relation to cultural factors, specifically hunting technologies.

10.4 The impact of disparate hunting technologies on the archaeofaunas

With the effects of any taphonomic and environmental differences accounted for, and the regional similarities in the archaeofaunas and the potential impact of seasonality highlighted, the remaining part of this chapter addresses the central question of this research: *what are the effects of hunting technologies on the zooarchaeological record?*

10.4.1 Patterns and Zooarchaeological Results

Disparities in Late Dorset and Thule Inuit hunting technologies, as they relate to Thule Inuit use of boats, the dog-pulled sled, the bow and arrow, harpoon float technologies, the throwing harpoon, whale hunting technologies, and more efficient fishing and bird hunting technologies, are expected to result in different Late Dorset and Thule Inuit archaeofaunas (see Chapter 6). These differences in hunting technologies, the behaviour of prey species, and previous research focused on the impact of technologies on subsistence practices, have been used to predict twelve zooarchaeological correlates. These expectations and the results of the analyses are presented in the table below and discussed in the following section.

Table 10.9 Predicted zooarchaeological correlates and results of the zooarchaeological analyses.

	Iqaluktuuq	**Grinnell Peninsula**	**Smith Sound**
Technological Factor A: Thule Inuit used dog traction; Late Dorset did not.			
Expectation#1 At Late Dorset campsites high food utility elements are expected to be most abundant. Thule Inuit contexts should feature high and low utility elements in more equal ratios.	X	X	X
Expectation#2 Late Dorset archaeofaunas should reflect lower frequencies of species not abundant or available in the local environment, which is here considered the area within a 20 km radius of the study sites; in comparison, the Thule Inuit archaeofaunas should have larger proportions of species not available or abundant in the local environment.	X	X	X
Technological Factor B: Thule Inuit used harpoon float technology, detachable harpoon foreshafts, and boats, but Late Dorset lacked float technology, detachable foreshafts are uncommon, and evidence of boat use is rare.			
Expectation#3 The Late Dorset faunal assemblages are expected to have a lower proportion of seals in comparison to the Thule Inuit assemblages	X	✔	✔
Expectation#4 A higher frequency of yearlings is expected in the Late Dorset faunal assemblages. Adult specimens, however, should be more frequent in the Thule Inuit archaeofaunas.	?	✔	✔
Technological Factor C: Thule Inuit used whale-hunting technologies (e.g., *umiaks*, large harpoon heads), however Late Dorset did not.			
Expectation#5 Whalebones are expected to be rare on Late Dorset sites. At Thule Inuit sites, especially in coastal locations, whale elements should be frequent.	--	✔	✔
Expectation#6 In locations where bowhead hunting was prominent, Thule Inuit archaeofaunas are expected to have lower taxonomic richness, and a less even distribution of species. Late Dorset archaeofaunas should have a higher taxonomic richness, and higher frequencies of non-focal species, resulting in a more generalized economy or a more even distribution of animal species.	--	✔	✔
Technological Factor D: Thule Inuit used the bow and arrow, but Late Dorset used spears and lances to hunt caribou			
Expectation#7 Higher proportions of caribou are expected to be found in the Thule Inuit archaeofaunas in comparison to the Late Dorset archaeofaunas.	✔	X	X
Expectation#8 Late Dorset archaeofaunas are expected to more evenly include males and females and include higher frequencies of young individuals. Thule Inuit archaeofaunas should exhibit caribou age and sex profiles reflecting a higher frequency of adult males.	✔	?	?
Technological Factor E: Though both Thule Inuit and Late Dorset likely used weirs to capture fish, fishing technologies used by Thule Inuit were generally more specialized, and include *kakivaks* (leisters), fish lures, hooks, and occasionally small harpoon heads; however Late Dorset people primarily used fish spears and possibly small harpoon heads			
Expectation#9 In locations where whales were not prominent and therefore whaling activities did not overlap with large fish runs, Thule Inuit archaeofaunas are expected to yield higher frequencies of fish in comparison to Late Dorset archaeofaunas	✔	--	--
Expectation#10 Thule Inuit archaeofaunas are expected to have a greater richness of fish species in comparison to Late Dorset.	✔	?	?
Technological Factor F: Thule Inuit used specialized bird hunting equipment, including bolas, hooked sticks, and bird spears, that are not found on Late Dorset sites.			
Expectation#11 When archaeofaunas represent spring and summer occupations, Thule Inuit assemblages are expected to have a higher proportion of bird remains in comparison to the Late Dorset assemblages	X	✔	--
Expectation#12 Thule Inuit archaefaunas are expected to have a greater richness of bird species in comparison to Late Dorset.	X	✔	X

--=sample is not applicable
?=sample size not adequate
✔=expectation met
X=expectation not met

Technological Factor A: Thule Inuit used dog traction; Late Dorset did not.

Expectation #1 At Late Dorset campsites high food utility elements are expected to be most abundant. Thule Inuit contexts should feature high and low utility elements in more equal ratios.

The results of the faunal analyses of the Late Dorset assemblages did not meet this expectation, as high and low food utility elements were found at Late Dorset sites and were of similar abundance throughout the Late Dorset and Thule Inuit archaeofaunas. Thus, it appears that the lack of dogs in Late Dorset society did not greatly impact how these animals were butchered at the kill site and transported. This may be because in all three study regions prey was primarily acquired close to camp; thus the more efficient Thule Inuit transport technology was not overly advantageous in transporting prey from the kill location to base camp. In the Thule Inuit faunal assemblages, as expected, the primary resources were represented by low and high food utility elements.

Expectation #2 Late Dorset archaeofaunas should reflect lower frequencies of species not abundant or available in the local environment, which is here considered the area within a 20 km radius of the study sites; in comparison, the Thule Inuit archaeofaunas should have larger proportions of species not available or abundant in the local environment.

This expectation was also not met in the study regions. Instead, Late Dorset had higher frequencies of species not abundant or not available locally, or within a 20 km radius from site. At Iqaluktuuq, the coast of Wellington Bay is located approximately 3 km from the Bell site, however marine mammals are uncommon and historically Inuit preferred to hunt seals at Cambridge Bay, approximately 60 km south of the site (Taylor 1972). In the Late Dorset archaeofaunas from Iqaluktuuq, seal bones were over three times as frequent than in the Thule Inuit archaeofaunas (5.1% vs. 1.5%). In both the Grinnell Peninsula and Smith Sound regions where marine resources are plentiful and large terrestrial mammals such as caribou are also uncommon, Late Dorset acquired higher frequencies of large terrestrial mammals. In these regions, caribou bones are generally infrequent, however they are five times more frequent in the Grinnell Peninsula Late Dorset assemblage in comparison to the corresponding Thule Inuit assemblage (4% vs. 0.8%, and eleven times more frequent in the Smith Sound Dorset assemblage (1.1% vs. 0.1%). This possibly suggests Late Dorset travelled more than Thule Inuit outside their local area to acquire these resources; or, that Late Dorset brought with them more food caught outside the local region when they initially arrived, in comparison to Thule Inuit who would appear to have brought with them a lower frequency of food from elsewhere. It is perhaps just as likely that Late Dorset more intensely hunted all species found in their local environment including those that were only occasionally found.

Technological Factor B: Thule Inuit used harpoon float technology, detachable harpoon foreshafts and boats, but Late Dorset lacked float technology, detachable foreshafts are uncommon, and evidence of boat use is rare.

Expectation #3 The Late Dorset faunal assemblages are expected to have a lower proportion of seals in comparison to the Thule Inuit assemblages.

In the Grinnell Peninsula and Smith Sound region, this prediction was met and Thule Inuit consistently acquired higher frequencies of seal in comparison to Late Dorset (Table 10.3). This expectation, however, was not met in the Iqaluktuuq samples where seals are uncommon.

Expectation #4 Because the spring hunt was particularly important to Late Dorset, a higher frequency of yearlings is expected in the Late Dorset faunal assemblages. Adult specimens, however, should be more frequent in the Thule Inuit archaeofaunas.

The frequencies of seals at the Iqaluktuuq sites were too small to adequately address this expectation, but at the Grinnell Peninsula and Smith Sound sites this expectation was met. In both regions, epiphyseal fusion data and ringed seal femur measurements suggest Late Dorset captured a higher frequency of yearlings and young seals (Table 10.2), and it appears Thule Inuit focused their efforts on adults.

Technological Factor C: Thule Inuit used whale-hunting technologies (e.g., *umiaks*, large harpoon heads), however Late Dorset did not.

Expectation #5 Whalebones are expected to be rare on Late Dorset sites. At Thule Inuit sites, especially in coastal locations, whale elements should be frequent.

Whale was absent from the Iqaluktuuq faunal assemblages, however the Grinnell Peninsula and Smith Sound faunal assemblages both met this expectation. The analyzed archaeofaunas from these regions all had low frequencies of whalebones, however they were consistently more frequent (Table 10.3) in the Thule Inuit archaeofaunas in comparison to the Late Dorset archaeofaunas.

Expectation #6 In locations where bowhead hunting was prominent, Thule Inuit archaeofaunas are expected to have lower taxonomic richness, and a less even distribution of species. Late Dorset archaeofaunas should have a higher taxonomic richness, and higher frequencies of non-focal species, resulting in a more generalized economy or a more even distribution of animal species.

This expectation was met in the Smith Sound region, but somewhat differed at the Grinnell Peninsula sites. In the Smith Sound region, Late Dorset had greater species richness in comparison to Thule Inuit, and acquired dovekie and black guillemot, both species not found in the Thule Inuit archaeofaunas (Table 10.3 and 10.10). The Smith Sound Late Dorset assemblage was also slightly more even than the Thule Inuit assemblage, which was less even and more strongly dominated by seal. However, because the two bird species unique to the Late Dorset archaeofaunas are both warm season migrants, and because they are far more plentiful near the Late Dorset site than they are near the Thule Inuit site, the greater taxonomic richness found in the Late Dorset archaeofaunas is most likely not the result of differences in hunting technologies, but rather it is probably a product of seasonality and differences in the local ecosystems. Comparatively, overall taxonomic richness was greater in the Grinnell Peninsula Thule Inuit assemblage, as Thule Inuit acquired several bird species not found in the corresponding Late Dorset assemblage, including murre species, loon, and shorebird. Measures of evenness indicate, however, that the Late Dorset assemblage was slightly more even, although it was more strongly dominated by the focal resource in comparison to the Thule Inuit assemblage. When mammal species alone are considered, the Grinnell Peninsula archaeofaunas exhibit similar taxonomic richness (NTAXA=10), but again the Late Dorset sample is more even, and the Thule Inuit sample is more strongly dominated by the focal resource (see Chapter 8, Table 8.8).

Table 10.10 Taxonomic richness and taxonomic evenness of species at the study sites.

Diversity measure	Iqaluktuuq		Grinnell Peninsula		Smith Sound	
	Late Dorset	Thule Inuit	Late Dorset	Thule Inuit	Late Dorset	Thule Inuit
Taxonomic richness	21	15	14	17	17	14
Shannon index of heterogeneity	1.325	1.096	1.107	1.247	1.798	1.253
Shannon index of evenness	0.179	0.199	0.216	0.205	0.355	0.250
The reciprocal of Simpsons index	0.592	0.439	0.469	0.550	0.738	0.519

Technological Factor D: Thule Inuit used the bow and arrow, but Late Dorset used spears and lances to hunt large terrestrial mammals.

Expectation #7 Higher proportions of caribou are expected to be found in the Thule Inuit archaeofaunas in comparison to the Late Dorset archaeofaunas.

At Iqaluktuuq, while the Late Dorset and Thule Inuit contexts suggest some variation in seasonality, both groups inhabited the site during the fall when the large caribou migration travels through the region, and thus both groups had access to the full caribou population. Despite this, as predicted the Thule Inuit archaeofaunas did have higher frequencies of caribou (88.7% of the identified mammal) in comparison to the Late Dorset archaeofaunas (64.3% of the identified mammal). In the Grinnell Peninsula and Smith Sound samples, however, the frequencies of caribou bones were not as predicted. In both the Grinnell Peninsula and Smith Sound regions, caribou are uncommon near the study sites throughout the year, thus differences in seasonality do not appear to have caused the identified pattern where caribou bones were more frequent in the Late Dorset assemblages than in the Thule Inuit assemblages. Instead, this pattern may reflect overall differences between Late Dorset and Thule Inuit hunting strategies, and is examined further in the following section (Table 10.1).

Expectation #8 Late Dorset archaeofaunas are expected to more evenly include males and females and higher frequencies of young individuals. Thule Inuit archaeofaunas should exhibit caribou age and sex profiles reflecting a higher frequency of adult males.

Data were not sufficient to determine sex profiles in any of the study regions or caribou age at death estimates for the Grinnell Peninsula or Smith Sound archaeofaunas. At Iqaluktuuq, however, epiphyseal fusion sequences suggest Late Dorset acquired a higher frequency of younger individuals. In the Late Dorset assemblage, there were a minimum of five calves killed between two and six months of age, and another four were killed between four and ten months of age. In total, 46% (n=121) of the caribou bones that could be assessed for epiphyseal fusion represent individuals younger than four and a half years of age; and, calves younger than 18 months represent 21.3% (n=56) of the specimens assessed (n=263). In comparison, the Thule Inuit archaeofaunas included a minimum of two calves killed between two and six months of age. When the overall fusion data is assessed 32% (n=49) of the sample (n=153) represents individuals younger than four and a half years, and only 12.4% (n=19) came from individuals younger than 18 months. Taken together, the data suggest that Late Dorset acquired higher frequencies of immature individuals and Thule Inuit acquired higher frequencies of adults.

Technological Factor E: Though both Thule Inuit and Late Dorset likely used weirs to capture fish, fishing technologies used by Thule Inuit were generally more specialized, and include *kakivaks* (leisters), fish lures, hooks, and occasionally small harpoon heads but Late Dorset people primarily used fish spears and possibly small harpoon heads (Maxwell 1985; Whitridge 2001).

Expectation #9 In locations where whales were not prominent and therefore whaling activities did not overlap with large fish runs, Thule Inuit archaeofaunas are expected to yield higher frequencies of fish in comparison to Late Dorset archaeofaunas (Maxwell 1985).

In the Grinnell Peninsula and Smith Sound archaeofaunas fish bones are rare and whales are abundant, therefore these assertions could not be tested. At Iqaluktuuq, however, the expectation was met. Fish bone comprised 35.7% of the Late Dorset archaeofaunas and 46.2% of the Thule Inuit archaeofaunas. It is possible that seasonality has played a role in this distribution, particularly if Thule Inuit were actively fishing throughout the winter and Late Dorset were not.

Expectation #10 Thule Inuit archaeofaunas are expected to have a greater richness of fish species in comparison to Late Dorset.

While both assemblages from Iqaluktuuq were primarily dominated by arctic char and lake trout, the Thule Inuit archaeofaunas also included few sculpin bones.

Technological Factor F: Thule Inuit used specialized bird hunting equipment, including bolas, hooked sticks, and bird spears, that are not found on Late Dorset sites.

Expectation #11 When archaeofaunas represent spring and summer occupations, Thule Inuit assemblages are expected to have a higher proportion of bird remains in comparison to the Late Dorset assemblages that are expected to exhibit a lower proportion of bird remains.

In the Grinnell Peninsula archaeofaunas Thule Inuit acquired a higher proportion of bird, however the Iqaluktuuq and Smith Sound samples displayed the opposite scenario (Table 10.1). In both these regions, the Late Dorset faunal samples had greater frequencies of bird. At the Grinnell Peninsula study sites, bird remains represent 2.2% of the identified fauna from the Late Dorset site, and 34.7% of the identified fauna from the Thule Inuit assemblage. Bird specimens were generally low in the Iqaluktuuq assemblages, forming 4% of the Late Dorset fauna, and 2.6% of the Thule Inuit faunal samples. At the Smith Sound sites, bird comprised 16.5% of the identified fauna of the Late Dorset samples, and 2% of the Thule Inuit samples, however, because the Smith Sound Thule Inuit site is likely a winter occupation the results in this region do not necessarily contradict the prediction.

Expectation #12 Thule Inuit archaeofaunas are expected to have a greater richness of bird species in comparison to Late Dorset.

