ECONOMIC CHANGE IN PALAEOESKIMO PREHISTORY

ECONOMIC CHANGE

IN

THE PALAEOESKIMO PREHISTORY

OF

THE FOXE BASIN, N. W. T.

By

MARIBETH S. MURRAY, B.A., M.A.

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AUTHOR: Maribeth S. Murray, B.A. (Wilfrid Laurier University), M.A. (Memorial University)

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Abstract

This thesis is a study of economic change in the Palaeoeskimo period (3200 B. P. to 1000 B. P.) at Igloolik Island, in the Foxe Basin, eastern Canadian Arctic. Evidence derived from the analysis of settlement, zooarchaeological and artefactual data was used to infer changes in settlement, subsistence and social organization between early PreDorset (3200 B. P.) and Late Dorset (1000 B. P.). The primary economic unit during early PreDorset was probably the nuclear family and at Igloolik the major subsistence activity was ringed seal hunting. PreDorset settlement was short-term and groups appear to have been highly mobile, moving away from Igloolik to exploit other resources on a seasonal basis. In contrast Dorset groups were less mobile, spending a greater proportion of the year at Igloolik and exploiting a wider range of resources. The Early Dorset period was characterized by the development of new technology, communal walrus hunting, storage practices and the appearance of larger economic and social units. In Late Dorset, this basic pattern remained the same, although subsistence strategies continued to broaden.

The development of communal walrus hunting, storage and the widening of the subsistence base combined to produce relative subsistence security in Dorset as compared to PreDorset. This relative security seems to have been expressed in the elaboration of material culture, particularly walrus hunting harpoon heads, and it may have resulted some socio-economic differentiation between Dorset groups in the Foxe Basin region and those in the central and high Arctic.

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Chapter One

Palaeoeskimo Prehistory: Context, History and Research Issues

Introduction[1]

There is a perception that human survival in the Arctic regions of North America involves a combination of personal and societal perseverance and stoicism (Brody 1991) and a mobile, fluid, and simple socio-economic system (Taylor 1966). This is directly related to the nature of the environment which when compared to more southerly regions is characterized by a difficult climate and relatively low plant and animal diversity. The cold, harsh weather and limited resources of the Arctic are thought to offer few possibilities for economic diversity and to impose stresses on human groups more severe than almost anywhere else in the world (Maxwell 1985, Sutherland 1991).

Like many hunter-gatherers, the peoples who lived and continue to live in the Arctic have frequently been identified with their particular and/or primary mode of subsistence. Thus Eskimo groups in the western Arctic and Inuit groups in the eastern have been studied as hunting peoples who may be whalers, sealers and/or caribou hunters. Similarly Arctic archaeological cultures have variously been characterized as terrestrial and/or marine oriented, omnivorous, opportunistic, foraging or collecting societies (for some examples see McCartney 1989, Savelle and McCartney 1988, Taylor 1966). The focus on subsistence organization in Arctic research is consistent with general anthropological interests in understanding economic change, the development of sedentism, and sometimes agriculture, the development of technological, social, and political complexity as well as the impact of non-traditional market economies on hunting peoples. Economy is tied to the development of social, political and religious institutions, and also structures gender, kin, and inter-group relations. Economic activities have practical, organizational social, symbolic and historical importance and these are intimately intertwined in hunting societies (see

[1] Places mentioned in the text can be found on Figure 1.1.

for example Tanner 1979) Archaeology has focused primarily on the practical and organizational (Binford 1980), less frequently on the social and historical (Duke 1991), and more rarely on the symbolic significance of particular economic strategies (Hodder 1990) Research has emphasized understanding access to resources and has linked various practices to environmental variables such as climate change This approach is situated within an evolutionary framework that explains differences in economic organization primarily as adaptive (Bettinger 1987, Weissner 1982) and which is applied to both archaeological and contemporary hunter-gatherers (Smith 1991) In the case of Arctic peoples, where the environment is seen as the major factor influencing human survival, adaptive models may be physiological as well as economic (Moran 1981)

The social, historical and symbolic aspects of prehistoric economies can be difficult to access particularly if archaeological remains are few Ironically, the cold Arctic climate, thought to have limited past economic possibilities, has enhanced present-day archaeological endeavors Throughout the North American Arctic there are many well-preserved archaeological sites with abundant bone and ivory artefacts, animal remains and relatively undisturbed structures Consequently the region is well-suited for research on prehistoric hunting economies

The aim of this thesis is twofold In the first instance it is to reconstruct long term trends in the economic prehistory of the Palaeoeskimos of the eastern Arctic as a means of explaining changes in the culture history of that group In the second it is to develop an understanding of the relationship of subsistence economy to social organization and symbolic behaviour Archaeological data from a series of Palaeoeskimo sites are used to define settlement patterns, subsistence strategies and general economic trends over approximately 2800 years Changes in these are linked to social re-organization and the symbolic elaboration of certain activities This model is one example an archaeological approach to questions about historical, social and symbolic developments in northern hunting societies

In the eastern Arctic, archaeologists recognize three distinct periods of human occupation Palaeoeskimo, Thule and Inuit The Palaeoeskimo occupation is separated into two broad temporal variants Early and Late The Early Palaeoeskimo period (3500 B P to 2400 B P)[2] is characterized by a number of differently named regional variants, while the Late Palaeoeskimo period (2400 B P to 1000 B P) is equated primarily with Dorset culture In 1925 based on a small collection of artefacts from the south Baffin region, Diamond Jenness identified and named the Dorset cultural tradition (Jenness 1925) The unique nature of Dorset artefacts, and their aged appearance led Jenness to conclude that Dorset occupation preceded but was probably not ancestral to Eskimo culture in the eastern Arctic The question of Dorset origins became a focal point for archaeological research over the next several decades In contrast Thule culture (1000 B P to 350 B P), first identified in 1927 by Therkel Mathiassen was immediately recognized as originating from the Alaska-Bering Strait region and as being ancestral to Eskimo and Inuit groups in Alaska, the eastern Arctic and Greenland (Mathiassen 1927)

In the 1940s at Cape Denbigh, Alaska, Louis Giddings was excavating Choris[3] culture deposits when beneath the Choris levels he discovered a microlithic flint industry reminiscent of Eurasian Mesolithic material He named this the Denbigh Flint Complex and attributed it to a movement of people from Siberia into Alaska (Giddings 1964) Subsequently, Eigil Knuth (1954) working in Pearyland, and Jorgan Meldgaard in Greenland (1952) and the Foxe Basin (1960), identified a microlithic complex that predated Dorset in the eastern Arctic Shortly afterwards William Irving (1957) suggested that Denbigh and other similar material from Alaska and the Canadian Subarctic could be usefully grouped as part of a single cultural tradition which he termed the Arctic Small Tool tradition[4] The eastern Arctic and Greenlandic material discovered by Knuth and Meldgaard could also be seen as part of the same tradition

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[2] Dates may vary somewhat according to geographical area and cultural historical perspective
[3] Choris generally occupied the same temporal period in Alaska as Dorset in the eastern Arctic
[4] Hereafter the Arctic Small Tool tradition is referred to as the ASTt

With the recognition that human history in the eastern Arctic had greater antiquity and complexity than previously thought the question of Dorset origins took a new twist with the possibility that Dorset arose from the pre -Dorset[5] eastern ASTt. Meldgaard's research in the Foxe Basin indicated an *in situ* transition to Dorset although he suggested that Dorset was more heavily influenced by southerly Indian groups than by the ASTt (Meldgaard 1960). Widespread acceptance of an eastern Arctic pre-Dorset/Dorset continuum, came with W. E. Taylor's work in northern Hudson Bay where stratigraphic deposits at the Dorset site Tyara and continuities in artefact classes between Tyara and the pre-Dorset site Arnapik provided a strong argument for cultural continuity (Taylor 1968).

The historical and intellectual contexts in which Palaeoeskimo archaeology has developed, combined with an understandable concern for chronology and cultural taxonomy, have shaped the major research concerns of Palaeoeskimo prehistorians. These have revolved around three principle issues: 1) the relationship between Early and Late Palaeoeskimo groups (Dorset) - including the nature of the 'transition' and the development of Dorset culture; 2) demographics - including the initial peopling of the Canadian Arctic, migration and subsequent resettlements within the region, and local population fluctuations; and 3) Palaeoeskimo economies - including regional and temporal variations, and the stability and reliability of certain subsistence strategies.

1) The Relationship Between Early and Late Palaeoeskimo Groups

Since Jenness' original identification, Dorset culture has come to be seen as a unique variation on a long-lived and widespread circumpolar tradition and as a relatively uniform phenomenon within the eastern Arctic. This is because of the broad similarity in material culture recovered from Dorset sites throughout the region. In contrast, the more easily observable variability in Early Palaeoeskimo material

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[5] The term pre-Dorset refers generally to all Early Palaeoeskimo groups while PreDorset refers specifically to the widespread Early Palaeoeskimo variant distinct from the Independence I and II in the High Arctic and Greenland, Saqqaq in Greenland, and Groswater in Labrador and Newfoundland.

culture, combined with the different ways in which classification of that material has proceeded, have enabled the identification of a number of regional variants (see for example Helmer 1994). As a result of Taylor's (1968) work in Hudson Bay, there is general consensus that Early Palaeoeskimo and Dorset are related but whether they are points along a cultural continuum (Maxwell 1985) or distantly related but separate entities (Tuck and Ramsden 1990) remains a matter of some debate.

Archaeologists recognize several differences between Early Palaeoeskimo groups and Dorset. Dorset are thought to differ from Early Palaeoeskimos by virtue of a more rigid, scheduled system of settlement and subsistence (Maxwell 1985) which is manifest as increased marine specialization and is generally attributed to increasing cold climatic conditions (Maxwell 1985) or to a prolonged period of climatic instability (Renouf 1990). New artefact forms (i.e., ice creepers) appear in the archaeological record between 2800 and 2200 B.P. At the same time some artefact types (i.e., the bow drill) disappear. Sites also become less numerous in the central and eastern Arctic. However, the characterization of this period which has come to be known as "transitional" is highly problematic because it encompasses a number of regional and chronological variants (Groswater, PreDorset, Independence II, Early Dorset and Transitional), it is a time of apparent population fluctuation (Maxwell 1985), and probably also a time of rapid, short term, climate change (Renouf 1990). There is lack of consensus with respect to the identification of transitional sites (Nagy 1994), the nature, mechanism and timing of the transition (Maxwell 1985, Renouf 1990, Tuck and Ramsden 1990) and even whether or not the concept of a "transitional period" is theoretically useful (Nagy 1994).

2) Demographics

Migration has been both a focus of research and an explanatory device in Arctic archaeology. As a research question, Arctic prehistorians have been concerned with the timing and nature of the initial settlement of the Canadian Arctic (McGhee 1976, Maxwell 1973), and subsequent resettlement of regions

by later groups, both Palaeoeskimo and Thule (Fitzhugh 1976b, McGhee 1970). As an explanatory device migration has been used to account for the wide range of variability in material culture (Dekin 1976), the nature of settlement strategies (Murray and Ramsden in press), and discontinuities in the archaeological record (Fitzhugh 1976a, 1980, Tuck 1976). In Palaeoeskimo archaeology, the Core Area model, an elegant demographic and environmental model of population movement, has been central to the explanation of culture change. The model framed a centre of Palaeoeskimo cultural development about 1000 kilometres square, which included Foxe Basin, northern Hudson Bay, and Hudson Strait. This is the area where Dorset culture was first identified (Jenness 1925) and where research indicated consistent and continual occupation by Early and Late Palaeoeskimo groups (Meldgaard 1960), and an *in situ* transition from PreDorset to Dorset (Taylor 1968). Based on the numbers and size of archaeological collections from the region, it was characterized as demographically stable (Fitzhugh 1976b 103) and thought to have supported a larger population than other areas (McGhee 1976 15).

The continuity and intensity of Palaeoeskimo settlement in the Core Area was contrasted with that of 'fringe areas' where continuous occupation had not been demonstrated. Fringe areas included 1) the High Arctic including the Queen Elizabeth Islands and the route to Greenland, 2) the Central Arctic Coast including the low Arctic islands and the mainland coast from Boothia Peninsula west towards the Mackenzie River, 3) the western Barrengrounds, 4) the west coast of Hudson Bay and adjacent eastern Barrengrounds, 5) eastern Hudson Bay coast and the islands, 6) Labrador, and 7) Newfoundland (McGhee 1976 15). The current understanding of site distributions, temporal discontinuities, and analogy with Eskimo groups on fringe areas (Copper, Netsilik, Caribou and Polar) enabled the development of a model that explained why occupations in peripheral regions showed no significant continuity or relationship to each other, but great similarity to occupations in the Foxe Basin and Hudson Strait region.