This prediction was not met at Iqaluktuuq, where the Late Dorset sample included a greater variety of bird species, including jaegers, *Larus* species, and sandhill crane. The Smith Sound samples also did not fit with the prediction, where Late Dorset acquired several species including dovekies that were not found in the Thule Inuit sample. This expectation, however, was met in the Grinnell Peninsula samples, where Thule Inuit acquired a variety of bird species not found in the Late Dorset sample, including murre, loon, and shorebird.

10.4.2 Discussion: The impacts of hunting technologies on Late Dorset and Thule Inuit archaeofaunas

This assessment of the expectations suggest Late Dorset and Thule Inuit hunting technologies impacted their respective archaeofaunas in a number of ways. They do not appear, however, to impact the ratios of high and low food utility elements that are brought back to site (Expectation#1). As previously mentioned, the similar distribution in utility elements in the samples may reflect the close distance between the kill sites and campsites. The results of the analyses also did not meet Expectation#2, since higher frequencies of species not available or abundant in the respective study regions were consistently found in the Late Dorset archaeofaunas. This pattern, however, may indirectly reflect disparities in Thule Inuit and Late Dorset hunting technologies, specifically the lack of the bow and arrow and open water hunting technologies in the Late Dorset tool kit. While it is possible that the higher proportion of seal remains in the Late Dorset archaeofaunas from Iqaluktuuq, and the higher frequencies of caribou remains in the Late Dorset archaeofaunas from the Grinnell Peninsula and the Smith Sound regions indicate Late Dorset made more hunting trips away from camp to acquire these resources that are not readily available or abundant in the local region, Late Dorset may have brought these items with them when they initially arrived at the site from elsewhere. Alternatively, this pattern may indicate Late Dorset were more intensely harvesting all resources in their local environment and spent more time acquiring species that were not commonly found, in comparison to Thule Inuit who appear to have focused their efforts on the most abundant resources. In any case, food from uncommon resources or those captured from elsewhere is more common at the Late Dorset sites and perhaps reflects a greater risk of acquiring food in comparison to Thule Inuit, who with their specialized technologies may have more easily captured food when needed. While it is impossible to say for certain which factor was the cause, the results highlight an important pattern of higher frequencies of non-locally available or abundant resources in the Late Dorset archaeofaunas that may reflect differences in the provisioning of food between the two societies.

In the Grinnell Peninsula and Smith Sound regions, the use of float technologies and harpoons with detachable foreshafts, and their absence or rarity, respectively, on Late Dorset sites appears to have influenced their seal harvests. In these regions, as expected, Thule Inuit acquired much higher frequencies of seals. While seals were more frequent in the Late Dorset samples in comparison to the Thule Inuit samples from Iqaluktuuq, this likely does not reflect the proportion of seals captured by both groups, since seals were not readily available in the region; and, again it perhaps is more of a reflection of differences in food provisioning, with Late Dorset initially bringing more seal with them to the site than Thule Inuit, with Late Dorset leaving the site more often to acquire resources elsewhere, or with Late Dorset spending more time trying to catch this locally uncommon resource. These technological differences also impacted the age at death profiles of seals in the archaeofaunas. The samples at Iqaluktuuq were too small to reliably evaluate age at death profiles, but in the Grinnell Peninsula region, where seasonality was generally similar between the groups, young seals were consistently more frequent in the Late Dorset archaeofaunas. A similar pattern was found in the Smith Sound region, though this may be influenced by slight differences in seasonality with the Late Dorset inhabiting their site for a longer period in the spring. Generally, however, the more specialized technologies used by Thule Inuit seem to have allowed them to target adult seals that yield a larger amount of blubber and meat, and thus reflect a greater return for their effort.

The lack of whale hunting technologies in the Late Dorset toolkit and their use by Thule Inuit had perhaps the most obvious impact on the archaeofaunas. Whale specimens were not altogether absent from the Late Dorset samples, however, in the Grinnell Peninsula and Smith Sound region assemblages, where they are present, they are consistently higher in the Thule Inuit samples. The few whale specimens on the Late Dorset sites were most likely scavenged from beached carcasses. Disparities in this technological factor also influenced species richness and evenness in the assemblages, although its impact somewhat varies. At the Smith Sound sites, as expected the Late Dorset archaeofaunas had a higher taxonomic richness and evenness, and the Thule Inuit archaeofaunas were more strongly dominated by seal. In the Grinnell Peninsula region, unexpectedly Thule Inuit had a slightly higher taxonomic richness than Late Dorset, but overall the Late Dorset assemblages have a more even distribution of species. The species found in the Thule Inuit assemblage and not in the Late Dorset assemblage, however, were all sea birds and may have been taken from boats while Thule Inuit were hunting whales at sea. Regardless, Thule Inuit still exhibit a more focal economy than Late Dorset, since the majority of their assemblage comprised few resources. Even at Iqaluktuuq, where whale hunting was not the centre of Thule Inuit hunting activities, they still appear to have focused their efforts on a few key resources, caribou and fish, in comparison to Late Dorset who took higher frequencies of lower ranked species such as arctic fox and bird.

The use of the bow and arrow by Thule Inuit and their absence on Late Dorset sites appear to have impacted the frequencies of caribou harvested in the Iqaluktuuq region, where the Thule Inuit harvest of caribou was more productive. In both the Grinnell Peninsula and Smith Sound regions where caribou is not prevalent, however, caribou bones are more frequent in the Late Dorset assemblages. Similar to the higher frequency of seal in the Late Dorset assemblage from Iqaluktuuq, this again may have more to do with food provisioning as opposed to hunting technology. Additionally, since caribou was not the focal resource in these regions it further suggests that Late Dorset were more dependent on non-focal resources than Thule Inuit. The age at death of caribou in the Iqaluktuuq samples also suggests the differences in large mammal hunting technologies impacted the archaeofaunas, since as expected younger individuals were more frequent in the Late Dorset assemblage and Thule Inuit appear to have primarily captured adult caribou that have a larger food yield. Insufficient data prevented the determination of sex profiles at all sites, thus it remains unclear whether or not the higher frequency of adult individuals in the Thule Inuit assemblage were primarily comprised of males.

The more specialized fishing technologies used by Thule Inuit also impacted the archaeofaunas in expected ways, at least at Iqaluktuuq, where their archaeofaunas include a much higher proportion of fish specimens and a slightly higher species diversity in comparison to the Late Dorset archaeofaunas. The higher frequency of lake trout in the Thule Inuit assemblage is perhaps also related to disparities in hunting technologies, since the use of leisters by Thule Inuit, as well as the use of line and hook would have allowed Thule Inuit to fish through the ice throughout the winter.

The impact of more specialized bird hunting equipment is less clear, and inconsistent across the assemblages. The Grinnell Peninsula Thule Inuit samples did have higher frequencies of bird as expected, and a higher diversity of bird species. At Iqaluktuuq, however, Late Dorset obtained a higher frequency of bird and a higher diversity of bird species. Within both these regions slight differences between the duration of each occupation has perhaps influenced the pattern since in the Grinnell Peninsular region Thule Inuit appear to have been present for a longer period during the summer as were Late Dorset at Iqaluktuuq, thus giving them a greater opportunity to capture more of these resources in their respective regions. Since the Smith Sound Thule Inuit site likely represents a winter occupation it was not used to test Expectation#11 that was based on spring/summer hunting activities. The Smith Sound Thule Inuit sample did not, however, have a greater diversity of bird species. Although it is perhaps a circular argument, if the greater frequency and diversity of bird in the Thule Inuit assemblage from the Grinnell Peninsula is in fact primarily the result of Thule Inuit hunting from boats at sea during the summer, as opposed to these birds having been specifically targeted, than it would appear that bird hunting equipment itself did not have a direct impact on the frequency or diversity of bird in the assemblage, but rather the pattern is more reflective of differences in open water hunting technologies.

Of the twelve expected zooarchaeological patterns, two expectations were not met at all, and an additional four were not met in at least one of the study regions; while ten expectations were met in at least one of the study regions. As detailed above, it appears that in general the more specialized hunting technologies, excluding bird hunting technologies, used by Thule Inuit and the more generalized tools used by Late Dorset directly influenced their hunting strategies, specifically impacting how important various species were to their diet.

10.4.3 Other Cultural Trends

There are few trends in the archaeofaunas that are not directly linked to differences in hunting technologies, regional ecosystems, or season(s) of site occupation. However, these trends may indicate different categories of cultural differences between Late Dorset and Thule Inuit.

The first trend relates to the distribution of arctic fox. In each study region, arctic fox was found in higher frequencies in the Late Dorset archaeofaunas in comparison to the Thule Inuit archaeofaunas. However, this pattern is not consistent throughout the Grinnell Peninsula and Smith Sound regions, where archaeofaunas from other occupations indicate Thule Inuit captured similar, and sometimes higher, frequencies of arctic fox in comparison to that captured by Late Dorset at the study sites (see McCullough 1989; Park 1989). Thus, the importance of arctic fox appears to have varied at Thule Inuit occupations, at least in these two regions. This pattern does not appear to be a product of seasonality, since the frequency of fox bones varies at sites that were occupied during a similar time of year (see section 10.3.2 for further details). In fact, in both the Grinnell Peninsula and Smith Sound regions the variation occurs at houses or sites that date to a similar time period. Therefore, the variable importance of arctic fox amongst, and even within, Thule Inuit sites (i.e., the Skraeling Island site), may suggest that fox hunting was a delegated task within Thule Inuit society. In comparison, arctic fox is consistently found in moderate to high frequencies in Late Dorset assemblages throughout the study regions (Darwent 2001; Darwent and Foin 2010). Therefore, it seems that while the majority of Late Dorset households undertook fox hunting it appears to have been a task undertaken by specific Thule Inuit households. A pattern that perhaps speaks to larger differences in the organization of hunting activities within Late Dorset and Thule Inuit society.

Another noteworthy finding is the high frequency of common raven at the Thule Inuit Smith Sound site. Common raven was identified at the Late Dorset site in the region, but formed 6.8%

of the identified bird specimens in comparison to the Thule Inuit assemblage where it comprised 82.4% of the very small bird sample. When the large number of dovekie specimens is excluded from the Late Dorset samples, common raven still only account for 10% of the identified bird, making common raven at least eight times as frequent at the Thule Inuit site. As discussed in Chapter 9, these birds are traditionally only eaten when other foods are scarce (Bennett and Rowley 2004), which does not appear to be the case at the site. Furthermore, there are no signs of processing and the majority of the skeletons were still articulated, which would presumably not be the case if they were captured by dogs or foxes (Howse 2013). While it cannot be ruled out that these birds died of natural causes, it is perhaps more plausible that these birds were conserved because of their symbolic value (see Chapter 9 for discussion). In Inuit mythology ravens figure prominently (Boas 1901; Nelson 1900; Rasmussen and Worster 1921), and ethnographic sources have described them as being used as amulets that figured importantly in whale hunting (Søby 1969/1970). Therefore, their high frequency in the Thule Inuit study assemblage from Smith Sound possibly reflects their position within Thule Inuit cosmology.

10.4.3 Conclusion

The data presented in this chapter demonstrate that the Late Dorset and Thule Inuit archaeofaunas differ in a number ways. The regional comparisons made in this chapter indicate that the local environment impacts several aspects including the focal resource for each group, and the relative frequencies of various other resources. However, various patterns in the archaeofaunas, including class distribution, age at death profiles, and species evenness, all appear to be culturally distinct. Therefore, I conclude that Late Dorset and Thule Inuit hunting technologies had clear impacts on their subsistence practices and archaeofaunas, and the impacts of variation between these technologies are identifiable.

Chapter 11
Conclusions

11.1 Introduction

The purpose of this chapter is to highlight key issues that arise from this dissertation. I provide concluding remarks and discuss what the results of my analyses can contribute to areas of inquiry in Arctic archaeology and, more broadly, hunter-gatherer research. First, I outline the strengths and weaknesses of the faunal data that form the basis of this dissertation. Second, I examine how the differences between human-animal interactions within Late Dorset and Thule Inuit societies influenced the trajectory of each society. Finally, I discuss what these differences may suggest about hunter-gatherer behaviour in general.

11.2 Strengths and Weakness of the Data

Although previous research, in addition to that presented in this dissertation (Chapter 10), has established that technologies impact subsistence practices, and these impacts can be identified in the zooarchaeological record (e.g., Ames 2002; Angelbeck and Cameron 2014), archaeofaunas are influenced by a number of factors and identifying the patterns that result from hunting technologies is not a straightforward process. Possible influencing factors include taphonomy, excavation method, climate, environment, and seasonality. Though some of these factors were discussed in Chapter 10, they are further considered in this section in order to fully understand the implications of the differences between the Late Dorset and Thule Inuit archaeofaunas.

Inherent in zooarchaeological research, and in archaeology as a discipline, are biases in study assemblages that result from site formation processes. Attempting to recreate the taphonomic histories of archaeofaunas helps to identify any patterns that may be caused by non-human behaviour (Lyman 2004; Schiffer 1983). It must be acknowledged, however, that the complete taphonomic history of an assemblage is never fully recoverable, and therefore interpretations and any inherent assumptions must be clearly outlined in order to establish their reliability and validity. Because this dissertation has included a discussion of broad-scale patterns, archaeofaunas with different taphonomic histories, excavated by a range of researchers using variable methods, were the focus of this research. In order to control for taphonomy, and equifinality in general, a multi-scalar approach to analyses was chosen. In this way, any biases, for instance the impact of density mediated attrition, could be assessed at the feature level, before interpretations were made at the intra-site, intra-regional, and inter-regional levels (Muir and Driver 2002). Thus, the causes of various observed patterns are more easily assessed. As a result, this approach, which considers biases at various scales, provides a more nuanced understanding of the impacts of various factors and allows confidence that interpretations are based on past human behaviour as opposed to natural formation processes.

As outlined in the previous chapter, generally, in each region taphonomic processes had a similar impact on the study assemblages with one exception – the impact of dog activities. The frequency of gnaw marks suggests dog activities consistently had a greater impact on the Thule Inuit archaeofaunas. While quantifying the impacts of dog activities is not straightforward, it is highly likely dogs impacted various categories of bones. As outlined, in Chapter 7, dogs likely removed large amounts of fish bones from the Thule Inuit archaeofaunas at Iqaluktuuq, and therefore have perhaps distorted the class frequencies from this region, which appear similar between the Late Dorset and Thule Inuit contexts. In all probability, the Thule Inuit at Iqaluktuuq acquired a greater proportion of fish than the archaeofaunas imply. Furthermore, dogs may have also significantly impacted the distribution of skeletal elements in the Thule Inuit archaeofaunas. In all regions, the skeletal element distributions of the most frequent resource are more variable in the Thule Inuit contexts than in the Late Dorset contexts. This is possibly, at least in part, related to dogs, which were likely fed various carcass parts, or scavenged the bones once they were discarded (see Friesen and Betts 2006). In regards to the distribution of skeletal elements, Expectation#1 proposed that in the Late Dorset archaeofaunas high utility elements would be more abundant in comparison to the Thule Inuit archaeofaunas that were expected to have a more even distribution of elements with both high and low food utility. This expectation was not met in any of the study regions, however it was not met by the samples from either group even though dogs would have had less of an impact on those recovered from the Late Dorset contexts. Thus, while dogs clearly had some impact on taxonomic frequencies and the distribution of skeletal elements, the variable impact of dog activities on the study assemblages does not appear to greatly obscure any patterns that may result from differences in hunting technologies at the study sites, or at the least those examined in this research.