An environmental and demographic version of the core area model which involved climatic deterioration and the effects of this on resources and human populations in Hudson Bay and Hudson Strait

was also presented (Fitzhugh 1976b). It explained Early Palaeoeskimo expansion as a function of climatic amelioration and/or caribou and musk-ox expansion. Settlement data suggested a decrease in population during the transition to Dorset. This population decrease appeared to be simultaneous in the peripheral regions except for Labrador, and to coincide with the onset of a cooler period (the Sub-Atlantic) around 800 B. C. It was argued that a period of climatic instability reduced caribou populations and contributed to increasingly difficult ice conditions which affected the availability and accessibility of marine species in southern Hudson Bay, and other peripheral regions. These difficulties caused some groups to migrate back to the Core Area, while others may have died out. Population pressure in the core area, may have created enough instability to "trigger social and demographic imbalances" that eventually resulted in the changes in material culture and settlement and subsistence strategies which are thought to mark the transition from Early to Late Palaeoeskimo (Fitzhugh 1976b).

Alternatively, it was suggested that the relatively reliable and abundant resource base in the core area enabled this region to function as a centre for Palaeoeskimo cultural development. Noting the difficulties associated with previous attempts to link culture change to climatic events, McGhee (1976:39) argued that Palaeoeskimo population movements could not be linked to major environmental change and that the disappearance of populations in the fringe areas more probably represented the extinction of local populations rather than abandonment or retreat to the core area.

Since 1976, increased fieldwork in peripheral/fringe regions demonstrated that the sporadic and discontinuous nature of Palaeoeskimo occupation in those places was primarily an artefact of limited sampling. Fieldwork in the High Arctic (Helmer 1992, Schledermann 1990) and Newfoundland (Renouf 1994) has demonstrated that, although some periods may be less well represented, Palaeoeskimo occupations outside the Core Area were indeed lengthy and substantial. Similarly, Tuck (1976) speaking of Newfoundland noted that "the presence of [Groswater] and of other complexes leading to Early Dorset seem[ed] to question the notion of repeated migrations of Dorset people from the so-called Core Area."

He suggested that a model of continuous occupation in Labrador and Newfoundland might more reasonably account for the number of Palaeoeskimo sites in the province and he further proposed that the entire area of Palaeoeskimo occupation might be better viewed as a 'diffusion sphere' within which a sufficient population was maintained to allow stylistic and technological innovations to be rapidly communicated. Tuck (1976: 141) rejected the notion of the core area as an innovative centre, arguing that because groups in 'marginal regions' were faced with new and different environmental conditions, and different resource bases, they should have been equally, if not more, innovative than the people in the core. In general then, the pattern of population movements and regional abandonment proposed in the model have largely been rejected (Maxwell 1985: 50). Demographic models have, however, continued to play a role in explaining Palaeoeskimo culture-history. Most recently, Schledermann (1990) has argued that the multi-regional appearance of archaeological material from Palaeoeskimo sites on the Bache Peninsula of eastern Ellesmere Island is a consequence of ongoing movements between Greenland and Ellesmere Island by Saqqaq and PreDorset groups.

3) Palaeoeskimo Settlement and Subsistence

The research on Palaeoeskimo settlement and subsistence is in part related to the difficulties associated with defining the relationship between Early and Late groups, however it is also in keeping with wider archaeological goals of understanding economic variability and adaptive change among hunting peoples. Palaeoeskimo economic systems have been studied through comparative research on settlement locations, artefact types and frequencies. For example, patterns of resource use and hunting strategies have been inferred from the placement of settlements (Pastore 1986), small-scale geographical shifts in settlement locations (Fitzhugh 1980; Helmer 1992), and stylistic variability in tool types (Maxwell 1985; Meldgaard 1962). Others have used comparative studies of archaeological faunal remains, which are direct indicators of economy, to examine seasonal resource use (Cox and Spiess 1980;

Helmer 1981, McCartney 1989, Murray 1992), resource procurement strategies (McCartney and Helmer 1989) and long-term local subsistence practices (Gronnow 1994, Gronnow and Meldgaard 1988)

At present the picture of Early Palaeoeskimo economies is one of a generalized foraging strategy, usually with both a marine and terrestrial component, although there is some regional variation in the extent of marine mammal use In contrast Dorset are thought to have had a specialized and restricted marine-based economic strategy This model implies a movement away from a mobile, flexible settlement pattern and social system to a more rigid and structured system (Binford 1980) and these economic systems have been portrayed as stable and successful with the change in orientation seen as a response to some form of stress, most probably environmental (Maxwell 1985) This view of a widespread continuity and uniformity in Palaeoeskimo subsistence economies is consistent with some general trends in Palaeoeskimo material culture For example, harpoon heads, generally believed to be good indicators of chronological change and cultural affiliation, exhibit a high degree of similarity in form across the entire region of occupation When changes do occur they appear to be concurrent across large areas suggesting a high degree of regional interaction and similarity and reinforcing notions of Palaeoeskimo cultural homogeneity

4) The Comparative Perspective

The broad research issues defined above in the archaeology of Palaeoeskimo hunters are in keeping with more general trends in the archaeology of hunter-gatherers Palaeoeskimo peoples are presumed to have been regionally and/or locally adapted to their environments with change resulting from change in the adaptive context (Bielawski 1988) The study of change in Palaeoeskimo prehistory is based on the spatial and temporal comparison of settlement and subsistence patterns (Bielawski 1988, Cox and Spiess 1980, Fitzhugh 1972, Helmer 1992, McCartney and Helmer 1989), stylistic shifts and changes in artefact types (McGhee 1979 1981, Maxwell 1973, 1976, Meldgaard 1960 1962 and Taylor 1968) and is often

situated environmentally with reference to patterns of climatic fluctuation (Arnold 1981, Dekin 1972 Fitzhugh 1976b, Helmer 1981 and Renouf 1990)

The study of change in hunter-gatherer archaeology has tended to focus on large-scale, long-term processes which occur outside the cultural system As a consequence, cause is frequently located in the environment (Gould 1985 428) although other factors may include migration, population increase or technological introductions In hunter-gatherer archaeology this framework developed in conjunction with the New Archaeology of the 1970's, is rooted in the cultural ecology of American social anthropology and linked to the work of Steward (1955), White (1959) and Sahlins and Service (1960) Following White (1959) culture is viewed as the extrasomatic means by which humans adapt to their environments, and human behaviour is patterned and governed by materialist constraints In Palaeoeskimo archaeology two significant general models have developed within this paradigm In the first, prehistory is seen as the history of increasing specialization over time, with the less well-adapted groups being replaced by the better adapted (McGhee 1981) In the second groups are modeled as economically and culturally "static" existing in a balanced equilibrium with the environment (Maxwell 1985) In the latter model, change results from ecological stress, or changes in environmental variables rather than from demographic pressure or competition

My research followed from an understanding of Palaeoeskimo archaeology as it is grounded in cultural-ecology and evolutionary theory It grew out of issues specific to Palaeoeskimo research, in particular whether or not there was a significant change in economic organization between PreDorset and Dorset and if so what the implications of that would have been for long-term social political and ideological developments in Dorset Looking at the history of Palaeoeskimo research it became clear that these issues could be addressed in the Foxe Basin where there was a well documented sequence of occupation from earliest PreDorset to the end of Dorset and there were a large number of well-known and previously excavated sites with extant artefact collections Finally more recently collected samples of faunal remains from a series of Palaeoeskimo sites at Igloolik Island meant that a study of economic

patterns was feasible. This thesis then is based on the analysis of settlement patterns, site structures, faunal remains, and artefact assemblages from PreDorset and Dorset occupations in the Foxe Basin, and particularly at Igloolik Island. It is directed towards understanding changes in the economic organization of one group of Arctic hunters and the implications of those changes for other societal institutions. By taking a long-term perspective through the study of archaeological remains two interrelated issues are addressed. Dorset Palaeoeskimo economic history in the Foxe Basin, eastern Canadian Arctic, and the means by which practical economic strategies become translated into symbolic systems. Long-term economic patterns are related not only to ecological conditions but also to prior and subsequent social conditions. Change is modeled as a function of external environmental factors, local historical circumstances and internal social organization.

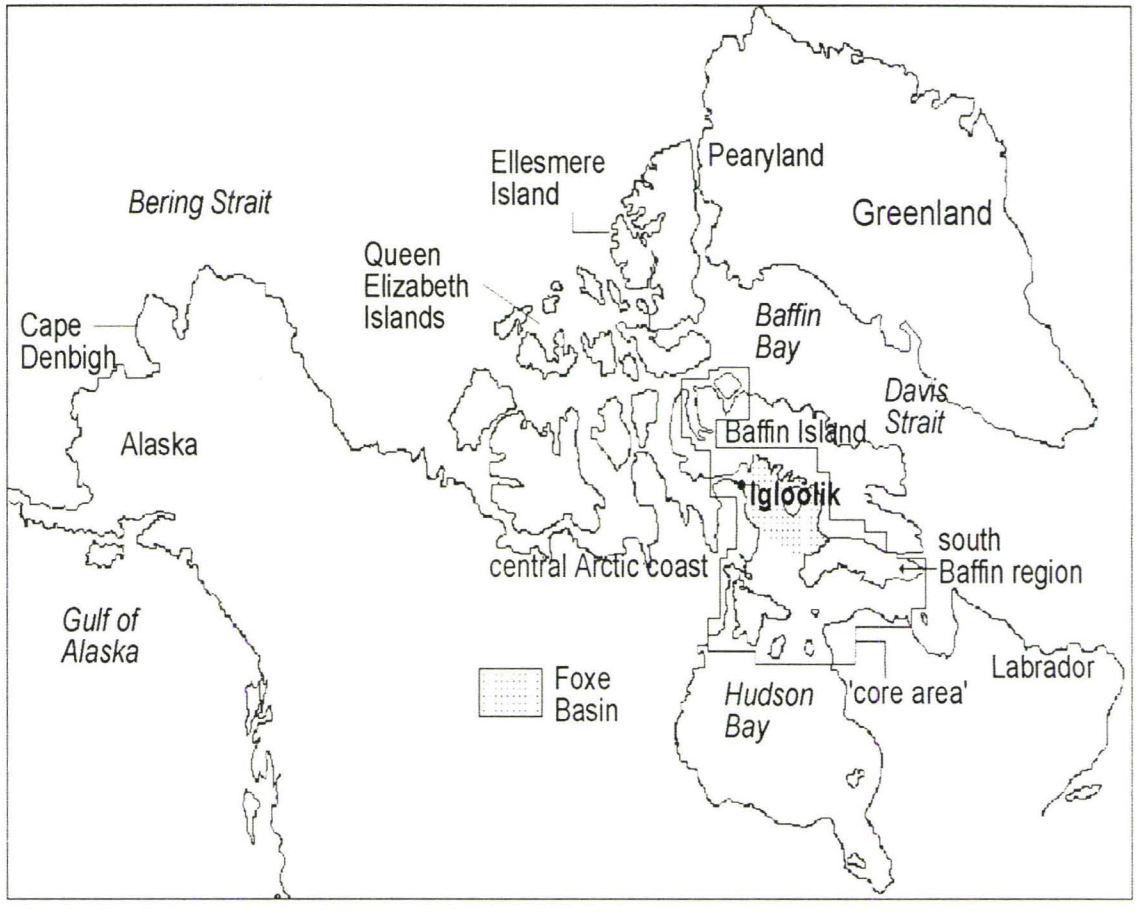

Figure 1.1 Map of the North American Arctic showing places discussed in the text.

Chapter Two

Local Circumstances, Practical Issues and Current Practice

This thesis is a study of long-term economic prehistory and the primary purpose of this chapter is to introduce and discuss the various categories of data, both environmental and archaeological, that will be used to build a picture of Palaeoeskimo prehistory in the Foxe Basin. The economic character of a pre-industrial hunting society is in part based on local resource potential, social organization, and subsistence procurement strategies. In this case, economic potential will be understood through the analysis of local environmental and ecological data, economic and social organization will be understood through the analysis of regional settlement patterns, and community and dwelling organization, and finally, subsistence strategies will be determined through the analysis of zooarchaeological and artefactual data.

Economic Potential in the Foxe Basin

The economic strategies of prehistoric hunters were partly related environmental and ecological conditions and partly to human decision making. Geological processes, geographic and oceanographic features dictated when and where it was possible to live in a region, and the locations of resource concentrations. The climate, as it does today, structured the general types of local plant and animal species, and climate and weather cycles affected human accessibility to animal and other resources. For example, in the Arctic, the accumulation of surplus food through the storage of locally produced agricultural products was not possible. However, some groups of people were able to accumulate surplus through alternative strategies such as the hunting of large game like whales and walrus, or alternatively through trade (Mine and Smith 1989).

The Foxe Basin is a highly productive area, particularly with respect to marine life. It is this marine productivity that made it possible for Palaeoeskimo, and subsequent Thule-Inuit groups to live there

successfully The abundant marine resources of the Foxe Basin are a direct reflection of the geology, geography, oceanography and climate of the region These local conditions and the influence of changes in them on Dorset economic development is a fundamental part of the explanation of the relationship between economic change and Dorset social and symbolic organization In the following section, a discussion of past and present environmental and ecological conditions is used to indicate the range of economic options and constraints Palaeoeskimo peoples in the Foxe Basin may have faced

Geology and Geography[1]

The Foxe Basin region incorporates the northwest coast of the Melville Peninsula, the land immediately north of Fury and Hecla Strait; large islands including Igloolik, Jens Munk, Koch, Bray Rowley, Prince Charles and Air Force, other smaller islands such as the Spicer and Ooglit islands, and the part of the south Baffin coast from Steensby Inlet and the Baird Peninsula to the entrance into Hudson Strait The land is composed primarily of flat tundra and low hills According to the Iglulingmiut who live in the region, the land is puqtutuq - without depth (Brody 1976 153) In the winter, the accumulation of ice and snow creates a relatively uniform landscape making it difficult to tell where the land ends and the coastal ice begins

The geologic processes that formed the Foxe Basin, and which continue even today, have had a significant impact on the nature of the resource base as well as the nature of human settlement in the region The geologic features of Igloolik Island and the Melville Peninsula are a consequence of four long-term processes in the history of the region 1) ancient marine flooding, 2) the Wisconsin glaciation 3) isostatic rebound after deglaciation, and 4) the Arctic climate (Dredge 1992 1) The most significant of these processes with respect to human history is deglaciation and subsequent land rebound

During the Wisconsin glacial maximum, the Foxe Basin - Hudson Bay - Hudson Strait regions were covered by the Laurentide ice sheet which depressed the earth's crust in this area by as much as 150

[1] Places mentioned in the text can be found on Figure 2 1

metres Glacial retreat began around 13000 B P and was completed by around 7000 B P (Craig 1965 1) Post-glacial rebound of the Melville Peninsula and adjacent islands, including Igloolik, averaging around 70 cm/100 years (Dredge 1992), has resulted in a steady increase in land area and coast and a decrease in ocean depth

Igloolik Island lies in the northwest portion of the Foxe Basin near the mouth of Fury and Hecla Strait It is 18 km long and consists of three rocky flat topped hills (buttes) joined by lowland plains partly covered by raised beaches and partly by wet and dry grass-sedge meadows (Forbes et al 1992) The highest of the three buttes is 56 metres above sea level, and the remaining two are 51 and 33 metres above sea level, respectively The buttes step down to the sea in a series of cliffs, small scarps, and raised beaches Bedrock is near the surface in many places and glacial deposits, raised beaches and scree cover most of the island (Dredge 1992 2) In small areas there are patches of marine sand and silt (Dredge 1992 3) as well as numerous small lakes and brackish ponds which along with the extensive tidal flats provide excellent habitat for waterfowl and shorebirds (Forbes et al 1992) At present there is a recurrent polynia about 10 kilometres off the eastern shore of Igloolik This enables offshore and pelagic bird species, primarily guillemots, to remain in the area year-round (Forbes et al 1992) This polynia is also a spring staging area for migratory ducks, terns gulls and loons who wait there until the snow is gone from inland areas (Riewe 1992 217)

Based on the vegetation and climate, Igloolik and the surrounding area is characterized as a "high arctic" region July is the warmest month with an average temperature of 6 3 degrees Celsius The annual precipitation is low, averaging about 27 cm, over half of which falls in the summer (Forbes et al 1992) The average January temperature is -30 degrees Celsius (Etkin and Agnew 1991) and for much of the year, snow and sea-ice dominate the landscape

In the historic period, the sea-ice helped to define northern Foxe Basin and north Baffin as a single culture area For example, the floe-edge followed the shore of Baffin Bay past northeast Bylot Island, along the south side of Lancaster Sound, around the Brodeur Peninsula and down into Fury and Hecla

Strait. This winter and spring ice demarcated the Iglulingmiut lands (Brody 1976:153). Through most of the winter the Foxe Basin is characterized by extensive areas of open water and loose pack ice (Fitzhugh 1976b). These conditions are excellent for walrus and bearded seal. As well, the Igloolik region is notable for a complex coastline (with fjords, and inlets) and extensive land-fast ice which is beneficial to ringed seals.

The seasonal and geographical extent of the sea-ice is influenced by conditions affecting energy exchange between the ocean and the air, (for example air and water temperature, wind conditions, humidity, air pressure, water movement, salinity and existing ice-cover); however, the complex interactions between the two are unclear but seem to be related on both long and short-term cycles. For the most part this makes it difficult to relate ice events to specific archaeological circumstances (Barry et. al. 1977). However, since sea-ice condition affects the distributions and densities of some marine animal species it has been used to explain changes in the subsistence practices of some Arctic peoples (see for example McGhee 1970).

Climate and Weather

As noted in the introduction, the severe climate and difficult weather conditions of the Arctic are thought to be limiting factors for human groups. Long-term climatic changes have often been linked to animal resource fluctuations, major cultural changes, economic re-orientations, and regional discontinuities in settlement histories (see for example Arnold 1981, Dekin 1972, Fitzhugh 1976a, 1976b, Helmer 1981, Maxwell 1985 and Renouf 1990). Maxwell (1985) has summarized the data relating to major culture periods and climate change episodes in the eastern Arctic and these are simplified in Table 2.1.

It is difficult to asses the connections between temperature change, animal resource fluctuations, subsistence strategies and culture change. In some regions the long-term faunal records of Palaeoeskimo sites do not reflect the predicted changes in resource use that should correspond to climatically related

fluxes in animal populations For example there is no significant difference in resource use between early and late Dorset groups in the Crozier Strait region of the high Arctic, despite the fact that the late period is thought to have been significantly warmer and wetter that the early period (Helmer 1981) This suggests that to some extent models of climatically induced culture change have greatly oversimplified the variability in Palaeoeskimo adaptations to regional and local circumstances (Helmer 1981)

Date B. P.	Cultural Period	Climatic Conditions
4500		warming
3900	initial Palaeoeskimo settlement of the eastern Arctic	warm
3500	PreDorset and Independence I expansion throughout the eastern Arctic	start of a cooling period
3200	PreDorset expansion into the barrens	cold
32-3000	PreDorset	cold
3-2800	PreDorset	warm
28-2700	PreDorset	cold
27-2500	PreDorset	warm
2400	late PreDorset/Early Dorset transition and marine intensification	coldest
2-1400	middle Dorset	unstable
1400-900	late Dorset Thule expansion into the eastern Arctic	warm
900-400	Thule	cooling
400	Thule decline	start of the Little Ice Age

Table 2.1 Major cultural periods and climatic conditions in the eastern Arctic

The most recent synthesis of climate change and the development of Dorset culture indicates that various Arctic regions are affected differently by long-term climatic episodes and that for many regions, including the Foxe Basin, climate histories have to be extrapolated from data pertaining to the Greenland and Baffin ice-caps (Renouf 1990) Given the range of variability in geographic and oceanic conditions in the eastern Arctic it is difficult to assess how accurate such extrapolations might be The current consensus is that climatic episodes were regionally variable in both extent timing and duration (McGhee 1994 576) and while certain climate trends are broadly understood, few are precisely dated, or understood

on a local level The exception to this is the Little Ice Age (400 B P to 200 B P) which post-dates the Palaeoeskimo occupation of the eastern Arctic

Although short-term weather episodes are related to longer-term climatic trends it is thought that the former could have had a more pronounced impact on coastal hunters than long-term changes to which people could have adjusted (Tuck 1976) Examples of the impact of weather events from the historic period and in Inuit oral history suggest that unfavourable conditions sometimes led to starvation and had a dramatic impact on particular communities or even local populations (Rowley 1985) Similar situations could be expected in prehistory and at the very least, weather conditions could have forced alternative hunting methods For example, weather conditions have a significant impact on ringed seal behaviour Haul-out during the summer is directly related to temperature, light intensity and wind speeds and in general fewer seals can be found on the ice on windy days, on dull cloudy days, and on days when it is too hot due to a combination of cloudlessness, warm temperatures and calm conditions (Finley 1978 24-44) Thus a prolonged period of any of these conditions could limit the accessibility to and abundance of seals on the ice As an alternative, hunters could seal in open water but under windy conditions this may not always have been feasible

When considering the relationship between climate and weather episodes and Palaeoeskimo prehistory in the Foxe Basin it is possible to use the long-term trends of warming, cooling and instability as presented by Maxwell (1985) to suggest possible changes in the population densities of particular animal species Similarly the effects of weather on hunting conditions and animal availability can also be hypothesized However because palaeoenvironmental techniques do not directly measure sea-ice conditions, snow cover, cloudiness and other general weather patterns, changes in these must be inferred from glaciology, palynology and limnology This can only be done for much longer time periods than the few weeks or months it would take for specific weather events to affect an individual community or communities (Sutherland 1991 142) It is also unlikely that such short-term events would result in archaeologically-visible culture change (Tuck 1976 99) Given the difficulties noted with developing local

climate histories, isolating small-scale weather trends and the problems with radiocarbon dating in the Arctic[2] (Arundale 1981, McGhee and Tuck 1976) it is at present not possible to directly link long-term local developments in Palaeoeskimo prehistory to either climate or weather conditions

Ecology and Animal Populations

There is a wide variety of animals available for human exploitation in the Foxe Basin Historically, Iglulingmiut in the region hunted caribou, ringed seal, bearded seal, walrus, narwhal, beluga and bowhead whales and polar bears They also fished for Arctic char, lake trout, cod, shark, and sculpin In addition a wide variety of birds including ptarmigan, geese, ducks, gulls, seabirds and loons were hunted, and wolves, Arctic fox and hare and occasionally wolverines were trapped (Brody 1976 159) Palaeoeskimo hunters could be expected to take advantage of many of these species, and indeed archaeological data from Igloolik indicate that seal, walrus, caribou, fox and a range of birds were all used to varying degrees and that the species of major economic importance were ringed seal, bearded seal, walrus and caribou

Ringed seal, bearded seal and walrus are all ice-dependent species which are mobile within the Foxe Basin, moving in and offshore depending upon ice conditions and time of year Similarly, the ringed seal and walrus found in certain locations (i e the ice edge, in the floating pack ice on the fast ice) are likely to be members of specific age and sex classes For any group of hunters these concentrations of animals would have been significant with respect to choosing hunting activities and locations while the geographic features and ice conditions of the Foxe Basin would have dictated the accessibility as well as the general robustness and abundance of any given population of animals

At present marine productivity in the Foxe Basin is quite high as indicated by the large numbers of top predator species like walrus and ringed seal (Sergeant and Hay 1978 15) For example, during

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[2] The use of marine mammal bone and fat for radiocarbon dating is problematic Dates on marine material tend to be out of line with the more reliable dates obtained from terrestrial material because the activity of carbon in marine environments is geographically and temporally variable, as is isotopic fractionation These variables are extremely difficult to control for, and correction factors consequently difficult to determine Most archaeologists reject dates from marine sources as too unreliable and dates on more suitable material are rare because of the scarcity of wood charcoal on Arctic archaeological sites

February thousands of walrus have been counted at the floe-edge in northwest Foxe Basin, several thousand were counted in August of 1983 between Igloolik and Rowley islands, 1300 were counted off the southeast coast of Igloolik Island in September 1982, in July and August large numbers are hauled out on ice floes northeast of the Amitoke peninsula and big concentrations are found around the Ooglit islands in the fall. (Riewe 1992:217).

Conditions at various times in the past obviously differed in detail, if not in general outline, from those of the present day; however, they can be estimated using data relating to geological changes, general climate trends and seasonal ice conditions. For example, over the long term an increase in coastline due to geologic uplift can be expected to benefit ringed seals who rely on coastal fast-ice for breeding habitat, haul-out and basking grounds. The more complex the coast, the more extensive fields of fast-ice would be. This can be expected to contribute to increasingly dense populations of ringed seals making the Igloolik area (a region of extensive complex coast), more attractive to sealers than simple straight coasts where seal populations are sparser and more difficult to hunt (McLaren 1958:63).