As outlined in Chapter 2, all the archaeofaunas were excavated by trowel. The Iqaluktuuq samples were screened using a 1/8th inch (3 mm) mesh, however the samples from the Grinnell Peninsula and the Smith Sound region were not subject to screening. The lack of screening likely had the largest impact on the recovery of smaller taxa such as bird and fish, which are more easily missed during excavation (e.g., Partlow 2006; Zohar and Belmaker 2005). The distributions of bird bones amongst the regions do not appear to be related solely to screening, since higher portions of bird bones are found in the Grinnell Peninsula and Smith Sound archaeofaunas that were not screened. As seen in Chapter 10, however, the Iqaluktuuq assemblages exhibit a much greater proportion of fish bones in comparison to the Grinnell Peninsula and Smith Sound assemblages, where fish bones were either rare or absent in both the Late Dorset and Thule Inuit contexts. Therefore, it is possible that the lack of screening at the Grinnell Peninsula and Smith Sound study sites impacted the recovery of fish bones, and that at these sites both groups potentially captured higher frequencies of fish than is indicated by the study samples. However, it is not expected to have had a great impact on the overall importance of resources at these sites since fish are not abundant in either location, and in the Arctic the majority of economically important fish species are large and less likely to be missed during excavation (see Betts 2004). At Iqaluktuuq, fish bone frequencies were very high, comprising one third of the Late Dorset archaeofaunas and almost half of the Thule Inuit archaeofaunas; patterns that cannot be fully explained by screening methods or taphonomy. Instead, it is most probable that the Iqaluktuuq assemblages reflect the local resource structure and that fish was a major contributor to the diet at the site.

The distance between the study sites within the Smith Sound region posed another limitation for this research. As mentioned in Chapter 1, while both Late Dorset and Thule Inuit occupied many of the same sites and sites located in close proximity throughout the eastern Arctic, access to suitable faunal assemblages largely determined which assemblages were chosen for this research. As a result, the distance between the study assemblages varies from region to region. Undoubtedly the 60 km between the study sites within the Smith Sound region impacted the subsistence behaviours of the societies that once inhabited these sites and the faunal assemblages they produced (see Chapter 10). As a result, variations between the Late Dorset and Thule Inuit archaeofaunas from this region are partly related to environmental differences, making untangling those related to cultural practices more complicated. However, studies by other researchers in the Smith Sound region have provided additional faunal data (Darwent and Foin 2010; Johnston 2011, 2013; McCullough 1989), allowing for further comparisons that have helped clarify patterns that reflect cultural differences between the Late Dorset and Thule Inuit archaeofaunas. Thus, the distance between the Smith Sound sites has not completely undermined the usefulness of that region for the present study.

Climate is yet another factor that may have influenced variation amongst the study assemblages. Precise dates are not available in all the study regions. At Iqaluktuuq, there is some temporal variation between the Late Dorset and Thule Inuit occupations, with Late Dorset inhabiting the site sometime between the 11th and 14th centuries CE and Thule Inuit appearing later, sometime between the 15th and 16th centuries CE (Friesen pers. com.; Ryan 2009). Radiocarbon dates are not available for the Grinnell Peninsula sites, however artifact typology and house style suggest Late Dorset and Thule Inuit occupied the study sites sometime between the 10th and 15th centuries CE (Park 1989; Allison 1985). In the Smith Sound region, radiocarbon dates from muskox bone indicate Late Dorset were inhabiting the study site sometime during the 11th-12th centuries CE (Chapter 9; Appelt and Gulløv 1999), and those recovered from willow in the Thule Inuit contexts suggest they were present sometime during the 12th-14th centuries CE (Chapter 9; McCullough 1989: 241). Thus, available radiocarbon dates indicate only the Smith Sound region was possibly inhabited by Late Dorset and Thule Inuit during the same time period. While it is difficult to fully evaluate the impacts of climate variation, at Iqaluktuuq and the Grinnell Peninsula sites there is no clear indication that available resources differed between the Late Dorset and Thule Inuit occupations (see also Howse and Friesen, in press). Therefore, at this time climate is not considered to be a primary factor for variation found between the Late Dorset and Thule Inuit archaeofaunas within each region.

Seasonality is perhaps the most confounding factor when attempting to identify the impacts of hunting technologies on the archaeofaunas. In general, using faunal indicators to determine when a site is occupied is subject to various limitations. Animals can be stored and/or brought to a site from seasonal occupations elsewhere. Thus, seasonal characteristics provide evidence for when a resource died, not necessarily for when, or for how long, a site was occupied (Reitz and Wing 2008). Also, the absence of seasonal indicators does not mean a site was unoccupied during a certain period, since it could be a reflection of sample size, or of shifting hunting strategies (e.g., Burke 2000). Despite these limitations, when faunal indicators are used together with other aspects of a site, including architecture and site location, more reliable inferences of the season(s) during which a site was occupied are possible.

As outlined in Chapter 10, taxonomic richness in the study assemblages appears to be directly impacted by seasonality, in addition to regional environmental differences. For instance, a more generalized toolkit and scheduling conflicts were used to predict that Late Dorset archaeofaunas would have higher taxonomic richness in areas where whales were abundant, and results suggest this was true within the Smith Sound region (Expectation#6). However, in light of seasonality factors the implications of this result are not so simple. The two species, dovekie and black guillemot, found in the Late Dorset archaeofaunas and not in the Thule Inuit archaeofaunas are seasonally available resources. Because house style, the location of the site, and faunal indicators suggest the Late Dorset occupation likely represents a winter/spring and perhaps summer occupation but the Thule Inuit structures were winter occupations, the presence of these bird species in the Late Dorset archaeofaunas, resulting in greater species richness, is perhaps not the result of differences in hunting technologies. Rather, this pattern almost certainly reflects seasonality or regional differences between the sites, since these species are generally only found in the spring/summer and are not as abundant near the Thule Inuit site on Skraeling Island. This result appears to suggest a flaw with the expectation. While it was expected that differences in hunting technologies would generally result in Late Dorset having a greater taxonomic richness than Thule Inuit in areas where whales were abundant (Expectation #6), this does not appear to be accessible in the current archaeological record, or available faunal data. To clarify, unless archaeofaunas from both groups reflect sites that were inhabited for the exact same period of the year, differences in species richness that result from differences in hunting technologies cannot be fully assessed. Furthermore, Late Dorset and Thule Inuit were both semi-sedentary hunter-gatherers and no one assemblage is likely to show the full range of animals each group hunted throughout the year. This would imply that assessing the impact of hunting technologies on species richness might only be possible if archaeofaunas from occupations representing all seasons for a given region can be acquired. Regardless, this research suggests that the differences between Late Dorset and Thule Inuit hunting technologies, at least in part, resulted in each group occupying sites in the same regions for different durations. Therefore, it appears that hunting technologies directly influenced the seasonal rounds of each group, and how each group interacted with animals in the same or similar environments, which ultimately speaks to the complicated nature of human and animal interactions. This issue is further discussed in section 11.4.

Although the data presented and discussed in this research were not without weaknesses, they do not undermine the results of the analyses that indicate Late Dorset and Thule Inuit hunting technologies have impacted their respective archaeofaunas. In fact, they have afforded some advantages. For instance, although the distance and variation between the study sites in the Smith Sound region is not ideal since it does not eliminate environmental differences as a cause for variation between the archaeofaunas, published data have provided supplementary material on which to base inferences and also serve to strengthen interpretations (e.g., Darwent and Foin 2010); as a result, a better understanding of the subsistence practices of Late Dorset and Thule Inuit within a larger region has been afforded. Overall, although the samples were collected by various researchers using a variety of methods, because all the archaeofaunas were identified or re-analyzed by a single researcher, identification biases were greatly reduced, strengthening the reliability of the data collected. The primary strength of this research, however, is that it includes archaeofaunas from three separate regions, allowing human-animal interactions in Late Dorset and Thule Inuit societies to be assessed in variable environments. This has provided a more nuanced understanding of regional patterns and permitted broader interpretations to be made regarding the impacts of Late Dorset and Thule Inuit hunting technologies on their archaeofaunas, and ultimately how they interacted with animals in varying ways. Thus, in light of any weaknesses, it appears that the data discussed in this dissertation have proven useful as a means to evaluate the impacts of variable hunting technologies on subsistence practices.

11.3 Implications for Arctic Archaeology

By and large, the results of this research show that Late Dorset and Thule Inuit interacted with animals in different ways, providing further insight into why Thule Inuit were more successful in the long term. This is relevant to one of the central questions of Arctic archaeology today - why did Late Dorset disappear?

While none of the archaeofaunas analyzed in this dissertation represent terminal Late Dorset (see Chapter 4), the analyses of Late Dorset and Thule Inuit archaeofaunas from similar environments allow for a more detailed understanding of how their subsistence practices differed and which aspects may have impacted the fate of Late Dorset society. Most generally, both societies acquired a variety of resources, however the specialized Thule Inuit hunting technologies resulted in them capturing higher frequencies of locally abundant, or available, high-ranked resources. Late Dorset archaeofaunas, however, have a more even distribution of resources with higher frequencies of low-ranking mammals such as arctic fox. Ultimately, the lack of the bow and arrow, and absence of float technology and rarity of throwing harpoons and boats at Late Dorset sites, would suggest Late Dorset hunting practices were subject to several limitations that did not impact Thule Inuit hunting to the same degree. These limitations are largely related to the success of Late Dorset hunting activities being more heavily and specifically dependent upon additional factors, such as physiographic features. For instance, as discussed in Chapter 2, when spears are used to hunt large terrestrial mammals, such as caribou, they are generally used as dispatching tools, and the hunter is forced to use aids, including corrals, snow drifts, or bodies of water, in order to confine the prey, ambush it, or pursue them to get close enough to strike (see Churchill 1993; Angelbeck and Cameron 2014).

Thus, for Late Dorset hunting success was dependent upon two factors: the animals being present and terrain features to be suitable for capture (Churchill 1993).

Undoubtedly, physiographic features were also integral to Thule Inuit hunting practices and countless ethnographic sources attest to the importance of sea ice patterns, bathymetry, and the placement of rivers and lakes when hunting a variety of resources (e.g., Jenness 1922). However, the more specialized nature of their hunting technologies allowed for a greater flexibility in their hunting strategies. For instance, with the bow and arrow Thule Inuit were not constrained to the same degree as Late Dorset who, using spears, would have had to confine their prey, ambush it, or pursue it to get close enough to strike and make the kill (see Churchill 1993). Thule Inuit had the advantage of making a kill some distance from their prey, reloading arrows many times, and launching their arrows from positions of concealment making hunting in an open environment much easier (see Kennett et al. 2013). The data presented in this research suggest as a result of differences in hunting technologies, Thule Inuit were better able to acquire higher frequencies of adult individuals, and in locations where caribou were abundant they were able to harvest higher frequencies of caribou in general. In comparison, Late Dorset captured a higher frequency of smaller, slower, younger individuals, which are lower ranked prey; and, in locations where caribou were abundant their harvest of this resource was less plentiful.

In regards to hunting sea mammals, Late Dorset would have also been limited by various factors, including the likelihood that they did not hunt from boats in open water (see Chapter 5; Damkjar 2005; Maxwell 1985). As outlined in Chapter 6, and stated in Expectations#3 and #4, which were both met by the Grinnell Peninsula and Smith Sound results, it seems that Late Dorset seal hunting took place on the sea ice or at the ice edge, during late fall, winter, and spring. Spring hunting appears to have been particularly important to Late Dorset, since animals are more easily captured as they bask on the sea ice in comparison to hunting at breathing-holes during the winter, which can be a time-consuming activity (Boas 1888:76), and summer hunting appears not to have been an option. Because ringed seals give birth to pups in the spring, and pups are less wary and more easily captured than adult seals, Late Dorset appear to have acquired a higher frequency of these smaller individuals, in comparison to Thule Inuit. Although the spring seal hunt would have without doubt been important to Thule Inuit, their ability to capture seals throughout the year, including from boats in open water, were able to concentrate their efforts on capturing adults that have a higher blubber and meat content than younger individuals. Additionally, without the seasonal constraints faced by Late Dorset, this appears to have allowed Thule Inuit, in coastal locations, to capture higher frequencies of seals.

Thus, it would seem that Late Dorset hunting technologies were more heavily and specifically dependent upon terrain features, and seasonal changes in the environment, in order for their hunting to be a success. In this way, ideal environmental circumstances would have been crucial for their ability to capture food and ultimately for their survival. Of course Thule Inuit were also reliant upon environmental circumstances, however their hunting technologies were less constrained and less risky in that they allowed for more flexibility in regards to which animals were hunted when; and, they also seem to have resulted in larger harvests in comparison to those made by Late Dorset, that would have provided better provisioning and perhaps an increased food security. If the incoming Thule Inuit forced Late Dorset out of the prime hunting locations, as has been suggested (see Friesen 2000), at a time when the climate was changing and the predictability and abundance of ringed seal was unstable (Barry et al. 1977), than Late Dorset would have been particularly disadvantaged and this would have ultimately led to their disappearance. Thus, the results of the analyses presented in this dissertation further support previous claims that inferior Late Dorset technologies prevented their survival during the changing Arctic climate alongside a highly technologically diverse Thule Inuit (see Barry et al. 1977).

11.4 Implications for Hunter-Gatherer Research

This research was intended primarily to allow the interpretation of a specific comparative case study in the eastern Arctic. However, it can also yield some insights into more general issues relating to hunter-gatherer behaviour. Specifically, the differences identified between Late Dorset and Thule Inuit archaeofaunas suggest that in northern environments, where there is a short list of available resources, the impacts of specialized technologies are perhaps more visible in taxonomic evenness versus subsistence diversity or diet breadth that are often the focus of subsistence studies (e.g., Morrison 1994; Reitz and Wing 1999). Additionally, the greater taxonomic evenness found in the Late Dorset assemblages further suggests that in environments with few seasonally abundant resources, capturing a greater number of a variety of resources helped manage hunting short-falls and the risk of food shortages for groups lacking specialized hunting technologies. Moreover, the results of the analyses further demonstrate the linkage between technologies, resource scheduling, and other parts of Northern hunter-gatherer behaviour (see also Betts 2005; Savelle 1987; Whitridge 2001).

As discussed in Chapter 2, faunal studies frequently suggest a relationship between specialized technologies and a decrease in diet breadth (e.g., Morrison 1994). This is based on the idea that specialized technologies allow for intensified procurement strategies that result in an increase in acquisition of certain prey species (Reitz and Wing 1999), and minimize the need to capture low-ranking species resulting in a decrease in subsistence diversity. However, other research has shown a correlation between specialized technologies and species diversification or an increase in diet breadth (e.g., Binford 2000). In this situation, it is understood that resource depression is responsible for a decrease in high-ranking resources and an increase in low-ranking resources and overall diet breadth (e.g., Broughton 1997; Butler 2000; Nagaoka 2002). While these two scenarios initially appear incongruent they are in fact a part of the same process (see Betts and Friesen 2004); and, although they are not expected to occur simultaneously, a decrease followed by an increase in subsistence diversity can occur successively over time in the intensification process (e.g., Zangrando 2009). It follows that in synchronic research subsistence diversity does not necessarily provide a clear reflection of the use of specialized technologies, since diet breadth may increase or decrease as a result of intensified procurement strategies, depending on what part of the process a sample represents. In this dissertation, which examines societies that existed within a similar time period, the results indicate that differences in subsistence diversity are largely reflective of differences in site seasonality (see Chapter 10 section 10.3.1), and subsistence diversity as measured by taxonomic richness is generally similar between both groups despite the use of very different hunting technologies. Taxonomic evenness, however, was consistently lower in the Thule Inuit archaeofaunas, which tended to be more strongly dominated by a single species, suggesting Thule Inuit utilized more intensified hunting practices (see Chapter 10). For Late Dorset, who had more generalized hunting technologies that were particularly reliant on very specific environmental circumstances, targeting the most abundant or large bodied animal was not always feasible (i.e., the lack of open water hunting technologies impeded hunting sea mammals during the summer). Therefore, capturing more even frequencies of a variety of species would have been necessary in order to ensure an adequate amount of food was obtained. While both groups obtained a similar range of species, hunting strategies largely differed in regards to the proportion of low-ranking species that were acquired; these were generally more important in the Late Dorset diet. Thus, differences in taxonomic evenness were consistent with the types of hunting technologies used.