Uplift processes in the Foxe Basin also created large expanses of shallow coastal shelves. Over time an increase in shallow water area (less than 80 metres deep) would benefit walrus who rely primarily on the mollusk species that inhabit these shelves. The expansion of shallow coastal regions would also benefit a wide range of bird species that use these locations for brood rearing and staging for the fall migrations (Riewe 1992:217)

Heeding the warnings about attempts to correlate climatic episodes with cultural episodes, some general points can be made about the effects of long-term temperature changes on sea-ice formation and precipitation levels, both of which impact animal population levels. Warming trends can be expected to result in warmer winters, more precipitation, delayed development of fast ice in the fall and earlier ice break-up in the spring (Helmer 1981). Such conditions are thought to be bad for caribou because increased winter precipitation makes access to food difficult. Similarly unseasonably warm and erratic spring weather that leads to freeze-thaw episodes makes access to food impossible and causes many

animals to starve to death (Heard and Gray 1989:76). As herd size declines, the size of the region exploited by caribou also shrinks. For example, prior to the turn of the century, caribou were abundant on both Baffin Island and the Melville peninsula with large migrations occurring in both places. Caribou were also common on the islands in Foxe Basin (Brody 1976:16). In the early 1900s there was a huge decline in these caribou herds, probably linked to a series of warm springs. This decline was so dramatic that the Melville migration ceased completely and the herd was reduced to small erratically moving groups. Nearly all the caribou disappeared from the islands in the basin and the Inuit at Igloolik had difficulty getting enough skins to make winter clothing (Calef and Helmer 1976:1). The only available caribou were located on Baffin Island, inland from the Baird peninsula and on the east coast of northern Foxe Basin (Brody 1976:160). The herds did not begin to recover until the late 1940s and have been expanding since that time (Brody 1976:160).

Warming trends are also thought to be bad for ringed seals. These animals rely on stable fast-ice for successful breeding. Longer and/or warmer springs and summers result in later freeze-up and earlier break-up as well as a possible decrease in the overall amount of fast ice. As the total population density of seals in a region is directly related to suitable fast-ice breeding habitat (McLaren 1958:60-61) a reduction in this could be expected to contribute to a reduction in overall population density. In addition seals breeding in unstable ice have higher levels of infant mortality as unstable conditions cause early weaning. Similarly unstable ice makes suitable lair construction difficult and pups in fragile lairs, or on the open ice, are subject to greater predation by polar bears and foxes and often freeze to death. Pups in areas of unstable ice are also more likely to be abandoned in bad weather and are frequently crushed to death by moving ice (McLaren 1958, Smith 1987).

For hunters, increasingly warm years would mean shorter periods of fast-ice hunting, fewer ringed seals, more recourse to open water hunting and a decline in accessibility to caribou. However, long-term warming trends may be beneficial to walrus and bearded seal, both of which are ice dependent species but prefer open water and broken ice, as neither species maintains breathing holes in the fast-ice to the same

extent as ringed seals. Earlier and longer summers would also mean that walrus and bearded seals would be found hauled out on rocky headlands and sand-bars (Mansfield 1963) for longer periods of time. Hunters with an open water hunting technology could take real advantage of the more productive open-water season (McCartney 1989) and make large kills, particularly of walrus, on land at haul-out areas.

Population density (and fluctuations) of animals species is also related to weather conditions, food shortages, inter and intra-species interactions (McLaren 1971:13), disease (Christian and Davis 1971:71) and reproduction rates (McLaren 1962). These smaller scale events would be difficult to determine archaeologically, although they may be assumed to have operated similarly in the past and to have had influence on human economies. For example their two year pupping cycle, combined with direct competition from walrus for shallow feeding areas, especially in winter, limits the bearded seals population size. This combined with the solitary behaviour of the bearded seal would suggest that these animals would not be as readily accessible to hunters as the more populous and densely distributed ringed seal and the more populous and gregarious walrus. In the historic period hunter accessibility to various animals was constrained by geography, weather, technology and animal population dynamics (McLaren 1962:179). These can be assumed to have been constraints for Palaeoeskimo hunters as well, and although some are difficult to recognize archaeologically, they can reasonably be factored into explanations for the general long-term patterns of Palaeoeskimo economy in the Foxe Basin.

Reconstructing Economic Prehistory

The remainder of this chapter outlines the various types of data and analyses used to reconstruct the economic prehistory of Palaeoeskimo groups in the Igloolik region. This includes methods for understanding patterns of social organization and mobility, subsistence strategies and technological innovations.

1) Defining Palaeoeskimo Social Organization and Mobility Patterns

As noted in the introduction, Palaeoeskimo economic and social organization can be understood through the analysis of regional settlement patterns, site structure and dwelling variability. One intent of this thesis is to consider the relationship between economic strategy and social organization. This can be approached though the analysis of temporal shifts in broad-scale settlement patterns. Changes in site density, size, composition, function, and seasonality, as well as changes in structure size, organization and function can all be recovered archaeologically and can be both a reflection of, or cause of, changes in socio-economic organization (Binford 1980). Changes in such things as site density and size may be indications of changes in group mobility. For example, as mobility decreases, more people occupy fewer sites for a longer period of time, producing fewer and larger sites over a given period (Kelly 1992: 56). Such a development might also be recognizable through the appearance of substantial, multi-seasonal houses, as well as storage structures. The development of storage mechanisms is thought to be directly related to risk reduction, changes in the subsistence system and developing social and/or economic complexity (Price and Brown 1985).

In keeping with this, all the known Palaeoeskimo settlements at Igloolik were compared with respect to location, total number per period of human occupation, number of features, and type of features in order to assess whether or not there was a significant change over time in mobility and size of the economic unit. On a finer scale five sites were compared with respect to number of structures, settlement organization, type, size and organization of structures, and subsistence data in order to assess changes in the intensity of site use, subsistence strategies and socio-economic organization. This multi-scalar settlement analysis permits more comprehensive explanations of economic change and at the same time provides greater confidence in interpretation if there is consistency at both levels. In spite of the limitations of the data from Igloolik (the difficulty of establishing the contemporeneity of sites and features within sites and the lack of suitable radiocarbon dates) it is entirely appropriate for this study because the problem is best approached by a temporal scale of analysis that is relatively coarse. In order to

address questions about changing economic strategies it is only necessary to establish whether sites and features are PreDorset or Dorset (see Savelle and McCartney 1988 for a similar example). The cultural affiliation of sites at Igloolik was established from artefactual data (Meldgaard 1954a, 1954b, 1960, 1965, 1969 and Rowley 1991a, 1991b, 1991c, 1992, 1993a, 1993b). While PreDorset and Dorset are both characterized by microlithic chipped stone assemblages there are some major differences in the assemblages of the two groups. PreDorset lithic assemblages are dominated by unpolished and polished spalled burins, stemmed end blades, side blades, concave side scrapers and ovate bifacial knife blades (Maxwell 1985). In general Dorset assemblages are characterized by a predominance of microblades, a scarcity of chipped burins, an abundance of ground burin-like tools and other ground slate artefacts, and triangular end-blades. In addition the various temporal phases of PreDorset and Dorset all have distinctive styles of harpoon heads, lance heads and other categories of organic artefacts such as sled shoes, ice creepers, and needles.

2) Defining Palaeoeskimo Subsistence Strategies

Archaeologically, the most direct means of identifying economic patterning and change is through the analysis of a temporal sequence of zooarchaeological data. This has been a successful approach in a number of studies. For example Stanford (1976) used zooarchaeological data to address a variety of issues bearing on the development of Thule culture in Alaska. These included the identification of changing settlement function as indicated by seal and caribou body part representation, human mobility patterns as indicated by size trends in ringed seal remains, and general economic developments as indicated by changes in species abundance over time.

The long-term patterns in Dorset subsistence economy (general strategies, change over time and difference or similarity to PreDorset), will be established through analysis of zooarchaeological remains from five sites which span the Palaeoeskimo occupation of Igloolik. In other regions of the Arctic the seasonal differences in Palaeoeskimo animal resource use appear to have been greater than changes in

resource use over time (Helmer 1981) Ideally, it would be possible to recover archaeological samples from sites from all phases of occupation and the full range of features at each of the five sites from Igloolik This would help to control for seasonal differences However such comprehensive sampling was not possible because excavations were focused on sites and structures threatened with destruction due to construction, erosion and other modern disturbances (Susan Rowley pers comm) Control over contextual variability is further limited because some sites have a more restricted range of feature types than others The best option for ensuring comparability of the zooarchaeological data was to select samples from contexts that were as similar as possible The samples used here are from dwellings as these were the only feature types found at all five sites In all cases but one, the faunal remains recovered come from structures undisturbed by re-occupation or re-use as garbage dumps In all cases but one, each collection is from a completely excavated structure and represents the total sample from that feature

The settlement data from Igloolik show real changes through time in Palaeoeskimo use of the island PreDorset sites at Igloolik appear to represent short-term, possibly single season occupations with one basic dwelling type In contrast Dorset sites are longer-term, possibly multi seasonal, containing a number of different dwelling types and other structures The comparison of settlement data from different periods of Palaeoeskimo occupation has been used in other locations to suggest differences between the settlement strategies of initial migrants into a region and later groups (Murray and Ramsden in press) and to suggest differences in group size and social organization (Jensen 1993) Differences between PreDorset and Dorset settlement patterns at Igloolik are taken to represent differences in the use of the island and differences in social organization

The use of zooarchaeological remains from dwellings on different sites and spanning different time periods to determine subsistence trends and seasonality is not uncommon Helmer (1981) used similar methodology to assess the relationship between Dorset economy and climate change in the Crozier Strait region and McCartney (1989) used zooarchaeological remains from dwellings to assess household variability from a number of early and late PreDorset sites He then generalized from these samples in

order to identify long-term economic patterns for the Early Palaeoeskimo period on Devon Island Following these examples, the analysis of zooarchaeological data from five sites on Igloolik Island will provide the basis for identifying subsistence strategies and tracking economic change and socio-political developments For example the range and abundance of species in the PreDorset samples are taken to indicate the subsistence strategies for that time period while differences between PreDorset and Dorset samples with respect to species abundance and variety are taken to indicate long-term shifts in Palaeoeskimo economic strategies

3) Understanding Subsistence and Innovation

Artefactual data are a secondary line of evidence bearing on subsistence strategies and a functional analysis of harpoon heads provides further information about changes in Palaeoeskimo hunting practices Traditionally, archaeologists have used differences in harpoon heads to work out Palaeoeskimo chronological sequences (see Maxwell 1976 for one example) and to identify regional groups (McGhee 1979) Although it is recognized that some differences between harpoon types must be related to intended prey and method of hunting, the specific function of any type has usually been inferred from size or from association with faunal remains or regions (Maxwell 1985) Here the objective is to take a more detailed look at a few specific attributes to see whether these can reasonably be related to varying functional requirements of hunting different types of game

A second objective of the artefact analysis is to see if significant technological changes in harpoon head form co-occur with observable changes in the subsistence economy and settlement organization The collections from the Foxe Basin contain large numbers of harpoon heads spanning all periods of Palaeoeskimo occupation The provenience information is sufficiently detailed for the purposes of this study in that all specimens can be related to specific sites time periods and elevation Most importantly, some of the collections are from the same sites as used in the settlement and zooarchaeological analyses

Summary

In subsequent chapters a picture of the long-term economic prehistory of the Palaeoeskimo peoples of the Foxe Basin will be painted from settlement, subsistence and material culture data. Change over time in general settlement patterns, site and dwelling organization, seasonal use of settlements and structures, the composition of zooarchaeological collections and the functional nature of harpoon heads from sites at Igloolik and elsewhere in the Foxe Basin indicate that Palaeoeskimo prehistory in the region was dynamic and characterized by significant shifts in economic and social organization. I will argue that these changes are a consequence of both internal and external factors and that the nature of Late Dorset symbolic behaviour is directly related to socio-economic reorganization in earlier periods.

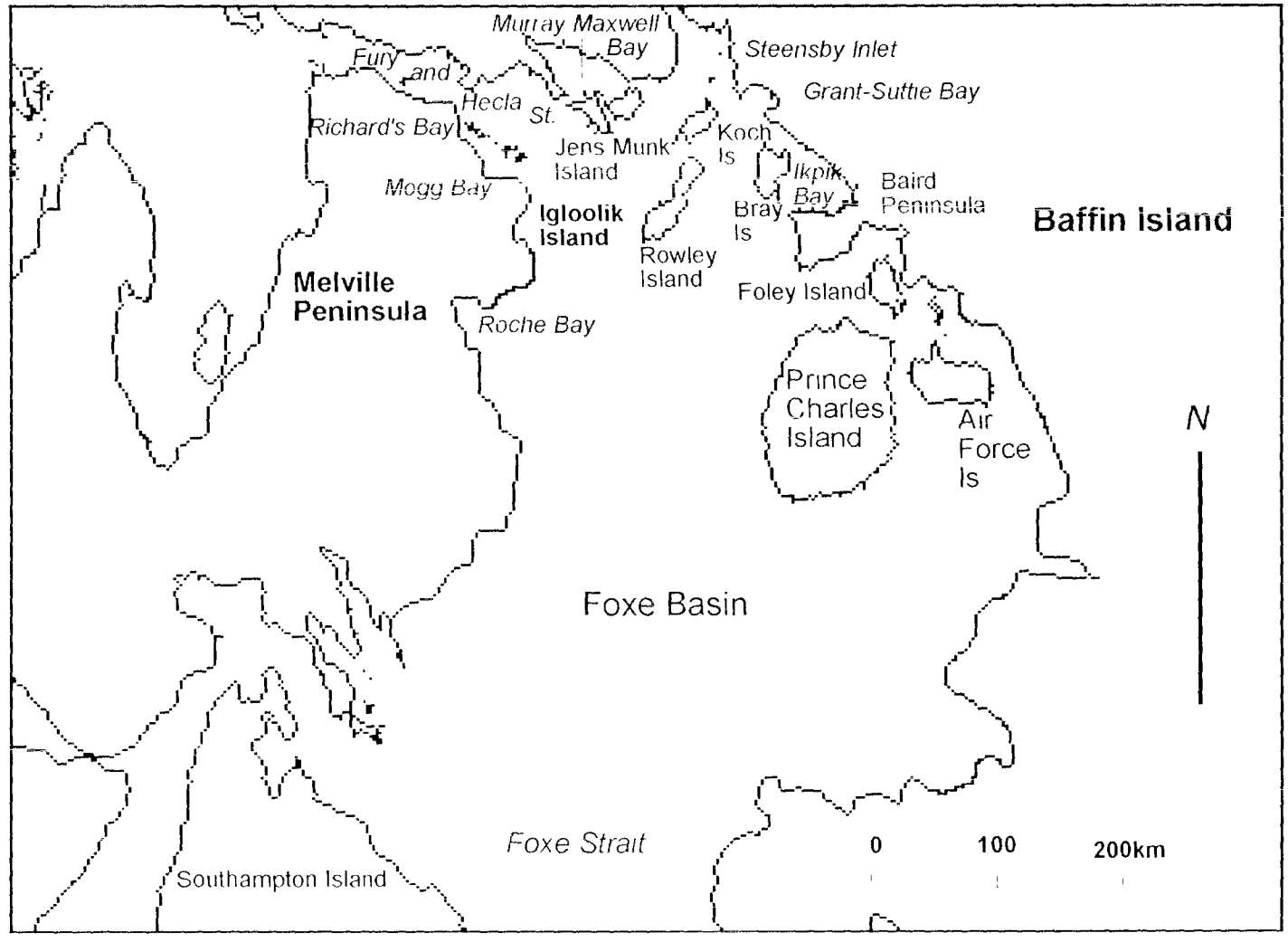

Figure 2.1 Foxe Basin showing places discussed in the text

Chapter Three

PreDorset and Dorset Settlement Patterns at Igloolik

In this chapter the long-term patterns of Palaeoeskimo settlement at Igloolik will be reconstructed through the analysis of the numbers and types of archaeological features located there. These will be used to suggest general models of organization for both PreDorset and Dorset groups. Site structure and dwelling forms indicate that during the PreDorset period settlement consisted of many short-term camps. The settlement data also suggest that there was little differentiation between PreDorset dwellings or sites. In contrast, the greater range of dwelling types in Dorset and the appearance of storage and other features suggests that Dorset groups were less mobile than PreDorset groups. Dorset settlement was more variable in terms of site size and composition and Dorset houses more variable in size than PreDorset. These difference imply that Dorset socio-economic structure was significantly different from PreDorset.

Site structure and dwelling form are a function of both economic and social organization. The contrast between the Netsilik Inuit of the central Arctic and the Pacific Eskimo provides an illustration. The Netsilik were highly mobile[1] hunters who practiced a dual economy of sea mammal hunting in the winter and spring and land mammal hunting and fishing on the coast and in the interior in the summer and fall. The Netsilik had no formalized political leadership, rarely held collective ceremonial activities, and had no system of corporate ownership. Social organization was structured around two kin groups: the restricted *ilagut* which normally included an elderly father and his married sons, their wives and children and some adopted relatives, and the extended *ilagut* which included the members of the restricted *ilagut* some secondary relatives (i.e. one's father's father), affinal relatives and some distant cousins. Most

[1] In any given year a Netsilik family might make up to eight different camps at various fishing, sealing and caribou hunting locations (Balikci 1964).

economic activities were the responsibility of the restricted *ilagut* and each was relatively self-sufficient (Balikci 1964:34) The extended *ilagut* was not a residential, ceremonial, political or economic unit but functioned primarily to regulate marriage and to provide a wider social network than the restricted *ilagut* Membership in either *ilagut* was fluid and group size and composition changed regularly due to mobility, and imprecise inheritance and residence rules (Balikci 1964 24-25) In contrast to the Netsilik, the Pacific Eskimo were sedentary co-operative marine mammal hunters and fishers They had a lineage-based system of social organization which regulated the economic relationships and activities of large groups of related people (Crowell 1988)

Netsilik summer camps consisted of a restricted *ilagut* normally with each nuclear family living in a single tent or two families sharing a tent These tents were small, and easily assembled and disassembled In winter, settlements were somewhat larger, consisting of several restricted *ilagut* who assembled for communal sealing and seal-meat sharing (Balikci 1964 38) The igloo was the primary winter dwelling and it could be easily built in several hours (Boas 1964 132) One igloo usually housed two nuclear families and there was a large communal igloo for feasting and some ceremonial activities Both dual family tents and igloos contained separate sleeping, eating and cooking areas for each family (Boas 1964 138-145) The Pacific Eskimo on the other hand lived in some of the largest permanent villages known among Eskimo peoples Both villages and houses were occupied in all seasons Houses were complex with each permanent wooden semi-subterranean structure housing up to 20 people of a given lineage Multiple side rooms for living, storage, and sweat-bathing were arranged around a communal cooking and eating area Some houses also contained peripheral burial chambers (Crowell 1988)

The differences between Netsilik and Pacific Eskimo houses and camps are a clear reflection of differences between these peoples in mobility, the structure of kinship and the nature of economic organization In this case small groups of self-sufficient mobile hunters with a loose and fluid social system occupy easily constructed, small and simple dwellings while larger sedentary corporate groups

occupy permanent elaborate communal houses The two groups have different socio-economic needs and occupy structures which best suit those needs

In hunter-gatherer archaeology the reconstruction of prehistoric socio-economic organization is usually framed within a forager-collector model which views settlement patterns as a function of a group's organization for access to resources (Binford 1980) In this model foragers utilize a broad spectrum of resources, usually move to resources on a seasonal basis, do not store food, and their sites reflect seasonal activities rather than functionally specific activities In contrast, collectors have specialized task groups, food storage, and a multitude of functionally specific sites Foragers have a limited number of site types primarily base camps and extractive locations, while collectors have residential base camps, field camps extractive locations, hunting stations and caches (Binford 1980) Settlement studies in the Arctic which have been focused on economic organization have addressed such issues as the number and kinds of resources accessible from a given location, the identification of seasonal and functional site types, and the modeling of prehistoric seasonal movements In such examples archaeological sites may be placed into a particular typological category (i e base or field camp) on the basis of data such as site size, layout, composition and location Cultural and or temporal periods may be associated with a foraging and or collecting adaptation depending on the range of site types identified, site locations and economic orientation as reconstructed from both settlement and zooarchaeological data (see for example McCartney and Helmer 1989, Savelle and McCartney 1988) In addition to economic reconstruction, settlement pattern data from the Arctic has also been used to identify cultural differences between groups (McGhee 1979), to suggest strategies of colonization (Murray and Ramsden in press), and to estimate population size and the nature of social units (Harp 1976)

Palaeoeskimo Settlement Patterns at Igloolik

Due to post-glacial rebound Igloolik Island has changed over the past 2800 years from two small, rocky islands to a single large island with a broad and shallow harbour, several small lakes, wet and dry sedge meadows and many kilometres of raised beaches which trap meltwater and are suitable for human

sedge meadows and many kilometres of raised beaches which trap meltwater and are suitable for human settlement (Figure 3.1). It might be expected that the nature of Palaeoeskimo settlement on Igloolik changed as the coastal area of the island increased, new peninsulas developed and wildlife habitat was altered. For example, increased coastal marsh areas would make Igloolik more attractive to waterfowl, which are available primarily in the spring and fall. Hunters wishing to take advantage of this would have several options including: 1) the extension of a winter or summer settlement through the fall and spring, 2) the establishment of short-term bird hunting camps used only in spring and fall. This sort of shift in settlement function and duration of occupation can be seen in changes over time in the numbers and types of dwellings.

Prehistoric archaeological sites on Igloolik were first described by Parry and Lyon in 1822-23 (Brody 1976) and then Mathiassen (1927). Some sites were tested by G. Rowley (Susan Rowley pers. comm.), and others were extensively excavated by J. Meldgaard (1954a, 1954b, 1965). More recently, S. Rowley (1991a, 1991b, 1991c, 1992, 1993a, 1993b) has carried out a program of survey and excavation of a number of Palaeoeskimo sites through the Igloolik Archaeology Field School and several salvage projects. Consequently, much of the island has been thoroughly surveyed and many Palaeoeskimo settlements have been located. The relative chronology for these was established by comparison of recovered artefactual material to material of known date and cultural affiliation, and by the height above sea level of the beach ridge upon which each site is located.

Beach ridges have been used to establish relative chronology in the Arctic for many years (for example Giddings 1964). The basic principle of beach ridge dating is that prehistoric Arctic peoples occupied the stretches of beach closest to the water, similar to historic and contemporary coastal Arctic peoples. In areas where there has been substantial isostatic rebound since deglaciation, settlements which are located at higher elevations are presumed to be older than settlements located at lower elevations. While there are some problems associated with the method (Harp 1976, Ramsden and Murray 1995), when it is combined with independent artefactual data, relatively reliable chronological and cultural

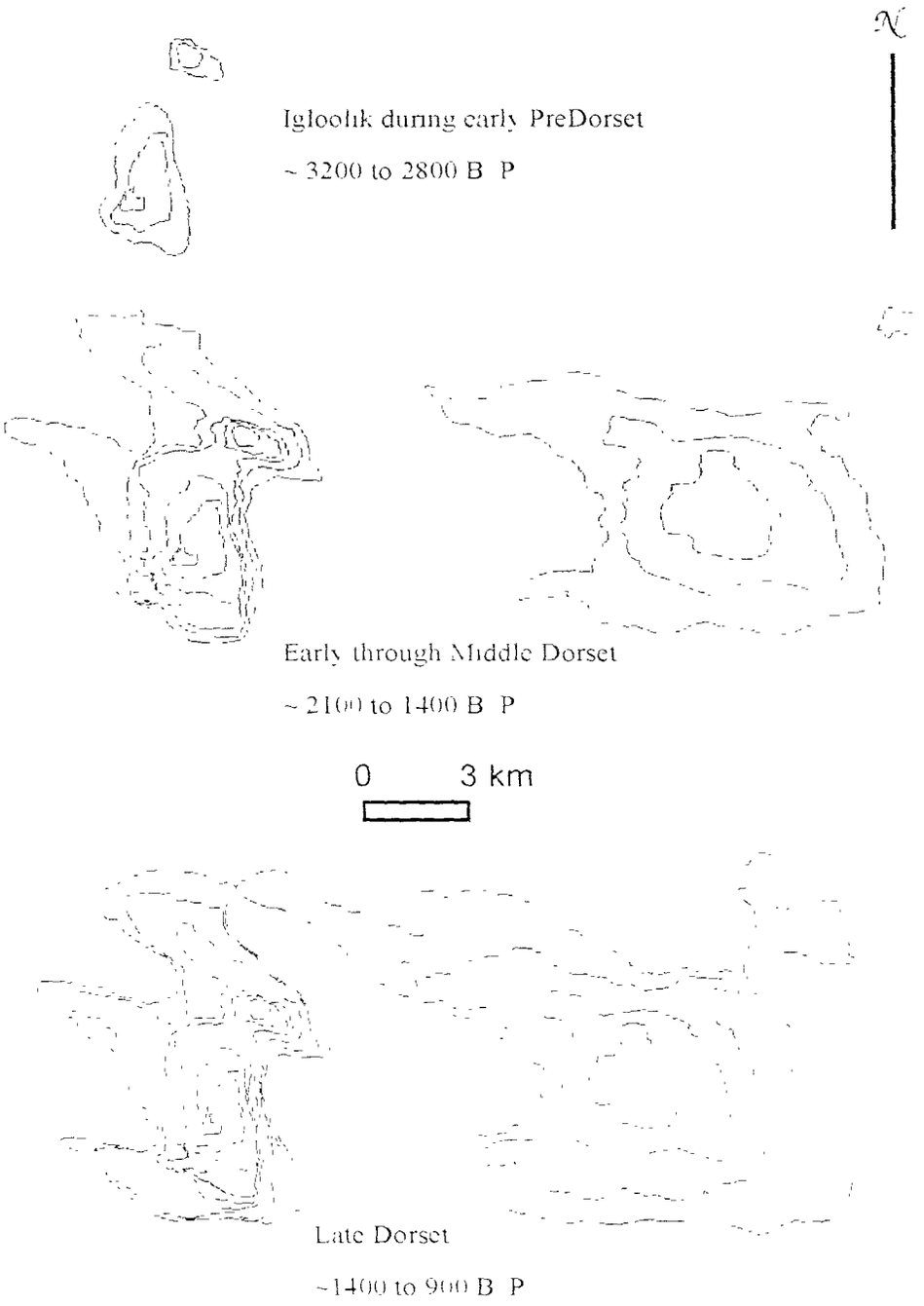

Figure 3.1 Changes over time in size and shape of Igloolik island

sequences can be established For example, Taylor's work at Arnapik and Tyara (Taylor 1968) established a general chronological development from PreDorset to Dorset on the basis of stratified deposits This was consistent with the general chronology developed on the basis of beach ridge dating in the Igloolik area (Meldgaard 1960, 1962), suggesting that at least in the northwest part of Foxe Basin the general association of higher elevation with earlier occupation is reasonable