The results of this dissertation also have the potential to inform more formal models that assess the influence of risk, specifically the risk of resource failure, in hunter-gatherer behaviour and its ability to account for variation in the technologies used by hunter-gatherers to obtain their food (Collard et al. 2011). The risk hypothesis, that holds that in more risky environments groups will use more diverse and complex toolkits than those in less risky environments, has been supported by a number of studies (e.g., Henrich 2006; Read 2008; Shennan 2001). However, in the eastern Arctic both Late Dorset and Thule Inuit inhabited a very similar environment that was subject to a great risk of resource failure and supported few seasonally abundant resources, and despite this their toolkits were extremely different in diversity and complexity. Their archaeofaunas suggest that hunting strategies, including resource scheduling and settlement patterns that are elaborated on below, are more strongly related to toolkit variation versus the risk of resource failure. Thus, it does not necessarily support the risk hypothesis, but instead provides a more nuanced understanding that is in agreement with other research that suggests when risk differences among groups are small other factors are as, and perhaps more, reflective of technological variation (Collard et al. 2011).

These different hunting strategies used by Late Dorset and Thule Inuit societies ultimately led to contrasts in their settlement patterns; in particular their seasonal rounds.

As discussed in the previous section, Thule Inuit hunting technologies allowed them to tailor their hunting strategies to the behaviour of their prey, and they were not confined by environmental circumstances to the same degree as Late Dorset. Their seasonal round was therefore "unconstrained", in that often they were able to target the resources that provided the greatest return in a given environment (i.e., they were able to hunt large sea mammals in open water). In comparison, the more generalized nature of the Late Dorset hunting tool-kit, and its greater dependence on physiographic features, typically required them to move locations once the local resources had been depleted. It is difficult to determine how this impacted the duration each group stayed in one area; particularly since it is rarely possible to reconstruct the complete annual settlement pattern of either Dorset or Thule. The greater taxonomic evenness in the Late Dorset archaeofaunas suggests they heavily exploited all resources in one location before moving to another (see also Darwent 2001). Their movement between sites perhaps corresponded with the melting and formation of the sea ice and their ability to capture sea mammals. However, Thule Inuit acquired higher frequencies of the high-ranking resources in each region, and this possibly allowed them to stay in one place for a longer period than Late Dorset.

In terms of the foraging and collecting hunting strategies defined by Binford (1980), it would seem that differences in hunting technologies had direct influence on Late Dorset and Thule Inuit settlement practices. The faunal data in this dissertation would suggest that Late Dorset utilized hunting strategies more typical of foragers versus collectors, moving locations between the seasons to be close to resources. However, the seasonal availability of resources would have required them to store at least part of their harvests in order to ensure adequate food throughout the year, a practice that is more commonly associated with a collector strategy (Nagy 1997). Thule Inuit were more typical collectors, who appear to more specifically target the seasonally abundant resources that were distributed throughout their environment. They also acquired higher frequencies of these abundant resources, which would suggest a greater need for food storage in order to preserve their harvest. Thus, while the environment has tended to be seen as dictating hunter-gatherer adaptations (e.g., Binford 1980), this research presents a case in which hunting technologies were a critical factor in constraining which hunting strategies were utilized.

11.5 Conclusion

In this dissertation, I have shown that although Late Dorset and Thule Inuit inhabited similar environments, and were subject to similar environmental constraints, they interacted with the animals in these environments often in very different ways. Although Late Dorset disappeared and left no known descendent communities, their sites across the eastern Arctic indicate they were very successful for centuries prior to the arrival of the more technologically specialized Thule Inuit. However, being displaced from key hunting locations would have presented a challenge that Late Dorset hunting technologies were not equipped to overcome, and thus contributed to their disappearance. Furthermore, this research demonstrates various particularities of Northern hunter-gatherer behaviours, including the important relationship between tool-kit structures and hunting strategies, especially resource scheduling, in a harsh environment with few seasonally abundant animal resources.

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Appendix A-Iqaluktuuq Data

Late Dorset Contexts, Bell Site (NiNg-2)

Element distribution for fish specimens identified as *Salvelinus* from Late Dorset contexts.

	Element	**# per ind.**	**TP4 Midden**	**H6 Midden**	**H6**	**TP4 Midden**	**H6 Midden**	**H6**	**TP4 Midden**	**H6 Midden**	**H 6**
				MNE			MAU			%MAU	
Cranium Elements	angular	2	10	10	13	5.0	5.0	6.5	50.0	41.7	81.3
	branchiostegal rays	14	9	17	31	0.6	1.2	2.2	6.4	10.1	27.7
	parasphenoid	1	6	12	8	6.0	12.0	8.0	60.0	100.0	100.0
	orbitosphenoid	1	0	0	1	0.0	0.0	1.0	0.0	0.0	12.5
	hyomandibular	2	7	7	4	3.5	3.5	2.0	35.0	29.2	25.0
	Ceratohyal	2	9	8	13	4.5	4.0	6.5	45.0	33.3	81.3
	Cleithrum	2	14	9	10	7.0	4.5	5.0	70.0	37.5	62.5
	postcleithrum 2nd	2	3	5	2	1.5	2.5	1.0	15.0	20.8	12.5
	supracleithrum	2	13	11	7	6.5	5.5	3.5	65.0	45.8	43.8
	scapula	2	3	2	1	1.5	1.0	0.5	15.0	8.3	6.3
	dentry	2	8	7	11	4.0	3.5	5.5	40.0	29.2	68.8
	exoocipital	2	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0
	basiooccipital	2	2	1	1	1.0	0.5	0.5	10.0	4.2	6.3
	epihyal	2	6	2	3	3.0	1.0	1.5	30.0	8.3	18.8
	symplectic	2	0	2	0	0.0	1.0	0.0	0.0	8.3	0.0
	maxilla	2	6	8	9	3.0	4.0	4.5	30.0	33.3	56.3
	opercle	2	11	5	6	5.5	2.5	3.0	55.0	20.8	37.5
	preopercle	2	4	0	4	2.0	0.0	2.0	20.0	0.0	25.0
	subopercle	2	9	2	8	4.5	1.0	4.0	45.0	8.3	50.0
	interopercle	2	5	0	2	2.5	0.0	1.0	25.0	0.0	12.5
	palatine	1	5	0	1	5.0	0.0	1.0	50.0	0.0	12.5
	quadrate	2	4	6	5	2.0	3.0	2.5	20.0	25.0	31.3
	mesoppterygoid	2	12	4	6	6.0	2.0	3.0	60.0	16.7	37.5
	metopterygoid	2	7			3.5			35.0		
	otolith	2	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0
	lingual plate	1	1	2	0	1.0	2.0	0.0	10.0	16.7	0.0
	urohyal	1	5	2	0	5.0	2.0	0.0	50.0	16.7	0.0
	ceratobranchial	8	20	0	1	2.5	0.0	0.1	25.0	0.0	1.6
	hypobranchial	6	5	0	0	0.8	0.0	0.0	8.3	0.0	0.0
	epibranchial	2	0	12	5	0.0	6.0	2.5	0.0	50.0	31.3
	pterotic	1	0	1	0	0.0	1.0	0.0	0.0	8.3	0.0
	frontal	2	3	4	2	1.5	2.0	1.0	15.0	16.7	12.5
	posttemoporal	2	8	11	8	4.0	5.5	4.0	40.0	45.8	50.0
Fins	mesocoracoid	2	0	0	1	0.0	0.0	0.5	0.0	0.0	6.3
	coracoid	2	5	7	2	2.5	3.5	1.0	25.0	29.2	12.5
	pectoril fin ray	26	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0
Vertebral column	basipterygium	2	2	9	5	1.0	4.5	2.5	10.0	37.5	31.3
	vertebrae	68	187	65	28	2.8	1.0	0.4	27.5	8.0	5.1
	hypural	1	10	1	0	10.0	1.0	0.0	100.0	8.3	0.0
	caudal bony plate	2	0	1	0	0.0	0.5	0.0	0.0	4.2	0.0
	expanded haemal spine	8	1	4	2	0.1	0.5	0.3	1.3	4.2	3.1

Significant bird species MNE's from Late Dorset contexts.

Skeletal part	H6			H6 Midden	TP4 Midden	
	Anatidae	Gull	Ptarmigan	Anatidae	Anatidae	ptarmigan
cranium	4	0	0	0	2	0
vertebrae	0	0	0	3	2	0
sternum	4	0	1	2	1	1
rib	2	0	0	0	1	0
shoulder girdle	2	4	2	4	2	6
wings	19	5	4	5	3	7
pelvis	4	0	3	3	1	0
legs	5	1	0	12	6	2

The MNE values are based on the most frequent skeletal part with consideration to element side, age, and the % of the element present. When a part includes more than one element the most frequent skeletal element portion forms the MNE (shoulder girdle includes: coracoids, furcula and scapula; wings include: humeri, radii, ulnas, carpometacarpi and wing phalanges; and, legs include: femora, tibiotarsi, tarsometatarsi, and foot phalanges).

Dog/wolf MNE's from Late Dorset contexts.

Element	TP4
mandible	0
thoracic	0
lumbar	0
rib	3
innominate	0
femur	0
metatarsal	0
tooth	1

Arctic fox element distribution for the Late Dorset contexts.

	TP4 Midden	H6 Midden	H6	TP4 Midden	H6 Midden	H6	TP4 Midden	H6 Midden	H6
	MNE			MAU			%MAU		
cranium	2	3	4	2.0	3.0	4.0	66.7	100.0	100.0
mandible	0	0	1	0.0	0.0	0.5	0.0	0.0	12.5
atlas	0	0	1	0.0	0.0	1.0	0.0	0.0	25.0
axis	1	0	1	1.0	0.0	1.0	33.3	0.0	25.0
cervical	5	1	4	0.7	0.1	0.6	23.8	4.8	14.3
thoracic	3	5	4	0.2	0.4	0.3	7.7	12.8	7.7
lumbar	3	8	4	0.4	1.1	0.6	14.3	38.1	14.3
caudal	5	6	1	0.3	0.4	0.1	9.8	11.8	1.5
sacrum	0	4	5	0.0	1.3	1.7	0.0	44.4	41.7
rib	30	16	21	1.2	0.6	0.8	38.5	20.5	20.2
sternum	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0
scapula	3	2	5	1.5	1.0	2.5	50.0	33.3	62.5
humerus	4	0	2	2.0	0.0	1.5	66.7	0.0	37.5
radius	1	1	2	0.5	0.5	1.0	16.7	16.7	25.0
ulna	0	0	1	0.0	0.0	0.5	0.0	0.0	12.5
metacarpal	22	0	0	2.2	0.0	0.0	73.3	0.0	0.0
carpal	1	3	0	0.1	0.3	0.0	3.3	10.0	0.0
innominate	0	0	4	0.0	0.0	2.0	0.0	0.0	50.0
femur	6	3	3	3.0	1.5	1.5	100.0	50.0	37.5
tibia/fibula	2	2	2	1.0	1.0	1.0	33.3	33.3	25.0
astragalus	0	0	1	0.0	0.0	0.5	0.0	0.0	12.5
calcaneum	0	1	1	0.0	0.5	0.5	0.0	16.7	12.5
tarsal	2	16	0	0.2	1.6	0.0	6.7	53.3	0.0
metatarsal	14	0	0	1.4	0.0	0.0	46.7	0.0	0.0
phalanges	18	4	9	0.9	0.2	0.5	30.0	6.7	11.3

Arctic hare MNE's from Late Dorset contexts.

Element	TP4 Midden	H6 Midden
cranium	0	0
scapula	1	0
humerus	0	0
radius	2	0
rib	0	0
axis	0	1
lumbar	0	0
phalanx	0	1

Small seal %MAU's compared with Food Utility Index (FUI) from the Late Dorset contexts. The MAU calculation includes long bone shaft fragments.

Element	TP4 Midden	H6 Midden	House 6
cranium	83.3	0	100
mandible	41.7	100.0	0.0
atlas	0	50	0
thoracic	44.4	10	0
lumbar	100	20	0
rib	6.9	22.9	12.5
sternum	27.8	0	0
scapula	41.7	25	100
humerus	83.3	100	0
radius/ulna	41.7	25	50
innominate	41.7	50	50
femur	41.7	0	0
tibia/fibula	0	50	0
front flipper	83.3	10	10
hind flipper	66.7	5	0
Spearmens rho correlation	r_s =-0.17, p=0.56	r_s =0.39, p=0.164	r_s =0.23, p=0.42

Small seal MAU's compared with bone mineral density from the Late Dorset contexts.

Element	**TP4 Midden**	**H6 Midden**	**H6**
mandible	0.5	2	0
atlas	0	1	0
axis	0	0	0
cervical	0.6	0	0
thoracic	0.5	0	0
lumbar	1.2	0.4	0
sacrum	0.3	0.25	0
rib	0.1	0.46	1
scapula	0.5	0.5	0
humerus-p	0	2	0
humerus-d	0	1.5	0
radius-p	0	0	0
radius-d	0.5	0	0
ulna-p	0	0	0
ulna-d	0	0	0
innominate	0.5	1	0.5
femur-p	0	0	0
femur-d	0	0	0
tibia-p	0	0	0
tibia-d	0	0	0
astragalus	0	0	0
calcaneum	0	0	0
Spearmens rho correlation	r_s =-0.49, p=0.02	r_s =0.06, p=0.77	r_s =-0.13 p=0.55

p=proximal, d=distal

Caribou element MNE’s and MAU’s from the Late Dorset Contexts.

Element	TP4 Midden	H6 Midden	H6	TP4 Midden	H6 Midden	H6
	MNE’s			MAU’s		
cranium	5	7	4	5.0	7.0	4.0
mandible	4	17	9	2.0	8.5	4.5
atlas	2	1	2	2.0	1.0	2.0
axis	0	1	1	0.0	1.0	1.0
cervical	4	8	2	0.8	1.6	0.4
thoracic	7	6	8	0.5	0.5	0.6
lumbar	4	2	2	0.6	0.3	0.3
caudal	0	1	1	0.0	0.1	0.1
sacrum	1	3	1	0.2	0.6	0.2
rib	34	33	99	1.3	1.3	3.8
sternum	8	3	6	1.3	0.5	1.0
scapula	4	7	4	2.0	3.5	2.0
humerus-p	6	6	1	3.0	3.0	0.5
humerus-d	6	3	3	3.0	1.5	1.5
radius/ulna-p	7	2	4	3.5	1.0	2.0
radius/ulna-d	8	3	1	4.0	1.5	0.5
metacarpal-p	7	1	5	3.5	0.5	2.5
metacarpal-d	3	10	3	1.5	5.0	1.5
carpal	24	10	13	2.0	0.8	1.1
innominate	5	2	4	2.5	1.0	2.0
femur-p	13	3	2	6.5	1.5	1.0
femur-d	3	1	1	1.5	0.5	0.5
tibia-p	4	3	4	2.0	1.5	2.0
tibia-d	1	5	1	0.5	2.5	0.5
fibula	6	3	2	3.0	1.5	1.0
astragalus	3	2	4	1.5	1.0	2.0
calcaneum	3	0	3	1.5	0.0	1.5
tarsal	8	6	6	1.3	1.0	1.0
metatarsal-p	7	4	4	3.5	2.0	2.0
metatarsal-d	5	14	2	2.5	7.0	1.0
phalanges	61	70	34	2.5	2.9	1.4

p=proximal, d=distal

Caribou element %MAU's compared with caribou food utility index from Late Dorset contexts. The MAU calculation includes long bone shaft fragments.

Caribou elements	**TP4 Midden**	**H6 Midden**	**H6**
cranium	76.0	82.4	88.9
mandible	30.8	100.0	100.0
atlas	30.8	11.8	44.4
axis	0.0	11.8	22.2
cervical	12.3	18.8	8.9
thoracic	8.3	5.4	13.7
lumbar	8.8	3.4	6.3
rib	20.1	14.9	84.6
sternum	20.5	5.9	22.2
scapula	30.8	41.2	44.4
humerus-p	46.2	35.3	11.1
humerus-d	46.2	17.6	33.3
radius/ulna-p	53.8	11.8	44.4
radius/ulna-d	61.5	17.6	11.1
metacarpal-p	53.8	5.9	55.6
metacarpal-d	23.1	58.8	33.3
carpal	30.8	9.8	24.1
innominate	38.5	11.8	44.4
femur-p	100.0	17.6	22.2
femur-d	23.1	5.9	11.1
tibia-p	30.8	17.6	44.4
tibia-d	7.7	29.4	11.1
astragalus	23.1	11.8	44.4
calcaneum	23.1	0.0	33.3
tarsal	20.5	11.8	22.2
metatarsal-p	53.8	23.5	44.4
metatarsal-d	38.5	82.4	22.2
phalanges	39.1	34.3	31.5
Spearmens rho correlation	r_s =-0.25 p=0.248	r_s =0.19, p=0.311	r_s =0.24, p=0.204

p=proximal, d=distal

Caribou element MAU's compared with the caribou Density Index (Lam et al. 1999). The MAU calculation includes long bone shaft fragments.