There are 45 registered locations[2] of Palaeoeskimo settlement at Igloolik Some of these are single-component sites, while others are grouped and registered as large multi-component sites In some cases three or four temporally and geographically distinct settlement areas have been designated as a single site while in others, a single structure has been given a site designation NiHf 4 is a good example of this The site consists of four separate components a late PreDorset component at 25 to 23 metres above sea level, an early Dorset component at 20 to 18 metres above sea level, a late Dorset component at 12 to 8 metres above sea level masl and a late Dorset/Thule component at 11 to 8 metres above sea level Nine of the 45 Palaeoeskimo settlements are not included in this analysis because there is no information about elevation and temporal affiliation is uncertain Table 3 1 summarizes the data on the remaining 36 sites

Height above sea level (in metres)	Temporal Affiliation	Total Number of Settlements
51-37	early to late PreDorset	1
47-44	early PreDorset	1
50-44	PreDorset	6
27-23	late PreDorset	5
25-20	PreDorset	3
22-17	early Dorset	8
20-17	Dorset	4
19-9	middle to late Dorset	1
12-7	late Dorset	6
9-6	Dorset	1
	Total	36

Table 3 1 Palaeoeskimo sites at Igloolik grouped according to elevation and temporal affiliation

[2] All settlement data in this chapter was abstracted from the records of the Archaeological Survey of Canada, and from Meldgaard 1954a, 1954b, 1965 and Rowley 1991a 1991b, 1991c, 1992, 1993a, 1993b These records are reproduced in greater detail in Appendix 1

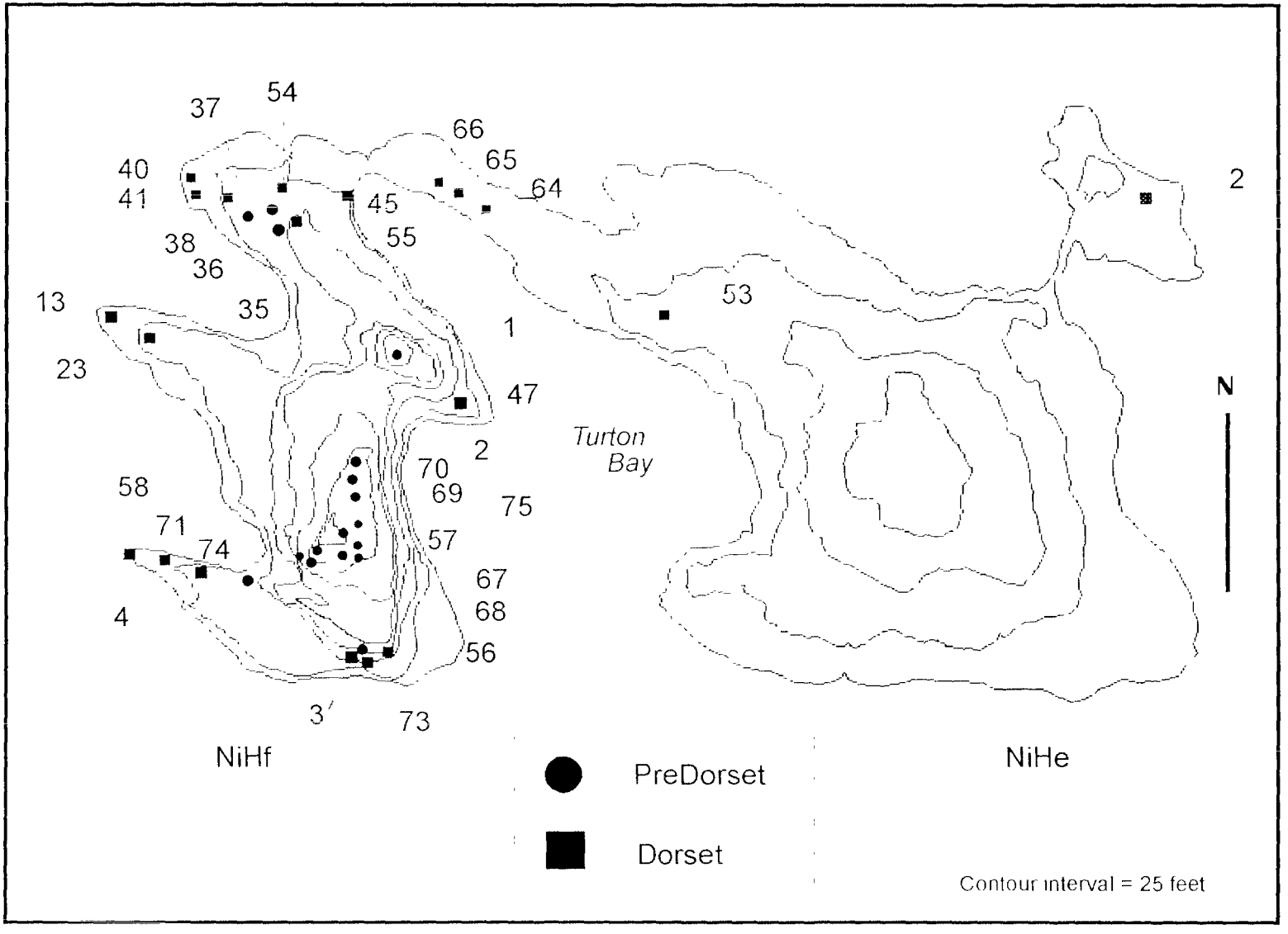

Figure 3.2 Locations of positively identified PreDorset and Dorset sites - Igloolik Island

Some Palaeoeskimo settlements are identified to fairly narrow chronological periods (for example, early PreDorset) while others have been designated to broader periods (for example, PreDorset). This presents two difficulties. First, to attempt analysis on the finest scale would mean that some chronological periods would be represented by a single settlement, thus creating a sample size problem; statistically there is no way to assess how representative of a whole period one settlement may be. Second, the chronological variants within PreDorset and Dorset are not equivalent in duration. For example, the early PreDorset period represents between six and eight hundred years of occupation, the middle PreDorset period between five and seven hundred years and the late PreDorset about four hundred years. To make these periods comparable the number of settlements can be converted to a ratio of settlements per hundred year period, but there is no way to determine into which period those simply designated as PreDorset or Dorset would fit. Moving to a coarser scale of analysis and comparing the number of PreDorset and Dorset settlements solves the problems of small sample size and of temporal incompatibility as both periods represent roughly 1500 years of occupation.

There are 16 settlements associated with PreDorset occupation and 20 with Dorset for a total of 36. This is a relatively equivalent representation however there is a big difference between PreDorset and Dorset settlements in the numbers and kinds of structures found on them. There are 401 features dating to the PreDorset period and 291 dating to the Dorset period. Included in these counts are houses, tent rings, external hearths, caches, fox traps and lithic scatters. Middens are excluded because numbers are not available for them. Furthermore, middens do not reflect occupation in the same way that structures do; they may represent the accumulated debris of one or more households, or one or more periods of occupation and this cannot be directly quantified.

There are 110 more structures in the PreDorset period than in the Dorset period. A comparison of the number and specific types of dwellings for each period indicates that there is a much greater range of variability in structure types in Dorset than in PreDorset, and that some Dorset dwellings are significantly larger than all PreDorset dwellings.

The data on structure form and frequency is summarized in Table 3.2. The category Houses consists of structures described in the site records as 'houses, semi-subterranean houses and boulder houses'. These are substantial structures, clearly visible as depressions on the surface of the ground, or by remaining stone, or low sod walls. The category Tent rings consists only of structures described as tent rings. Tent rings are ephemeral patches of moss or flat stones, sometimes demarcated by a circular or oval ring of larger stones or a low gravel ridge. The category External hearths consists of structures described as 'external hearths, hearths or axial features'. Axial features are linear pavements ranging in size from one to three metres long and up to one metre wide. They generally contain a single hearth feature demarcated by upright slabs in the centre, or two such hearths, one at either end of the pavement. The category Lithic scatters consists of features described as 'lithic scatters or flake scatters'. These are concentrations of chert debris, primarily debitage, not associated with any obvious dwelling feature. The category Fox traps consists of features described as 'fox traps or box traps'. Jumping stones are a linear arrangement of flat limestone slabs, generally placed about one metre apart. They may have been used in a game or ritual, although their function is unclear.

There are 153 unidentified structures in the PreDorset period and 81 in the Dorset period. This category includes structures listed as 'ruins, or unidentified' and cases where structure types were listed but no count was given. These are excluded from analysis[5] thus completely eliminating three PreDorset and three Dorset settlements from consideration. While portions of these sites have been excavated there are no descriptions of the features (Meldgaard 1954a, 1954b, 1960, 1962, 1965). Some dwellings at the PreDorset site NiHf-1 have been described as boulder ovals with axial features, but there is no indication of how many there are, or whether there are other feature types at the site (Rowley 1993a). In addition there are 16 unidentified features from seven other Dorset sites which are excluded from analysis. These excluded features represent 38% of the of the total number of PreDorset features and 27% of the total number of Dorset features.

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[5] These are summarized in Appendix I.

Feature Type	PreDorset		Dorset	
	Number	Frequency (%)	Number	Frequency (%)
Houses	0	0	52	24 7
Dwellings (type uncertain)	3	1 5	0	0
Tent rings	196	89	76	36 1
External hearths	4	1 8	9	4 2
Lithic Scatters	11	5	13	6 1
Caches	6	2 7	55	26 1
Fox traps	0	0	2	0 9
Jumping stones	0	0	1	0 4
Graves	0	0	2	0 9
Total	220	99 8	210	99 4

Table 3 2 Number and frequency of types of structures per period

Based on the current understanding of the function of Palaeoeskimo dwellings (see Jensen 1993 Maxwell 1985, Murray 1992, Ramsden and Murray 1995) and less specific studies of hunter-gatherer settlement systems and structure types (see Binford 1980, Testart 1982, Weissner 1982) tent rings are assumed to have been short-term, possibly single season dwellings, while houses are thought to have been longer-term, possibly multi-seasonal dwellings Lithic scatters are thought to reflect the outdoor manufacture, maintenance and repair of stone tools, caches are interpreted as storage features, and stone fox traps as permanent resource procurement fixtures While jumping stones and graves are difficult to interpret, they are taken to indicate the multi-functional nature of some sites The comparison of the frequency of these feature types illustrates general differences between PreDorset and Dorset settlement at Igloolik Specific seasonality and length of occupation of tent-rings and houses will be dealt with in greater detail in chapter four

As Table 3 2 indicates, tent rings are by far the most common PreDorset feature found at Igloolik Due in part to their ephemeral nature, limited content and small size PreDorset tent rings are usually interpreted as the remains of temporary dwellings probably occupied single family units (Maxwell 1985 Jensen 1993) Tent rings are usually classed as summer structures but in some cases, have also been interpreted as the remains of snow-walled cold-season dwellings (Ramsden and Murray 1995) Without more detailed information and faunal samples is impossible to pinpoint the specific seasonality of these

structures, but, the important and generally agreed upon point with respect to PreDorset tent rings is that they were used on a short-term basis, probably several days to several weeks, by a small group of people

The second most common PreDorset feature type is the lithic scatter These scatters are not associated with any given dwelling type and they probably reflect outdoor manufacturing, maintenance and/or repair of lithic tools Two remaining types associated with PreDorset settlement at Igloolik are the cache and the external hearth Caches are normally equated with some form of storage, while external hearths are equated with outdoor warm weather activities, although like many other Palaeoeskimo structure types, seasonality is inferred rather than demonstrated

PreDorset structures at Igloolik are located between 51 to 23 58 metres above sea level Tent rings are found on all sites and represent 89% all identified features Although the appearance of additional features types (ten of 11 lithic scatters, all six caches and all four external hearths) at the lowest and probably the latest levels of PreDorset occupation (25 5 and 23 58 masl) suggests some change late in the PreDorset period, the broad pattern is best described as one of repeated short-term settlement

Dorset Feature Types

By comparison the Dorset settlement on Igloolik is marked by a much greater range of feature types and this variability is present at all levels of occupation (22-8 masl) Feature types include tent rings (36 1%), a variety of house types (24 7%) such as boulder houses, semi-subterranean houses with and without axial features caches (26 1%), external hearths (4 2%), fox traps (0 9%), lithic scatters (6 1%) and possible graves (0 9%) Dorset tent rings are thought to have been used on a short-term basis while semi-subterranean houses are generally thought to have been more permanently inhabited because of the more substantial nature of their construction (Jensen 1993) Caches are believed to indicate some form of storage Their co-occurrence with tent rings and semi-subterranean houses at the same sites, along with the appearance of permanent resource procurement structures like stone fox traps, ritual/recreational

features like jumping stones, and possible graves, indicates that Dorset settlement on Igloolik was more sedentary than that of PreDorset. This is further illustrated by differences between specific PreDorset and Dorset sites.

As noted above, PreDorset sites are composed primarily of tent rings. The largest of these sites, NiHf 2, reportedly contains 133 such features. Figure 3.3 indicates that these are spread widely over a large area (greater than 3 km^2) and that they occur in clusters of one to 28 structures. This suggests that this site is actually a number of much smaller sites. Descriptions of other PreDorset sites suggest that they are similar in organization to the small clusters at NiHf 2, ranging in size from one (NiHf 68) to 7 tent rings (NiHf 2). This is consistent with most PreDorset sites elsewhere in the eastern Arctic both in terms of dwelling form, and site composition (Jensen 1993: 59), although some axial features are also known. The only PreDorset site that differs significantly from NiHf 2 is NiHf 37. This site occurs late in the sequence as indicated by its elevation of 23.58 masl and consists of 14 tent rings, 3 external hearths, six caches, nine lithic scatters and four additional unidentified structures.

Dorset sites are strikingly different from PreDorset sites and from each other. Information about numbers and types of dwellings is available for 15 Dorset sites and these can be placed into five groups according to the frequencies of tent rings and semi-subterranean houses. These are: sites with tent rings; sites with semi-subterranean houses; sites with both but dominated by semi-subterranean houses; sites with both but dominated by tent rings; and finally sites with approximately equal numbers of tent rings and semi-subterranean houses. These are summarized in Figure 3.4.

If the assumption that house form is broadly indicative of length of occupation or permanence of occupation is correct there are several points to make about these Dorset sites. First it would appear that some sites were occupied repeatedly on a short term-basis (those with many tent rings only) while others were more permanently occupied (those with semi-subterranean houses only). In addition there are other sites that may have been occupied at various time on both a long and short-term basis (those with both types of dwellings). Finally there are sites that are quite large (in excess of 18 dwellings) which could

Figure 3.3 NiHf-2 - distribution of PreDorset tent rings (after Meldgaard n.d.)

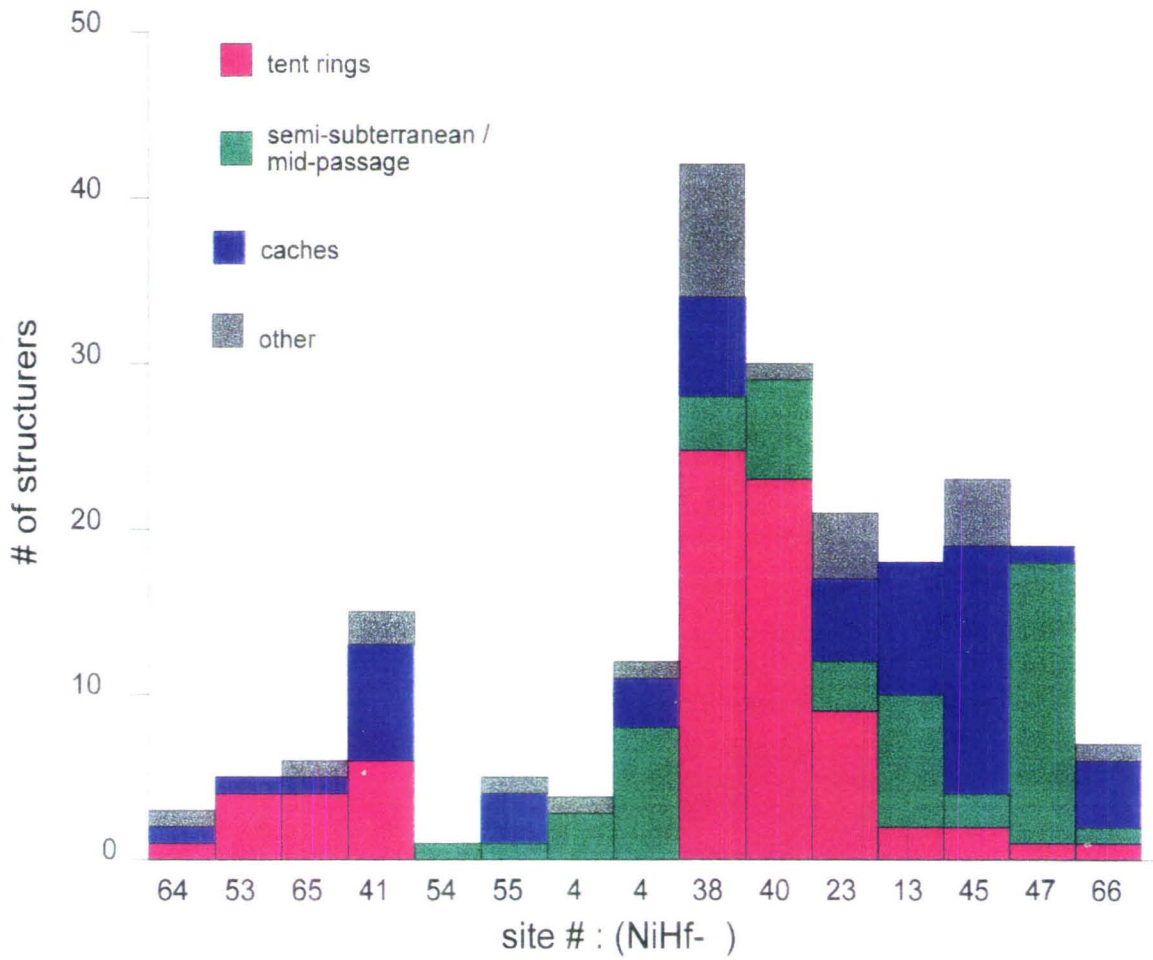

Figure 3.4 Structural variability of Dorset sites, Igloolik island. Sites are grouped accorded to dwelling type: sites with tent rings, sites with semi-subterranean houses, and sites with both.

have been occupied repeatedly by individual households or less frequently by multiple households and other sites that are quite small (only one or two structures) and were probably occupied by only one or two households. All sites except NiHf-54 have at least one cache feature suggesting that some form of storage was practiced throughout Dorset regardless of the duration of occupation or the size of settlement.

It is noteworthy that the largest Dorset sites are located on opposite sides of the island and that they are opposite in composition. For example, NiHf-38, on the west side of the island, contains primarily tent rings (25), with a few external hearths and three semi-subterranean houses. NiHf-47, on the east side of the island, contains 17 semi-subterranean houses and one tent ring. It is tempting to view these sites as seasonal opposites, with NiHf-38 functioning primarily as a warm season short-term camp, and NiHf-47 functioning as a large winter settlement. While it is impossible to assess this, a similar pattern of settlement has been described for the middle Dorset occupation at Port au Choix, Newfoundland. Settlement there appears to consist of a large winter site with substantial semi-subterranean houses on the north side of the Port au Choix peninsula and a smaller summer site, with less substantial dwellings on the south side (Renouf 1991). At Igloolik, in addition to differences in site composition, there are also real differences in the sizes of PreDorset and Dorset dwellings. For the most part Dorset semi-subterranean dwellings are significantly larger than PreDorset tent rings. However, a limited sample of Dorset tent rings indicates that they are, for all intents and purposes, the same average size as PreDorset tent rings. The difference in the average size of Dorset structure types may be related to permanence of occupation, season of use, and household size. For example, Dorset semi-subterranean dwellings may have housed more people and been used for longer periods than Dorset tent rings.

Period	Total tent rings	Tent rings measured	Average size of tent rings (m^2)	Total semi-subterranean houses	Semi-subterranean houses measured	Average size of semi-subterranean houses (m^2)
PreDorset	224	28(12.5%)	8.66	0	0	0
Dorset	76	2 (2.6%)	6.99	52	16 (30.7%)	20.02

Table 3.3. Average sizes of PreDorset and Dorset dwellings.

A similar case can be made for the differences in size and form of Dorset and PreDorset dwellings Jensen (1993) in his survey of Palaeoeskimo house types in the eastern Arctic noted that Dorset houses and axial features were on average much larger than PreDorset tent rings and Independence[4] axial features, and that they commonly contained two or three hearths in contrast to PreDorset structures which only contained a single hearth He suggested that these large semi-subterranean houses were probably multi-family structures and as such represented functionally and socially different situations than PreDorset dwellings It is possible that there may have been seasonal differences in groups size in Dorset, or that While it is impossible to determine how many of the semi-subterranean houses have axial features and multiple hearths, there is at least one at Nihf 47 This dwelling (feature 18) is an 18 21 m^2 semi-subterranean house with a finely constructed dual hearth axial feature over four metres in length At least 11 other semi-subterranean houses appear to have similar large mid-passage features (Rowley 1992), so there is a reasonable possibility that there are more multi-hearth houses at Igloolik

Summary

The data from Igloolik, while incomplete, do indicate that over time there was a significant change in the settlement patterns of Palaeoeskimo peoples on the island While the contemporeneity of structures and sites cannot be assessed, the variability of Dorset sites does stand in real contrast to that of PreDorset sites This difference is due to the greater range of feature types in Dorset, and most significantly the appearance of substantial and large semi-subterranean houses One possible explanation for the appearance of a new house type in Dorset and for the greater variability in Dorset sites is that Dorset groups used Igloolik more extensively and more intensively than PreDorset groups In practical terms, this means that they were less mobile, stayed on the island throughout the year and were more dependent upon locally available or storable resources Certainly the abundance of cache features during Dorset is an indication that groups may have been more sedentary Storage is commonly used as a risk reduction

[4] Independence is a High Arctic and Greenlandic variant in the Early Palaeoeskimo period PreDorset is also part of that period

mechanism among groups who are not in a position to pick up and move to a new location in times of resource stress (Rowley-Conwy and Zvelebil 1989) and among groups who exploit a small territory on an annual basis (comments in Testart 1982)

Based on the settlement data alone, PreDorset sites are most easily interpreted as short-term camp sites. If this is correct then PreDorset people must have been relatively mobile, moving frequently around on Igloolik or spending at least part of their time in places other than Igloolik. The latter option seems most plausible, given the probably limited animal resources available at Igloolik during most of the PreDorset occupation[5] and the general lack of storage and other features which would indicate year-round settlement or regular exploitation of a small territory. By comparison Dorset sites can be variously interpreted as small short-term camp sites, small year-round single or dual household settlements, and multi-seasonal, possibly semi-sedentary villages which swelled in size at particular times of the year possibly in conjunction with the seasonal exploitation of particular resources. There is also a slight indication that the size of the household unit may have been more variable in Dorset than in PreDorset as the sizes of tent rings and semi-subterranean houses within Dorset are quite different, and some semi-subterranean houses have more than one hearth feature. This is often taken to indicate multi-family occupation. The data on dwelling size and hearths suggests, however tentatively, that there may have been significant differences in household size among Dorset groups and this might have been related the permanence of settlement.