MAU	**TP4 Midden**	**H6 Midden**	**H6**
mandible	2.0	8.5	4.5
atlas	2.0	1.0	2.0
axis	0.0	1.0	1.0
cervical	0.8	1.6	0.4
thoracic	0.5	0.5	0.6
lumbar	0.6	0.3	0.3
rib	1.3	1.3	3.8
scapula	2.0	1.5	2.0
humerus	3.0	3.5	5.0
radius/ulna	4.0	6.5	8.0
metacarpal	3.5	3.5	3.0
innominate	2.5	1.0	2.0
femur	6.5	3.0	3.0
tibia	2.0	7.0	9.0
metatarsal	3.5	7.0	6.5
phalanges	2.5	2.9	1.4
Spearmens rho correlation	r_s =0.77, $p \leq 0.001$	r_s =0.75, $p \leq 0.001$	r_s =0.84, $p \leq 0.001$

Caribou element MAU's compared with caribou meat drying index (MDI). The MAU calculation includes longbone shaft fragments.

Caribou element	TP4 Midden	H6 Midden	H6
cranium	5.0	7.0	4.0
mandible	2.0	8.5	4.5
atlas	2.0	1.0	2.0
cervical	0.8	1.6	0.4
thoracic	0.5	0.5	0.6
lumbar	0.6	0.3	0.3
rib	1.3	1.3	3.8
sternum	1.3	0.3	1.0
scapula	2.0	1.5	2.0
humerus	3.0	3.5	5.0
radius/ulna	4.0	6.5	8.0
metacarpal	3.5	3.5	3.0
innominate	2.5	1.0	2.0
femur	6.5	3.0	3.0
tibia	2.0	7.0	9.0
metatarsal	3.5	7.0	6.5
phalanges	2.5	2.9	1.4
Spearmens rho correlation	r_S =-0.79, $p \leq 0.001$	r_S =0.85, $p \leq 0.001$	r_S s=-0.72, p=0.001

Caribou Element MAU's compared with the UMI (Morin 2007:77).

Element	TP4 Midden	H6 Midden	H6
humerus	3.0	5.0	3.5
radius/ulna	4.0	8.0	6.5
metacarpal	3.5	3.0	3.5
carpal	2.0	1.1	0.8
femur	6.5	3.0	3.0
tibia	2.0	9.0	7.0
astragalus	1.5	2.0	1.0
calcaneum	1.5	1.5	0.0
metatarsal	3.5	6.5	7.0
tarsal	1.3	1.0	1.0
phalanges	2.5	1.4	2.9
Spearmens rho correlation	r_S =0.64, p=0.03	r_S =0.88, $p \leq 0.001$	r_S =0.84, $p \leq 0.001$

Muskox MNE's from the Late Dorset contexts.

Element	**TP4 Midden**	**H6 Midden**	**H6**
cranium	1	0	0
horn	1	0	0
mandible	5	0	0
Radius	2	0	0
ulna	0	0	1
metacarpal	1	0	0
sesmoide-front	2	0	0
phalanx-front	1	0	0
sternebra	0	0	0
rib	3	0	0
vertebra	1	0	0
femur	2	0	0
tibia	3	1	0
tarsal	1	0	0
sesmoide-hind	2	0	0
phalanx-hind	2	0	1

Categories used to calculate diversity measures

Taxon	**NISP**
Bird	
canada goose	20
goose	58
long-tailed duck	3
common eider	9
king eider	17
eider	4
pintail	4
duck	3
trumpeter swan	4
swan	2
glaucous gull	7
herring ull	1
iceland gull	5
medium gull	1
small gull	1
gull	8
jaeger	1
arctic tern	2
sandhill-crane	1
ptarmigan	28
Mammal	
wolverine	15
dog/wolf	4
arctic fox	798
arctic hare	5
polar bear	4
bearded seal	15
ringed seal	151
caribou	1887
muskox	54

Thule Inuit Contexts, Bell Site (NiNg-2)

Element distribution for fish specimens identified as *Salvelinus* from Thule Inuit contexts.

	Element	# per ind	TP2 Midden	TP3 Midden	H56	TP2 Midden	TP3 Midden	H56	TP2 Midden	TP3 Midden	H56
				MNE			MAU			%MAU	
Cranium Elements	angular	2	25	7	7	12.5	3.5	3.5	48.1	58.3	43.8
	branchiostegal rays	14	19	17	27	1.4	1.2	1.9	5.2	20.2	24.1
	parasphenoid	1	26	5	7	26.0	5.0	7.0	100.0	83.3	87.5
	alisphenoid	1	0	2	0	0.0	2.0	0.0	0.0	33.3	0.0
	vomer	2	2	0	0	1.0	0.0	0.0	3.8	0.0	0.0
	orbitosphenoid	1	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0
	hyomandibular	2	11	5	2	5.5	2.5	1.0	21.2	41.7	12.5
	ceratohyal	2	31	4	1	15.5	2.0	0.5	59.6	33.3	6.3
	cleithrum	2	36	5	16	18.0	2.5	8.0	69.2	41.7	100.0
	postcleithrum 2nd	2	4	1	1	2.0	0.5	0.5	7.7	8.3	6.3
	supracleithrum	2	31	4	2	15.5	2.0	1.0	59.6	33.3	12.5
	scapula	2	14	2	0	7.0	1.0	0.0	26.9	16.7	0.0
	dentry	2	30	9	6	15.0	4.5	3.0	57.7	75.0	37.5
	exoocipital	2	1	1	0	0.5	0.5	0.0	1.9	8.3	0.0
	basiooccipital	2	1	1	0	0.5	0.5	0.0	1.9	8.3	0.0
	epihyal	2	19	6	6	9.5	3.0	3.0	36.5	50.0	37.5
	symplectic	2	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0
	maxilla	2	50	12	16	25.0	6.0	8.0	96.2	100.0	100.0
	premaxilla	2	6	7	0	3.0	3.5	0.0	11.5	58.3	0.0
	supramaxilla	2	0	3	2	0.0	1.5	1.0	0.0	25.0	12.5
	opercle	2	22	6	8	11.0	3.0	4.0	42.3	50.0	50.0
	preopercle	2	16	7	3	8.0	3.5	1.5	30.8	58.3	18.8
	subopercle	2	6	6	14	3.0	3.0	7.0	11.5	50.0	87.5
	interopercle	2	12	2	1	6.0	1.0	0.5	23.1	16.7	6.3
	palatine	1	2	3	1	2.0	3.0	1.0	7.7	50.0	12.5
	quadrate	2	22	1	0	11.0	0.5	0.0	42.3	8.3	0.0
	mesopterygoid	2	46	9	10	23.0	4.5	5.0	88.5	75.0	62.5
	otolith	2	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0
	lingual plate	1	2	3	0	2.0	3.0	0.0	7.7	50.0	0.0
	urohyal	1	22	3	1	22.0	3.0	1.0	84.6	50.0	12.5
	pharyngeal plate	2	1	0	0	0.5	0.0	0.0	1.9	0.0	0.0
	ceratobranchial	8	36	0	5	4.5	0.0	0.6	17.3	0.0	7.8
	hypobranchial	6	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0
	pharyngobranchial	6	17	3	5	2.8	0.5	0.8	10.9	8.3	10.4
	epibranchial	2	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0
	pterotic	1	0	2	0	0.0	2.0	0.0	0.0	33.3	0.0
	epiotic	1	1	0	0	1.0	0.0	0.0	3.8	0.0	0.0
	prootic	1	1	1	0	1.0	1.0	0.0	3.8	16.7	0.0
	frontal	2	3	1	2	1.5	0.5	1.0	5.8	8.3	12.5
	posttemoporal	2	30	7	7	15.0	3.5	3.5	57.7	58.3	43.8
Fins	mesocoracoid	2	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0
	coracoid	2	22	4	4	11.0	2.0	2.0	42.3	33.3	25.0
	pectoril fin ray	26	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0
Vertebral column	basipterygium	2	35	6	2	17.5	3.0	1.0	67.3	50.0	12.5
	vertebrae	68	72	163	36	1.1	2.4	0.5	4.1	40.0	6.6
	hypural	1	0	1	0	0.0	1.0	0.0	0.0	16.7	0.0
	caudal bony plate	2	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0
	expanded haemal spine	8	0	6	0	0.0	0.8	0.0	0.0	12.5	0.0

Bird MNE's from Thule Inuit contexts.

Element	H56	TP3 Midden		TP2 Midden	
	Anatidae	Antidae	ptarmigan	Anatidae	ptarmigan
cranium	0	0	0	1	0
vertebrae	0	2	0	13	0
sternum	0	1	0	1	0
rib	0	0	0		0
shoulder girlde	2	2	1	6	1
wings	5	4	2	9	2
pelvis	0	0	0	2	0
legs	1	3	2	8	1

The MNE values are based on the most frequent skeletal part with consideration to element side, age, and the % of the element present. When a part includes more than one element the most frequent skeletal element portion forms the MNE (shoulder girdle includes: coracoids, furcula and scapula; wings include: humeri, radii, ulnas, carpometacarpi and wing phalanges; and, legs include: femora, tibiotarsi, tarsometatarsi, and foot phalanges).

Dog/wolf MNE's from Late Dorset contexts.

Element	TP2 Midden	TP3 Midden	H56
mandible	0	1	0
thoracic	1		0
lumbar	2		0
rib	7	1	1
innominate	1		1
femur	0	1	0
metatarsal	0	1	0

Arctic fox MNE'S element distribution for the Thule Inuit contexts.

Element	**TP2 Midden**	**TP3 Midden**	**H56**	**TP2 Midden**	**TP3 Midden**	**H56**	**TP2 Midden**	**TP3 Midden**	**H56**
	MNE			MAU			%MAU		
cranium	2		2	2.0	0.0	2.0	100.0	0.0	100.0
mandible		2	1	0.0	1.0	0.5	0.0	100.0	25.0
atlas			1	0.0	0.0	1.0	0.0	0.0	50.0
axis				0.0	0.0	0.0	0.0	0.0	0.0
cervical	2		4	0.3	0.0	0.6	14.3	0.0	28.6
thoracic				0.0	0.0	0.0	0.0	0.0	0.0
lumbar	2			0.3	0.0	0.0	14.3	0.0	0.0
caudal	4	3	3	0.2	0.2	0.2	11.8	17.6	8.8
sacrum	1		1	0.3	0.0	0.3	16.7	0.0	16.7
rib	11	1	4	0.4	0.0	0.2	21.2	3.8	7.7
sternum				0.0	0.0	0.0	0.0	0.0	0.0
scapula			1	0.0	0.0	0.5	0.0	0.0	25.0
humerus	1	1		0.5	0.5	0.0	25.0	50.0	0.0
radius	2			1.0	0.0	0.0	50.0	0.0	0.0
ulna	3			1.5	0.0	0.0	75.0	0.0	0.0
metacarpal	3		1	0.3	0.0	0.1	15.0	0.0	5.0
carpal	1	1		0.1	0.1	0.0	0.0	10.0	0.0
innominate	1			0.5	0.0	0.0	25.0	0.0	0.0
femur	3			1.5	0.0	0.0	75.0	0.0	0.0
tibia/fibula				0.0	0.0	0.0	0.0	0.0	0.0
astragalus	2		1	1.0	0.0	0.5	50.0	0.0	25.0
calcaneum		1	2	0.0	0.5	1.0	0.0	50.0	50.0
tarsal				0.0	0.0	0.0	0.0	0.0	0.0
metatarsal	1		4	0.1	0.0	0.4	5.0	0.0	20.0
phalanges	5	1	1	0.3	0.1	0.1	12.5	5.0	2.5

Arctic hare MNE's from the Thule Inuit contexts.

Element	**H56**
cranium	1
humerus	1
radius	1
rib	1
lumbar	1

Small seal %MAU's compared with Food Utility Index (FUI) from the Late Dorset contexts. The MAU calculation includes long bone shaft fragments.

Element	**TP2 Midden**	**TP3 Midden**	**H56**
cranium	0	0	0
mandible	100	0	0
atlas	0	0	0
thoracic	0	0	0
lumbar	0	0	0
rib	8.3	0	0
sternum	0	0	0
scapula	0	0	0
humerus	100	0	0
radius/ulna	0	0	0
innominate	0	0	0
femur	100	0	0
tibia/fibula	100	0	100
front flipper	0	100	10
hind flipper	0	100	30
Spearmens rho correlation	r_s =-0.07 p=0.80	r_s =0.45, p=0.10	r_s =0.37, p=0.19

Small seal MAU's compared with bone mineral density. The MAU calculation includes longbone shafts.

Seal Element	TP2 Midden	H56
mandible	0.5	0.0
humerus-d	0.5	0.0
femur-p	0.5	0.0
femur-d	0.0	0.0
tibia-p	0.5	0.0
tibia-d	0.0	1.0
Spearmens rho correlation	r_s =0.26, p=0.24	r_s =0.09 p=0.70

p=proximal, d=distal

The MNE frequencies for unfused seal elements for each age category from TP2 and the H56.

Seal element	TP2 Midden				House 56			
Age Fusion Sequence	unfused	fusing	fused	total	unfused	fusing	fused	total
Y: metatarsal 1, distal	-	-	-	-	-	-	-	-
Y: pelvis, acetabulum	-	-	-	-	-	-	-	-
Y: scapula, supraglenoid tubercle	-	-	-	-	-	-	-	-
Total	-	-	-	-	-	-	-	-
% unfused	**0**							
J: femur, proximal	1	0	1	2	-	-	-	-
J: radius, proximal	-	-	-	-	-	-	-	-
J: humerus, distal		0	1	1	-	-	-	-
Total	1	0	2	3	-	-	-	-
% unfused	**0**							
YA: femur, distal	-	-	-	-	-	-	-	-
YA: humerus, proximal	-	-	-	-	-	-	-	-
YA: ulna, proximal	-	-	-	-	-	-	-	-
YA: tibia/fibula, proximal	1	0	0	1	-	-	-	-
Total	1	0	0	1	-	-	-	-
% unfused	**100%**							
OA: ulna, distal	-	-	-	-		0	0	
OA: metatarsal 1, proximal	-	-	-	-	0	0	0	0
OA: radius, distal	-	-	-	-	0	0	0	0
OA: tibia/fibula, distal	-	-	-	-	2	0	1	3
Total	-	-	-	-	2	0	1	3
% unfused	**0**				**66.6%**			

Caribou element MNE's and MAU's from the Thule Inuit contexts.

	TP2 Midden	TP3 Midden	H56	TP2 Midden	TP3 Midden	H56
	MNE's			MAU's		
cranium	3	4	2	3.0	4.0	2.0
mandible	9	3	2	4.5	1.5	1.0
atlas	2	1	0	2.0	1.0	0.0
axis	0	0	0	0.0	0.0	0.0
cervical	0	2	1	0.0	0.4	0.2
thoracic	11	5	1	0.8	0.4	0.1
lumbar	1	0	0	0.1	0.0	0.0
caudal	0	0	0	0.0	0.0	0.0
sacrum	1	0	0	0.2	0.0	0.0
rib	15	11	12	0.6	0.4	0.5
sternum	8	0	1	1.3	0.0	0.2
scapula	4	3	2	2.0	1.5	1.0
humerus-p	1	1	0	0.5	0.5	0.0
humerus-d	2	0	0	1.0	0.0	0.0
radius/ulna-p	4	3	2	2.0	1.5	1.0
radius/ulna-d	0	3	2	0.0	1.5	1.0
metacarpal-p	2	4	0	1.0	2.0	0.0
metacarpal-d	5	3	1	2.5	1.5	0.5
carpal	9	5	2	0.8	0.4	0.2
innominate	6	3	2	3.0	1.5	1.0
femur-p	1	1	0	0.5	0.5	0.0
femur-d	0	3	0	0.0	1.5	0.0
tibia-p	4	4	2	2.0	2.0	1.0
tibia-d	4	3	3	2.0	1.5	1.5
fibula	1	1	2	0.5	0.5	1.0
astragalus	0	2	1	0.0	1.0	0.5
calcaneum	6	9	0	3.0	4.5	0.0
tarsal	2	5	2	.2	0.8	0.3
metatarsal-p	2	10	0	1.0	5.0	0.0
metatarsal-d	3	1	3	1.5	0.5	1.5
phalanges	25	20	22	1.0	0.8	0.9

p=proximal, d=distal

Caribou element %MAU's compared with caribou food utility index, calculation includes proximal and distal longbone parts.

Caribou elements	TP2 Midden	TP3 Midden	H56
cranium	66.7	80.0	100.0
mandible	100.0	30.0	50.0
atlas	44.4	20.0	0.0
axis	0.0	0.0	0.0
cervical	0.0	8.0	10.0
thoracic	18.8	7.7	15.4
lumbar	3.2	5.7	0.0
rib	12.8	8.5	23.1
sternum	29.6	0.0	8.3
scapula	44.4	30.0	50.0
humerus-p	11.1	10.0	0.0
humerus-d	22.2	0.0	0.0
radius/ulna-p	44.4	30.0	50.0
radius/ulna-d	0.0	30.0	50.0
metacarpal-p	22.2	40.0	0.0
metacarpal-d	55.6	30.0	25.0
carpal	16.7	8.3	8.3
innominate	66.7	30.0	50.0
femur-p	11.1	10.0	0.0
femur-d	0.0	30.0	0.0
tibia-p	44.4	40.0	50.0
tibia-d	44.4	30.0	75.0
astragalus	0.0	20.0	25.0
calcaneum	66.7	90.0	0.0
tarsal	0.0	16.7	16.7
metatarsal-p	22.2	100.0	0.0
metatarsal-d	33.3	10.0	75.0
phalanges	23.1	16.7	45.8
Spearmens rho correlation	r_s=-0.15, p=0.44	r_s =-0.21, p=0.27	r_s =-0.07, p=0.71

p=proximal, d=distal

Caribou element MAU's compared with the caribou Density Index (Lam et al. 1999), shaft fragments are included.

Element	**TP2 Midden**	**TP3 Midden**	**H56**
mandible	4.5	1.5	1.0
atlas	2.0	1.0	0.0
axis	0.0	0.0	0.0
cervical	0.0	0.4	0.2
thoracic	0.8	0.4	0.3
lumbar	0.1	0.3	0.0
rib	0.6	0.4	0.5
scapula	2.0	1.5	1.0
humerus	1.0	1.5	3.0
radius/ulna	2.0	1.5	1.5
metacarpal	2.5	3.0	0.5
innominate	3.0	1.5	1.0
femur	1.0	0.0	2.0
tibia	2.0	5.5	4.0
metatarsal	1.5	5.0	3.0
phalanges	1.0	0.8	0.9
Spearmens rho correlation	r_s s=0.52, p=0.04	r_s =0.57, p=0.02	r_s =0.87, p≤0.001

Caribou element MAU's compared with caribou meat drying index (MDI), longbone shaft fragments are included.

Caribou element	**TP2 Midden**	**TP3 Midden**	**H56**
cranium	3.0	4.0	2.0
mandible	4.5	1.5	1.0
atlas	2.0	1.0	0.0
cervical	0.0	0.4	0.2
thoracic	0.8	0.4	0.3
lumbar	0.1	0.3	0.0
rib	0.6	0.4	0.5
sternum	1.3	0.0	0.2
scapula	2.0	1.5	1.0
humerus	1.0	1.5	3.0
radius/ulna	2.0	1.5	1.5
metacarpal	2.5	3.0	0.5
innominate	3.0	1.5	1.0
femur	1.0	0.0	2.0
tibia	2.0	5.5	4.0
metatarsal	1.5	5.0	3.0
phalanges	1.0	0.8	0.9
Spearmens rho correlation	r_s =0.49, p=0.03	r_s =-0.66, p=0.002	r_s =-0.67, p=0.002

Caribou Element MAU's compared with the UMI (Morin 2007:77).

	TP2 Midden	TP3 Midden	H56
humerus	1.0	1.5	3.0
radius/ulna	2.0	1.5	1.5
metacarpal	2.5	3.0	0.5
carpal	0.8	0.4	0.2
femur	1.0	0.0	2.0
tibia	2.0	5.5	4.0
astragalus	0.0	1.0	0.5
calcaneum	3.0	4.5	0.0
metatarsal	1.5	5.0	3.0
tarsal	0.0	0.8	0.3
phalanges	1.0	0.8	0.9
Spearmens rho correlation	r_s =0.58, p=0.06	r_s =0.55, p=0.08	r_s =0.83, p=0.002

Muskox MNE's from Thule Inuit contexts.

Element	**TP2 Midden**
sternebra	2
femur	1
tibia	1

Categories used to calculate diversity measures

Taxon	NISP
Bird	
canada goose	50
goose	47
long-tailed duck	2
eider	17
duck	27
swan	7
medium gull	1
ptarmigan	15
Mammal	
dog/wolf	21
arctic fox	121
arctic hare	5
bearded seal	4
ringed seal	26
caribou	1492
muskox	14

Appendix B-Grinnell Peninsula

Late Dorset, Hornby Head (RbJq-1)

Significant species of bird MNE's from Late Dorset contexts.

Skeletal part	**H2**		**H3**		**H3 midden**		**Sheet midden**	
	anatidae	gull	anatidae	gull	anatidae	gull	anatidae	gull
cranium	0	0	0	0	0	0	0	0
vertebrae	0	0	0	0	1	0	0	0
sternum	0	0	0	0	0	0	1	0
rib	0	0	0	0	0	0	0	0
shoulder girdle	1	0	0	0	0	0	0	1
wings	3	1	1	1	1	0	0	1
pelvis	0	0	0	0	0	0	0	0
legs	2	1	2	0	0	1	8	0

The MNE values are based on the most frequent skeletal part with consideration to element side, age, and the % of the element present. When a part includes more than one element the most frequent skeletal element portion forms the MNE (shoulder girdle includes: coracoids, furcula and scapula; wings include: humeri, radii, ulnas, carpometacarpi and wing phalanges; and, legs include: femora, tibiotarsi, tarsometatarsi, and foot phalanges).

Dog/wolf MNE's from the Late Dorset contexts.

Element	**H2**
	MNE
cranium	1
tibia	1
teeth	5

Arctic fox MNE’s from the Late Dorset contexts.

Element	H2	H3	H3	Sheet Midden
cranium	2	0	2	4
mandible	0	0	1	0
atlas	0	2	0	1
axis	0	0	0	0
cervical	1	4	0	1
thoracic	0	0	2	0
lumbar	0	0	0	2
caudal	17	0	0	0
sacrum	0	0	0	0
rib	7	10	4	5
sternum		0	0	0
scapula	0	0	0	3
humerus	3	2	0	1
radius	0	1	1	2
ulna	0	1	0	1
metacarpal	0	0	0	2
carpal	0	0	0	1
innominate	0	0	2	0
femur	1	0	1	1
tibia	6	1	1	2
fibula	6	0	0	1
astragalus	1	0	0	0
calcaneum	1	0	0	0
tarsal	0	0	0	0
metatarsal	2	5	0	0
phalanges	1	1	0	5
teeth	4	0	3	9

Arctic hare MNE’s from the Late Dorset contexts.

Element	H2	H3	H3	Sheet Midden
			MNE	
cranium	1	0	0	0
mandible	0	1	0	0
radius	1	0	0	0
ulna	0	1	0	0
metacarpal	0	0	1	0
femur	1	0	0	0
metatarsal	0	0	0	3
metapoidial	0	1	0	0

Polar bear MNE”s from the Late Dorset contexts

Element	H2	H3	Sheet Midden
rib	2	0	0
radius	1	1	1
ulna	1	0	0
tibia	1	0	1
metatarsal	3	1	0
phalanges	2	1	0
teeth	3	0	0

Large seal MNE's from the Late Dorset contexts.

Element	H2	H3	H3 midden	Sheet Midden
axis	1	0	0	0
cervical	0	1	0	0
thoracic	1	0	0	0
lumbar	3	1	0	1
rib	3	2	1	3
scapula	1	0	0	0
humerus	1	0	0	0
radius	0	0	1	0
ulna	0	0	0	2
femur	1	0	0	0
patella	0	0	1	0
tibia	1		0	2
fibula	3	1	0	0
metatarsal	0	0	0	1
phalanges	2	1	1	2

Small seal element distribution for the Late Dorset contexts.

Element	# per Ind.	H2	H3	H3 Midden	Sheet Midden	H2	H3	H3 Midden	Sheet Midden
			MNE's				MAU's		
cranium	1	6	0	1	1	3.0	0.0	1.0	1.0
mandible	2	6	2	3	4	3.0	1.0	1.5	2.0
atlas	1	4	0	1	1	4.0	0.0	1.0	1.0
axis	1	1	0	0	0	1.0	0.0	0.0	0.0
cervical	7	10	2	3	4	1.4	0.3	0.4	0.6
thoracic	15	17	4	8	3	1.1	0.3	0.5	0.2
lumbar	5	0	3	1	6	0.0	0.6	0.2	1.2
caudal	12	2	1	2	5	0.2	0.1	0.2	0.4
sacrum	4	2	0	1	4	0.5	0.0	0.3	1.0
rib	24	25	15	57	40	1.0	0.6	2.4	1.7
sternum	9	2	0	4	2	0.2	0.0	0.4	0.2
scapula	2	1	7	6	4	0.5	3.5	3.0	2.0
humerus-p	2	2	1	0	3	1.0	0.5	0.0	1.5
humerus-d	2	3	0	6	3	1.5	0.0	3.0	1.5
radius-p	2	2	0	1	2	1.0	0.0	0.5	1.0
radius-d	2	2	0	3	4	1.0	0.0	1.5	2.0
ulna-p	2	2	0	1	0	1.0	0.0	0.5	0.0
ulna-d	2	3	0	4	1	1.5	0.0	2.0	0.5
metacarpal	10	2	2	5	4	0.2	0.2	0.5	0.4
carpal	20	1	1	3	3	0.1	0.1	0.2	0.2
innominate	2	5	2	1	3	2.5	1.0	0.5	1.5
femur-p	2	2	2	5	3	1.0	1.0	2.5	1.5
femur-d	2	2	2	3	0	1.0	1.0	1.5	0.0
tibia-p	2	4	0	7	2	2.0	0.0	3.5	1.0
tibia-d	2	4	2	7	3	2.0	1.0	3.5	1.5
fibula-p	2	0	1	1	3	0.0	0.5	0.5	1.5
fibula-d	2	2	1	6	0	1.0	0.5	3.0	0.0
astragalus	2	0	0	6	2	0.0	0.0	3.0	1.0
calcaneum	2	0	0	6	0	0.0	0.0	3.0	0.0
tarsal	10	7	2	12	4	0.7	0.2	1.2	0.4
metatarsal	10	8	5	27	10	0.8	0.5	2.7	1.0
phalanges-f	10	7	5	16	24	0.7	0.5	1.6	2.4
phalanges-h	10	23	10	32	35	2.3	1.0	3.2	3.5

p=proximal, d=distal, f=fore, h=hind

Small seal MAU's compared with Bone Mineral Density.

Element	H2	H3	H3 Midden	Sheet Midden
mandible	3.0	1.0	1.5	2.0
atlas	4.0	0.0	1.0	1.0
axis	1.0	0.0	0.0	0.0
cervical	1.4	0.3	0.4	0.6
thoracic	1.1	0.3	0.5	0.2
lumbar	0.0	0.6	0.2	1.2
sacrum	0.5	0.0	0.3	1.0
rib	1.0	0.6	2.4	1.7
scapula	0.5	3.5	3.0	2.0
humerus-p prox	1.0	0.5	0.0	1.5
humerus-d	1.5	0.0	3.0	1.5
radius-p	1.0	0.0	0.5	1.0
radius-d	1.0	0.0	1.5	2.0
ulna-p	1.0	0.0	0.5	0.0
ulna-d	1.5	0.0	2.0	0.5
innominate	2.5	1.0	0.5	1.5
femur-p	1.0	1.0	2.5	1.5
femur-d	1.0	1.0	1.5	0.0
tibia-p	2.0	0.0	3.5	1.0
tibia-d	2.0	1.0	3.5	1.5
astragalus	0.0	0.0	3.0	1.0
calcaneum	0.0	0.0	3.0	0.0
Spearmens rho correlation	rs=0.33, p=0.13	rs=-0.07, ,p=0.74	rs=0.17, p=0.44	rs=0.02, p=0.94

p=proximal, d=distal

Small seal %MAU's from Late Dorset contexts used for Food Utility index correlation. The MAU calculation includes longbone shafts.

Element	H2	H3	H3 Midden	Sheet Midden
cranium	75.0	0.0	28	28.6
atlas	100.0	0.0	28.6	28.6
thoracic	28.3	7.6	15.2	5.7
lumbar	0.0	17.1	5.7	34.3
rib	26.0	17.9	67.9	47.6
sternum	5.6	0.0	12.7	6.3
scapula	12.5	100.0	85.7	57.1
humerus	37.5	14.3	85.7	71.4
radius/ulna	62.5	14.3	57.1	57.1
innominate	25.0	28.6	14.3	42.9
femur	25.0	57.1	71.4	28.6
tibia/fibula	50.0	28.6	100.0	100.0
fore flipper	8.3	7.6	22.9	29.5
hind flipper	31.7	16.2	79.0	48.6
Spearmens rho correlation	r_s=0.21 p=0.46	r_s =0.12, p=0.64	r_s =-0.15,	r_s =0.01, p=0.9

Small seal %MAU's from Late Dorset context used for Food preference correlation. The MAU calculation includes longbone shafts.

Element	H2	H3	H3 Midden	Sheet Midden
cranium	75.0	0	28.6	28.6
atlas	100.0	0	28.6	28.6
thoracic	28.3	7.6	15.2	5.7
lumbar	0.0	17.1	5.7	34.3
rib	26.0	17.9	67.9	47.6
scapula	12.5	100	85.7	57.1
humerus	37.5	14.3	85.7	71.4
radius/ulna	62.5	14.3	57.1	57.1
innominate	25.0	28.6	14.3	42.9
femur	25.0	57.1	71.4	28.6
tibia/fibula	50.0	28.6	100	100
	r_s =-0.24, p=0.47	r_s =0.64, p=0.04	r_s =0.40, p=0.22	r_s 0.49, p=0.13

Walrus MNE's from the Late Dorset contexts.

Element	H2	H3	H3	Sheet Midden
cranium	1	1	0	0
mandible	0	1	0	0
rib	1	0	1	0
tibia	0	1	0	0
metatarsal	0	0	1	0
phalanges	0	0	2	1
baculum	1	1	1	1
ivory	0	1	0	0

Caribou MNE's from the Late Dorset contexts

Element	H2	H3	H3	Sheet Midden
antler	1	1	1	0
cranium	1	0	0	0
hyoid	0	1	0	0
mandible	2	0	0	0
cervical	1	0	0	0
lumbar	1	0	0	0
rib	3	2	0	1
scapula	1	1	0	0
humerus	1	0	0	0
radius	1	1	0	0
ulna	1	0	0	0
metacarpal	1	1	0	0
innominate	1	0	0	1
femur	1	0	0	0
patella	1	0	0	0
tibia	2	1	0	1
metatarsal	1	0	0	1
phalanges	1	1	0	0
teeth	2	0	0	0

Muskox MNE's from the Late Dorset contexts.

Element	H2
mandible	1
teeth	9

Categories used to calculate diversity measures

Taxon	NISP
Bird	
canada goose	1
snow goose	7
goose	2
eider	2
duck	10
small gull	2
gull	3
Mammal	
small whale	2
bowhead whale	1
dog/wolf	8
arctic fox	195
arctic hare	11
polar bear	17
bearded seal	48
large seal	11
large seal/walrus	2
ringed seal	970
walrus	18
caribou	53
muskox	10

Thule Inuit, Porden Point (RbJq-6)

Significant bird species MNE's from Thule Inuit contexts.

Skeletal part	H11			H13			H21		H37		M27	
	Anatidae	gull	murre	Anatidae	gull	murre	Anatidae	gull	Anatidae	murre	Anatidae	gull
cranium	0			0	1	1	2	0	1		1	
vertebrae	0				1		11	0	1		0	
sternum	0						0	0	0		0	
rib	0			1			10	0	9		0	
shoulder girdle	1						9	1	2		3	
wings	1		2	3	1	2	8	7	2		7	10
pelvis	0							0	0			
legs	0	1		1	2	24	15	3	1	1	3	3

The MNE values are based on the most frequent skeletal part with consideration to element side, age, and the % of the element present. When a part includes more than one element the most frequent skeletal element portion forms the MNE (shoulder girdle includes: coracoids, furcula and scapula; wings include: humeri, radii, ulnas, carpometacarpi and wing phalanges; and, legs include: femora, tibiotarsi, tarsometatarsi, and foot phalanges).

Large whale MNE's from Thule Inuit contexts.

Element	H11	H13	H21
vertebrae	1	1	3

Small whale MNE's from Thule Inuit contexts.

Element	H11	M27
maxilla	1	1

Dog/wolf MNE's from Thule Inuit contexts.

Element	H13
cranium	1

Arctic fox MNE's from Thule Inuit contexts.

Element	H11	H21	H37	M27
cranium	1		2	1
radius	1			
ulna	3			
scapula		1		
astragalus			3	

Polar bear MNE's from the Thule Inuit contexts.

Element	H21	H37
humerus	1	
fibula	1	1

Small seal element distribution for the Thule Inuit contexts.

Element	**# per Ind.**	**H11**	**H13**	**H21**	**H37**	**M27**	**H11**	**H13**	**H21**	**H37**	**M27**
				MNE's					MAU's		
cranium	1	4	2	3	3	1	4	2.0	3	3	1
mandible	2	1	1	1	1	0	0.5	0.5	0.5	0.5	0.0
atlas	1	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0
axis	1	0	0	0	1	0	0.0	0.0	0.0	1.0	0.0
cervical	7	2	0	1	0	0	0.3	0.0	0.1	0.0	0.0
thoracic	15	1	1	8	0	2	0.1	0.1	0.5	0.0	0.1
lumbar	5	0	1	0	2	1	0.0	0.2	0.0	0.4	0.2
caudal	12	0	0	0	2	0	0.0	0.0	0.0	0.2	0.0
sacrum	4	0	0	1	1	0	0.0	0.0	0.3	0.3	0.0
rib	24	16	7	55	45	11	0.7	0.3	2.3	1.9	0.5
sternum	9	0	0	2	0	0	0.0	0.0	0.2	0.0	0.0
scapula	2	1	1	2	4	0	0.5	0.5	1.0	2.0	0.0
humerus-p	2	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0
humerus-d	2	0	1	1	0	0	0.0	0.5	0.5	0.0	0.0
radius-p	2	2	0	0	5	1	1.0	0.0	0.0	2.5	0.5
radius-d	2	0	0	1	5	0	0.0	0.0	0.5	2.5	0.0
ulna-p	2	1	0	1	1	1	0.5	0.0	0.5	0.5	0.5
ulna-d	2	0	0	1	6	1	0.0	0.0	0.5	3.0	0.5
metacarpal	10	2	3	3	1	0	0.2	0.3	0.3	0.1	0.0
carpal	20	0	0	1	0	0	0.0	0.0	0.1	0.0	0.0
innominate	2	1	0	0	4	0	0.5	0.0	0.0	2.0	0.0
femur-p	2	1	0	0	0	1	0.5	0.0	0.0	0.0	0.5
femur-d	2	0	0	0	2	1	0.0	0.0	0.0	1.0	0.5
tibia-p	2	0	0	0	3	0	0.0	0.0	0.0	1.5	0.0
tibia-d	2	1	0	0	2	0	0.5	0.0	0.0	1.0	0.0
fibula-p	2	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0
fibula-d	2	0	0	0	1	0	0.0	0.0	0.0	0.5	0.0
astragalus	2	0	2	0	1	0	0.0	1.0	0.0	0.5	0.0
calcaneum	2	0	0	0	1	0	0.0	0.0	0.0	0.5	0.0
tarsal	10	0	3	1	1	0	0.0	0.3	0.1	0.1	0.0
metatarsal	10	6	2	6	4	5	0.6	0.2	0.6	0.4	0.5
phalanges-	10	3	4	4	6	3	0.3	0.4	0.4	0.6	0.3
phalanges-	10	3	0	19	4	6	0.3	0.0	1.9	0.4	0.6

p=proximal, d=distal, f=fore, h=hind

Small seal %MAU's from Thule Inuit contexts used for Food Utility index.

Element	H11	H13	H21	H37	M27
cranium	100.0	100.0	100.0	100.0	100.0
atlas	0.0	0.0	50.0	0.0	0.0
thoracic	1.7	3.3	13.3	0.0	13.3
lumbar	0.0	10.0	0.0	13.3	20.0
rib	16.7	14.6	57.3	63.3	45.8
sternum	0.0	0.0	19.4	0.0	0.0
scapula	12.5	25.0	25.0	66.7	0.0
humerus	12.5	50.0	12.5	83.3	0.0
radius/ulna	25.0	25.0	50.0	100.0	100.0
innominate	12.5	0.0	0.0	16.7	0.0
femur	25.0	50.0	0.0	16.7	50.0
tibia/fibula	25.0	25.0	12.5	20.0	50.0
fore flipper	4.2	5.0	10.8	6.7	0.0
hind flipper	7.5	11.7	25.0	13.3	0.0
	r_s =-0.01, p=0.96	r_s =-0.16, p=0.57	r_s =0.22, p=0.44	r_s =0.09, p=0.73	r_s =0.07, p=0.80

Small seal MAU's compared with the Bone density values.

Element	H11	H13	H21	H37	M27
mandible	0.5	0.5	0.5	0.5	0.0
atlas	0.0	0.0	0.0	0	0.0
axis	0.0	0.0	0.0	1	0.0
cervical	0.3	0.0	0.1	0	0.0
thoracic	0.1	0.1	0.5	0	0.1
lumbar	0.0	0.2	0.0	0.4	0.2
sacrum	0.0	0.0	0.3	0.3	0.0
rib	0.7	0.3	2.3	1.9	0.5
scapula	0.5	0.5	1.0	2	0.0
humerus-p prox	0.0	0.0	0.0	0	0.0
humerus-d dis	0.0	0.5	0.5	0	0.0
radius-p	1.0	0.0	0.0	2.5	0.5
radius-d	0.0	0.0	0.5	2.5	0.0
ulna-p	0.5	0.0	0.5	0.5	0.5
ulna-d	0.0	0.0	0.5	3	0.5
innominate	0.5	0.0	0.0	2	0.0
femur-p	0.5	0.0	0.0	0	0.5
femur-d	0.0	0.0	0.0	1	0.5
tibia/fibula-p	0.0	0.0	0.0	1.5	0.0
tibia/fibula-d	0.5	0.0	0.0	1	0.0
astragalus	0.0	1.0	0.0	0.5	0.0
calcaneum	0.0	0.0	0.0	0.5	0.0
	r_s =0.07, p=0.80	r_s =-0.096, p=0.66	r_s =-0.13, p=0.55	r_s =0.26, p=0.22	r_s =0.10, p=0.64

p=proximal, d=distal

Small seal MAU's for the Thule Inuit contexts compared with the food-preference ranking for small seals (Diab 1998). The MAU's are calculated using long bone shafts.

Element	H11	H13	H21	H37	M27
cranium	4.0	2.0	4.0	3	1
atlas	0	0.5	2.0	0	0
thoracic	0.1	0.1	0.5	0	0.1
lumbar	0	0.2	0.0	0.4	0.2
rib	0.7	0.3	2.3	1.9	0.5
scapula	0.5	0.5	1.0	2	0.0
humerus	0.5	1.0	0.5	0.0	0.0
radius/ulna	1.0	0.5	2.0	3.0	1.0
innominate	0.5	0.0	0.0	2.0	0
femur	1.0	1.0	0.5	1.0	0.5
tibia/fibula	1.0	0.5	0.5	1.5	0.5
Spearmens rho correlation	r_s =-0.07, p=0.84	r_s =-0.61, p=0.05	r_s =-0.61, p=0.04	r_s =0.04, p=0.91	r_s =-0.36, p=0.27

Large seal MNE's from Thule Inuit contexts.

Element	H11	H13	H21	H37	M27
radius	1				
rib	4	1	2	2	
sternebra			1		
patella		1			
fibula			1		
metatarsal			1		
phalanx					1

Walrus MNE's from Thule Inuit contexts.

Element	H21	H37
baculum	1	

Caribou MNE's from Thule Inuit contexts.

Element	H11	H13	H21	M27
antler	1	1		
humerus				1
ribs			2	
metacarpal				1

Muskox MNE's from Thule Inuit contexts.

Element	H13	H21
horn	1	
radius		1
ribs		2
tibia		2

Categories used to calculate diversity measures

Taxon	NISP
Bird	
canada goose	4
goose	38
long-tailed duck	1
common eider	40
eider	90
duck	55
loon	5
glaucous gull	23
large gull	1
medium gull	1
small gull	8
gull	10
black guillemont	1
thick-billed murre	3
murre	33
shorebird	1
Mammal	
small whale	2
bowhead whale	7
dog/wolf	1
arctic fox	13
arctic hare	1
polar bear	3
large seal	15
ringed seal	598
walrus	1
caribou	5
muskox	10

Appendix C-Smith Sound Data

Late Dorset Contexts, South West Point site, Qeqertaaraq

Significant bird species MNE’s from the Late Dorset contexts, SWP site, Qeqertaaraq.

	Midden			**House**		
	Anatidae	Gull	Dovekie	Anatidae	Gull	Dovekie
cranium	8	0	0	0	1	0
vertebrae	0	0	15	0	1	2
sternum	4	0	2	1	0	1
rib	1	0	9	0	11	0
shoulder girdle	7	0	6	4	2	0
wings	25	15	3	6	12	7
pelvis	1	0	3	0	0	0
legs	20	4	9	1	8	15

The MNE values are based on the most frequent skeletal part with consideration to element side, age, and the % of the element present. When a part includes more than one element the most frequent skeletal element portion forms the MNE (shoulder girdle includes: coracoids, furcula and scapula; wings include: humeri, radii, ulnas, carpometacarpi and wing phalanges; and, legs include: femora, tibiotarsi, tarsometatarsi, and foot phalanges).

Whale MNE’s from Late Dorset contexts

Element	**House**	**Midden**
rib	2	1

Arctic fox element distribution for the Late Dorset contexts.

	House	Midden	House	Midden	House	Midden
	MNE		MAU		%MAU	
cranium	14	6	14.0	6.0	100.0	92.3
mandible	22	10	11.0	5.0	78.6	76.9
atlas	1	1	1.0	1.0	7.1	15.4
axis	2	1	2.0	1.0	14.3	15.4
cervical	2	1	0.3	0.1	2.1	1.5
thoracic	2	2	0.2	0.2	1.4	3.1
lumbar	3	5	0.4	0.7	2.9	10.8
caudal	23	9	1.4	0.5	10.0	7.7
sacrum	0	0	0.0	0.0	0.0	0.0
rib	62	46	2.4	1.8	17.1	27.7
sternum	0	1	0.0	0.2	0.0	3.1
scapula	8	9	4.0	4.5	28.6	69.2
humerus	12	10	6.0	5.0	42.9	76.9
radius	15	7	7.5	3.5	53.6	53.8
ulna	12	6	6.0	3.0	42.9	46.2
metacarpal	1	0	0.1	0.0	0.7	0.0
carpal	0	3	0.0	0.3	0.0	4.6
innominate	8	6	4.0	3.0	28.6	46.2
femur	13	12	6.5	6.0	46.4	92.3
tibia/fibula	19	13	9.5	6.5	67.9	100.0
astragalus	0	2	0.0	1.0	0.0	15.4
calcaneum	2	2	1.0	1.0	7.1	15.4
tarsal	0	3	0.0	0.3	0.0	4.6
metatarsal	13	0	1.3	0.0	9.3	0.0
phalanges	6	10	0.3	0.5	2.1	7.7

Arctic hare MNE’s from the Late Dorset contexts.

Element	House	Midden
cranium	6	0
mandible	13	0
scapula	1	1
humerus	2	0
radius	2	0
innominate	0	1
femur	1	0
tibia	2	0
metapoidial	0	1

Polar bear MNE's from the Late Dorset contexts.

Element	House	Midden
cranium	0	1
mandible	1	0
cervical	1	0
rib	5	0
scapula	0	1
femur	2	1
tibia	1	1
metapoidial	0	1

Large seal MNE's from Late Dorset contexts.

Element	House	Midde
mandible	1	0
thoracic	1	0
rib	1	0
metatarsal	1	0
phalanx	0	1

Small seal element distribution from the Late Dorset contexts.

	House	Midden	House	Midden
	MNE's		MAU's	
cranium	1	0	1.0	0.0
mandible	0	2	0.0	1.0
atlas	1	1	1.0	1.0
axis	0	1	0.0	1.0
cervical	3	5	0.4	0.7
thoracic	3	7	0.2	0.5
lumbar	3	4	0.6	0.8
sacrum	0	5	0.0	1.3
rib	17	20	0.7	0.8
scapula	2	0	1.0	0.0
humerus-p	1	0	0.5	0.0
humerus-d	0	1	0.0	0.5
radius-p	3	1	1.5	0.5
radius-d	0	0	0.0	0.0
ulna-p	0	0	0.0	0.0
ulna-d	0	0	0.0	0.0
innominate	0	2	0.0	1.0
femur-p	0	1	0.0	0.5
femur-d	1	4	0.5	2.0
tibia-p	2	2	1.0	1.0
tibia-d	2	2	1.0	1.0
astragalus	1	0	0.5	0.0
calcaneum	1	0	0.5	0.0
phalanges-f	3	13	0.3	1.3
phalanges-h	8	7	0.8	0.7

p=proximal, d=distal, f=fore, h=hind

Small seal %MAU's from Late Dorset contexts used for Food Utility index correlation. The MAU calculation includes long bone shaft fragments.

Element	House	Midden
cranium	66.7	0.0
atlas	66.7	50.0
thoracic	13.3	23.3
lumbar	40.0	40.0
rib	47.2	41.7
sternum	0.0	44.4
scapula	66.7	0.0
humerus	33.3	25.0
radius/ulna	100.0	25.0
innominate	0.0	50.0
femur	33.3	100.0
tibia/fibula	66.7	50.0
fore flipper	8.9	18.3
hind flipper	33.3	16.7
Spearmens rho correlation	r_s =0.24, p=0.41	r_s =0.08, p=0.78

Small seal MAU's compared with Bone Mineral Density.

Element	House	Midden
mandible	0.0	1.0
atlas	1.0	1.0
axis	0.0	1.0
cervical	0.4	0.7
thoracic	0.2	0.5
lumbar	0.6	0.8
sacrum	0.0	1.3
rib	0.7	0.8
scapula	1.0	0.0
humerus-p	0.5	0.0
humerus-d	0.0	0.5
radius-p	1.5	0.5
radius-d	0.0	0.0
ulna-p	0.0	0.0
ulna-d	0.0	0.0
innominate	0.0	1.0
femur-p	0.0	0.5
femur-d	0.5	2.0
tibia-p	1.0	1.0
tibia-d	1.0	1.0
astragalus	0.5	0.0
calcaneum	0.5	0.0
Spearmens rho correlation	r_s =-0.23, p=0.29	r_s =0.12, p=0.60

p=proximal, d=distal

Small seal %MAU's from Late Dorset context used for Food preference correlation.

Element	House	Midden
cranium	66.7	0.0
atlas	66.7	50.0
thoracic	13.3	23.3
lumbar	40.0	40.0
rib	47.2	41.7
scapula	66.7	0.0
humerus	33.3	25.0
radius/ulna	100.0	25.0
innominate	0.0	50.0
femur	33.3	100.0
tibia/fibula	66.7	50.0
Spearmens rho correlation	r_s =-0.15,p=0.66	r_s =0.49, p=0.12

Table. Walrus MNE's from the Late Dorset contexts.

Element	House	Midden
	MNE	
cranium	3	4
radius	1	1
rib	11	3
cervical	1	0
baculum	1	1
tibia/fibula	1	1
patella	1	0
metatarsal	0	1
tarsal	0	1
phalanx-hind	2	0

Table. Caribou MNE's from Late Dorset contexts.

Element	House	Midden
	MNE	
maxilla	0	1
rib	1	2
scapula	0	3

Muskox MNE's from the Late Dorset contexts.

Element	**House**	**Midden**
	MNE's	
cranium	1	1
mandible	2	1
cervical	0	2
thoracic	7	0
lumbar	1	0
scapula	0	1
humerus	4	2
rib	14	2
radius	2	0
metacarpal	1	0
carpal	1	0
innominate	2	1
femur	3	2
tibia	2	1
metatarsal	1	0
calcaneum	1	0
phalanx	1	0

The frequency and size distribution of ivory and antler within the house and midden.

Material	Size (Length)	House	Midden
Antler	1-5 cm	3	0
	5-10cm	1	0
	10-15 cm	1	0
Antler total		**5**	**0**
Ivory*	0-1 cm	20	10
	1-2 cm	77	80
	2-3 cm	41	32
	3-4 cm	6	5
	4-5 cm	4	0
	5-6 cm	2	0
	6-7 cm	1	1
	7-8 cm	1	0
	8-9	0	0
	9-10	1	0
Ivory total		**153**	**128**

*all ivory was confidently identified as walrus ivory, no specimens were from narwhal.

Categories used to calculate diversity measures

Taxon	NISP
Bird	
goose	3
brant goose	1
eider	69
long-tailed duck	1
duck	15
glaucous gull	43
iceland gull	2
glaucous/iceland gull	4
gull	4
common raven	16
dovekie	74
black guillemont	2
Mammal	
bowhead	2
arctic fox	711
arctic hare	82
polar bear	19
bearded seal	4
large seal/walrus	2
ringed seal	18
harbour seal	1
harp seal	4
small seal	261
walrus	93
caribou	15
muskox	117

Thule Inuit contexts, Skraeling Island (SfFk-4)

Significant bird species MNE's from the Thule Inuit contexts, Skraeling Island site.

	H15 M	**H 15**		**H16**		**H14/16 M**		
	Anatidae	Anatidae	common raven	Anatidae	common raven	Anatidae	gull	common raven
cranium	0	0	7	0	0	0	0	1
vertebrae	0	0	0	1	0	0	1	0
sternum	0	0	3	0	0	0	0	0
rib	0	0	4	0	0	0	0	0
shoulder girdle	0	0	10	0	0	0	2	0
wings	0	0	8	2	3	1	3	9
pelvis	0	0	5	0	1	0	0	0
legs	1	1	6	0	0	0	0	2

The MNE values are based on the most frequent skeletal part with consideration to element side, age, and the % of the element present. When a part includes more than one element the most frequent skeletal element portion forms the MNE (shoulder girdle includes: coracoids, furcula and scapula; wings include: humeri, radii, ulnas, carpometacarpi and wing phalanges; and, legs include: femora, tibiotarsi, tarsometatarsi, and foot phalanges).

Whale MNE's from the Thule Inuit contexts, Skraeling Island site.

	H14	H15	H16	H15 M	H14/16 M
cranium	1	1	0	1	0
lumbar	0	0	0	1	0
caudal	3	0	1	0	0
rib	0	1	0	1	1
scapula	0	1	1	0	0
humerus	1	0	0	0	0
carpal/tarsal	2	0	0	0	0
phalange	1	0	0	0	0
teeth	0	0	0	0	1

Dog/wolf MNE's from Thule Inuit contexts, Skraeling Island site.

Elements	H14	H15	H16	H15 M	H14/16 M
cranium	0	0	0	0	1
mandible	0	0	0	0	0
atlas	2	2	0	0	0
axis	3	3	0	0	0
cervical	5	5	0	0	1
thoracic	6	6	0	1	4
lumbar	10	10	0	0	0
caudal	8	8	0	1	0
sacrum	7	7	0	0	0
rib	12	12	1	1	27
sternum	3	3	0	0	1
scapula	2	2	0	0	3
humerus	0	0	0	0	2
radius	2	2	0	0	2
ulna	3	3	0	0	0
metacarpal	8	8	0	0	4
carpal	5	5	0	0	2
innominate	4	4	0	1	3
femur	2	2	0	0	2
tibia	1	1	0	1	1
fibula	1	1	0	0	0
astragalus	1	1	0	0	1
calcaneum	1	1	0	0	3
tarsal	0	4	0	0	0
metatarsal	0	4	0	0	0
phalanges	0	31	0	0	0

Arctic fox MNE's from the Thule Inuit contexts, Skraeling Island site.

	H14	H15	H16	H14/16 M
cranium	2	0	0	0
mandible	3	0	0	1
atlas	0	0	0	0
axis	0	0	0	0
cervical	0	0	0	0
thoracic	0	0	3	0
lumbar	1	0	0	0
caudal	2	0	0	1
sacrum	0	0	0	0
rib	3	0	0	0
sternum	1	0	0	0
scapula	4	0	0	0
humerus	1	0	1	0
radius	2	0	0	0
ulna	1	0	0	1
metacarpal	1	0	0	0
carpal	0	0	0	0
innominate	2	0	0	0
femur	0	1	0	0
tibia	2	0	0	0
fibula	1	0	0	0
astragalus	0	0	0	0
calcaneum	0	0	0	0
tarsal	0	0	0	0
metatarsal	1	0	0	0
phalanges	0	0	0	0
teeth	4	5	1	3

Arctic hare MNE's from the Thule Inuit contexts, Skraeling Island site.

Element	H14	H15	H16	H15 M
mandible	0	0	1	0
humerus	0	0	1	0
scapula	0	1	0	1
tooth	1	0	0	0

Large seal MNE's from the Thule Inuit contexts, Skraeling Island site.

	H14	**H15**	**H16**	**H15 M**	**H14/16 M**
atlas	0	0	0	2	1
thoracic	1	2	0	1	1
lumbar	0	1	1	0	0
rib	11	20	2	3	0
sternum	2	0	0	0	0
scapula	0	2	0	2	0
humerus	0	0	0	0	3
radius	0	0	0	0	1
ulna	0	0	0	0	1
metacarpal	2	1	0	0	0
carpal	0	0	0	0	1
femur	2	0	0	1	0
tibia	0	1	0	0	0
fibula	0	1	0	0	0
metatarsal	0	0	0	1	0
phalanges	2	5	0	2	1

Small seal element distribution from the Thule Inuit contexts, Skraeling Island site.

Element	H14	H15	H16	H15M	H14/16M	H14	H15	H16	H15M	H14/16M
			MNE's					MAU's		
cranium	4	1	0	1		4.0	1.0	0.0	1.0	2.0
mandible	1	5	1	1	10	0.50	2.50	0.50	0.50	5.00
atlas	2	3	0	1	7	2.00	3.00	0.00	1.00	7.00
axis	1	1	0	0	5	1.00	1.00	0.00	0.00	5.00
cervical	5	9	5	3	13	0.71	1.29	0.71	0.43	1.86
thoracic	9	29	7	13	67	0.60	1.93	0.47	0.87	4.47
lumbar	4	13	4	7	18	0.80	2.60	0.80	1.40	3.60
caudal	1	5	4	2	17					
sacrum	2	8	0	5	9	0.50	2.00	0.00	1.25	2.25
rib	21	110	34	26	85	0.88	4.58	1.42	1.08	3.54
sternum	2	2	3	4	8	0.2	0.2	0.3	0.4	0.9
scapula	3	4	0	1	16	1.50	2.00	0.00	0.50	8.00
humerus-p	4	7	0	1	4	2.00	3.50	0.00	0.50	2.00
humerus-d	3	6	0	2	3	1.50	3.00	0.00	1.00	1.50
radius-p	3	3	0	4	0	1.50	1.50	0.00	2.00	0.00
radius-d	0	4	0	7	1	0.00	2.00	0.00	3.50	0.50
ulna-p	0	5	0	2	5	0.00	2.50	0.00	1.00	2.50
ulna-d	1	6	0	1	4	0.50	3.00	0.00	0.50	2.00
metacarpal	14	36	3	2	22					
carpal	4	11	1	0	5					
innominate	3	2	1	3	8	1.50	1.00	0.50	1.50	4.00
femur-p	5	8	0	1	6	2.50	4.00	0.00	0.50	3.00
femur-d	5	7	1	2	4	2.50	3.50	0.50	1.00	2.00
tibia-p	3	4	0	5	10	1.50	2.00	0.00	2.50	5.00
tibia-d	1	4	0	5	5	0.50	2.00	0.00	2.50	2.50
fibula-p	0	1	0	0	0					
fibula-d	2	1	1	3	0					
astragalus	3	3	2	2	6	1.50	1.50	1.00	1.00	3.00
calcaneum	3	6	3	2	6	1.50	3.00	1.50	1.00	3.00
tarsal	8	14	1	5	10					
metatarsal	26	72	11	7	55					
phalanges-f	15	64	7	0	48					
phalanges-h	22	98	8	6	63					

p=proximal, d=distal, f=fore, h=hind

Small seal %MAU’s compared with Food Utility Index (FUI) from the Thule Inuit contexts, Skraeling Island site. The MAU calculation includes long bone shaft fragments,

Element	H14	H15	H16	H15 M	H14/16 M
cranium	100.0	16.1	0.0	25.0	25.0
atlas	50.0	48.4	0.0	25.0	87.5
thoracic	15.0	31.2	33.3	21.7	55.8
lumbar	20.0	41.9	57.1	35.0	45.0
rib	21.9	73.9	101.2	27.1	44.3
sternum	5.6	3.6	23.8	11.1	11.1
scapula	37.5	32.3	0.0	12.5	100.0
humerus	50.0	56.5	0.0	37.5	25.0
radius/ulna	37.5	48.4	0.0	100.0	12.5
innominate	37.5	16.1	35.7	37.5	50.0
femur	62.5	64.5	35.7	75.0	37.5
tibia/fibula	50.0	56.5	0.0	87.5	75.0
fore flipper	27.5	53.8	7.1	0.8	43.3
hind flipper	51.7	100.5	57.1	15.8	84.2
Spearmens rho	r_s =-0.04,	r_s =-0.14,	r_s =0.2,	r_s =0.19,	r_s =0.43,
correlation	p=0.88	p=0.62	p=0.5	p=0.5	p=0.1

Small seal MAU’s compared with bone mineral density from the Thule Inuit contexts, Skraeling Island site.

Element	H14	H15	H16	H15M	H14/16M
mandible	0.50	2.50	0.50	0.50	5.00
atlas	2.00	3.00	0.00	1.00	7.00
axis	1.00	1.00	0.00	0.00	5.00
cervical	0.71	1.29	0.71	0.43	1.86
thoracic	0.60	1.93	0.47	0.87	4.47
lumbar	0.80	2.60	0.80	1.40	3.60
sacrum	0.50	2.00	0.00	1.25	2.25
rib	0.88	4.58	1.42	1.08	3.54
scapula	1.50	2.00	0.00	0.50	8.00
humerus-p prox	2.00	3.50	0.00	0.50	2.00
humerus-d dis	1.50	3.00	0.00	1.00	1.50
radius-p	1.50	1.50	0.00	2.00	0.00
radius-d	0.00	2.00	0.00	3.50	0.50
ulna-p	0.00	2.50	0.00	1.00	2.50
ulna-d	0.50	3.00	0.00	0.50	2.00
innominate	1.50	1.00	0.50	1.50	4.00
femur-p	2.50	4.00	0.00	0.50	3.00
femur-d	2.50	3.50	0.50	1.00	2.00
tibia/fibula-p	1.50	2.00	0.00	2.50	5.00
tibia/fibula-d	0.50	2.00	0.00	2.50	2.50
astragalus	1.50	1.50	1.00	1.00	3.00
calcaneum	1.50	3.00	1.50	1.00	3.00
Spearmens rho	r_s =0.14,	r_s =0.14,	r_s =-0.28,	r_s =-0.11,	r_s =-0.18,
correlation	p=0.51	p=0.54	p=0.2	p=0.64	p=0.42

p=proximal, d=distal

Small seal %MAU's compared with the food-preference ranking for small seals (Diab 1998) from the Thule Inuit contexts, Skraeling Island site. The MAU's are calculated using long bone shafts.

Element	H14	H15	H16	H15M	H14/16M
cranium	100.0	16.1	0.0	25.0	25.0
atlas	50.0	48.4	0.0	25.0	87.5
thoracic	15.0	31.2	33.3	21.7	55.8
lumbar	20.0	41.9	57.1	35.0	45.0
rib	21.9	73.9	101.2	27.1	44.3
scapula	37.5	32.3	0.0	12.5	100.0
humerus	50.0	56.5	0.0	37.5	25.0
radius/ulna	37.5	48.4	0.0	100.0	12.5
innominate	37.5	16.1	35.7	37.5	50.0
femur	62.5	64.5	35.7	75.0	37.5
tibia/fibula	50.0	56.5	0.0	87.5	75.0
Spearmens rho correlation	r_s =0.17, p =0.62	r_s =0.24, p=0.47	r_s =-0.14, p=0.68	r_s =0.73, p=0.01	r_s =-0.01, p=0.95

Walrus MNE's from the Skraeling Island contexts.

Element	H15	H15 M	H14	H 16	H14/16 M
cranium	2	2	1	2	1
mandible	0	4	0	0	0
atlas	1	0	0	0	1
axis	0	0	0	0	0
cervical	1	0	1	0	0
thoracic	1	0	1	0	0
lumbar	1	0	0	0	0
rib	4	4	1	4	21
sternum	0	0	0	0	1
scapula	0	1	0	0	3
humerus	0	0	0	0	2
radius/ulna	1	1	2	0	3
innominate	1	0	0	0	0
baculum	1	0	2	1	1
femur	1	0	0	0	0
tibia/fibula	2	0	1	0	1
fore flipper	3	1	0	0	0
hind flipper	4	1	2	2	5

Caribou MNE's from the Thule Inuit contexts.

Element	**H14**	**H15**	**H16**
antler	1	0	1
scapula	0	0	1
femur	0	1	0

Muskox MNE's from the Thule Inuit contexts.

Element	**H14**	**H15**	**H16**	**H15M**	**H14/16M**
antler	0	0	0	0	0
thoracic	0	0	0	1	0
rib	0	2	0	1	1
scapula	1	1	1	0	0
humerus	1	1	0	1	0
ulna	0	1	0	1	0
radius	0	0	0	1	0
femur	0	1	0	1	0
tibia	0	0	0	1	0
tooth	1	0	0	0	0

The frequency and size distribution of ivory and antler in each context.

Material	Size	H14	H15	H16	H14/16 midden	H15 midden
Antler	1-5 cm					
	5-10cm	1		1		
	10-15 cm					
Antler total		**1**	**0**	**1**	**0**	**0**
Ivory*	0-1 cm		2			
	1-2 cm		7	1	1	1
	2-3 cm		3			1
	3-4 cm					
	4-5 cm					
	5-6 cm				1	
	6-7 cm				1	1
Ivory total		**0**	**12**	**1**	**3**	**3**

Categories used to calculate diversity measures

Taxon	NISP
Bird	
goose	4
eider	3
Thayer's gull	2
glaucous gull	1
medium gull	1
large gull	2
common raven	61
Mammal	
small whale	15
bowhead	19
dog/wolf	197
arctic fox	50
arctic hare	5
polarbear	66
bearded seal	13
grey seal	5
large seal	79
large seal/walrus	7
ringed seal	187
harbour seal	3
harp seal	12
small seal	1639
walrus	197
caribou	3
muskox	33