In the following chapter, zooarchaeological data from PreDorset and Dorset deposits at Igloolik will be used to expand on these settlement data in an effort to determine whether particular structure types and

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[5] It is unlikely that land mammals would have been abundant on Igloolik during most of the PreDorset period. This is particularly true of caribou which are seldom found on very small islands. Land mammals, and caribou especially are thought to have been indispensable to Arctic survival, and there is good evidence from other locations that they were regularly exploited by PreDorset peoples (see for example McCartney and Helmer 1989). Thus PreDorset peoples living at Igloolik would had to have moved elsewhere for caribou probably to south Baffin or the northern Melville peninsula. PreDorset economy will be explored further in subsequent chapters.

sites can be associated with specific seasonal occupations and resource procurement strategies and to assess whether or not the direct economic evidence supports the settlement strategies reconstructed here

Chapter 4

PreDorset and Dorset Dwelling and Site Seasonality

Detailed zooarchaeological, structural and settlement data from five Palaeoeskimo sites (Figure 4.1) indicate that there were major differences in the settlement strategies of PreDorset and Dorset peoples at Igloolik. PreDorset dwellings and sites are similar to those observed among highly mobile Arctic societies, while Dorset dwellings and sites are in keeping with those observed among more sedentary groups.

The five sites span the period of Palaeoeskimo occupation on Igloolik island. Two settlements are PreDorset (NiHf-2 and NiHf-58), dating to approximately 3800 B.P. Artefactual material from NiHf-2 included unifacial burins and burin spalls, chert and quartz microblades, triangular end blades, stemmed and side-notched bifaces, bone needle blanks, harpoon foreshafts, four self-bladed PreDorset harpoon heads and two Saqqaq harpoon heads (Figure 4.2) (Rowley 1992). Artefactual material from NiHf-58 included burins and burin spalls, microblades, bifaces, scrapers, cores, soapstone lamp fragments, an adze handle, one needle, a bone bipoint, one ivory toggle and an open-socketed harpoon head (Rowley 1992). These assemblages are similar to early Palaeoeskimo assemblages recovered from the High Arctic (McGhee 1979), from other locations at Igloolik (Meldgaard 1969) and are generally typical of the PreDorset cultural tradition in the eastern Arctic (Helmer 1994).

The third settlement, NiHf-47, is an Early Dorset site, dating to approximately 2400 B.P. based on estimates of isostatic rebound. Recovered artefacts are consistent with an Early Dorset occupation and included burin-like tools, burins on flakes, an abundance of ground slate, a rectangular soapstone pot, and a sliced socket harpoon head (Figure 4.2) (Rowley 1992). Maxwell (1985:169) estimates that the Early Dorset period spans between 2735 B.P. ± 143 to 2223 B.P. ± 144 and NiHf-47 probably falls somewhere within this range. The remaining two settlements (NiHf-4 and NiHf-45) are Late Dorset. NiHf-4 is

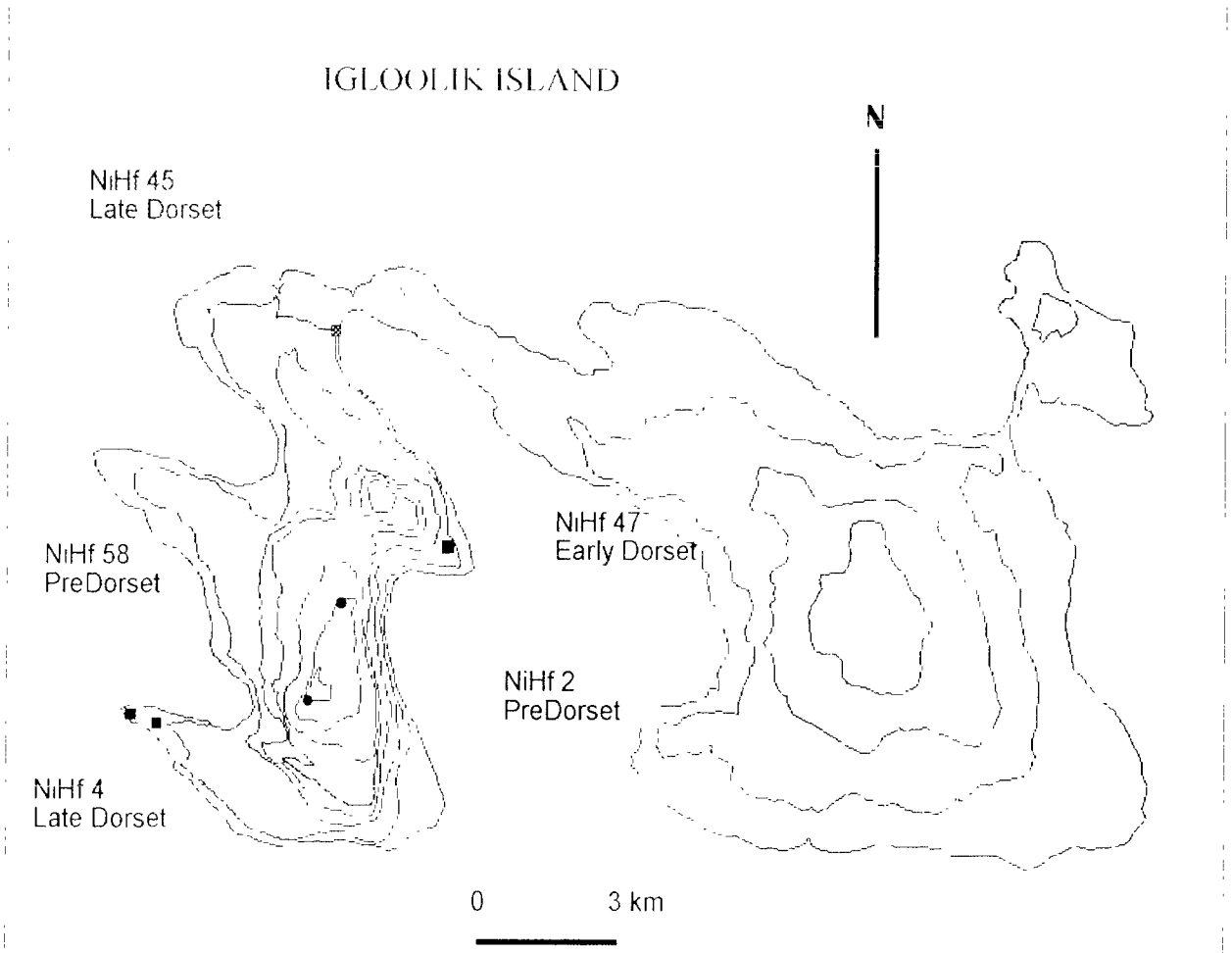

Figure 4.1 Location of sites discussed in Chapter Four

estimated to date between 1200 and 800 B P. Artefactual material included a range of artwork, lithics and Dorset Parallel harpoon heads (Rowley 1993b) Based on estimates of isostatic rebound (Dredge 1992), NiHf-45 dates to approximately 1400 B P Artefacts consistent with this Late Dorset date include several ivory animal carvings, microblades, scrapers, knife handles, awls, needle fragments and needle blanks, a range of organic and lithic debitage, and 26 harpoon heads of seven types (Figure 4-2) Meldgaard's Ha2, J, and F types, Maxwell's Saatut pointed and Kingait closed types, the Dorset parallel type and the Qalirusuijak type [1] Maxwell (1985 218) estimates that the Late Dorset period falls between 1550 B P ± 55 and 420 B P ± 105

Defining structure and site seasonality

Arguments about season of dwelling and settlement occupation are based on the presence or absence and the seasonal availability of animal species identified in the faunal assemblages, the presence or absence of foetal/neonate bone in each assemblage, and the structural nature of dwellings

The relative season of dwelling or site use can be estimated in a number of ways The simplest and most common method is the presence/absence method, whereby the identification of one or more migratory animal species in a given deposit is used to suggest occupation and/or hunting during the period of that species availability (Monks 1981) In the Foxe Basin seasonally-available species include various types of geese and ducks, seabirds gulls, and loons as well as narwhals, belugas, and occasionally bowhead whales All others (ringed seal, bearded seal, walrus, caribou, arctic fox, arctic hare, arctic wolf and polar bear) are permanent residents in the region

The following animals were identified in the faunal samples from the sites at Igloolik Arctic char, migratory waterfowl, ptarmigan, Arctic fox, polar bear, caribou, ringed and bearded seal and walrus The

[1] There is no drawing available for the Qalirusuijak type It is carved from antler with a blade slot on one side and a notch for lashing on the other There is a vertically oriented double line hole (Rowley 1991)

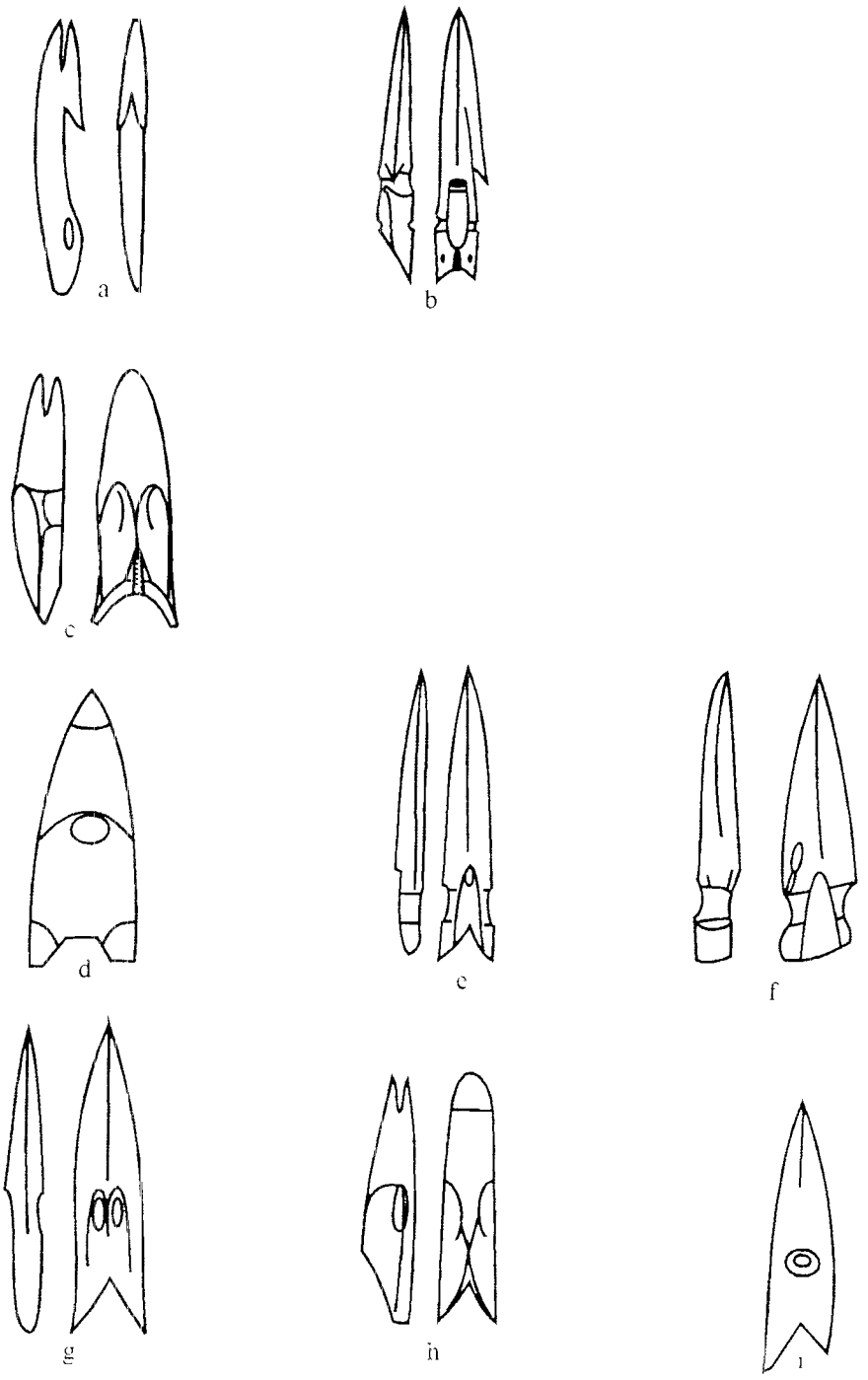

Figure 4.2. Palaeoeskimo harpoon heads. a - Saqqaq type (Gronnow 1994). b - PreDorset type (Meldgaard n.d.). c - Slotted socket Early Dorset type (Meldgaard n.d.). d - Kingait closed type (Maxwell 1976). e - type IIa2 (Meldgaard n.d.). f - type I (Meldgaard n.d.). g - type I (Meldgaard n.d.). h - Dorset Parallel type (Meldgaard n.d.). i - Saatut Pointed type (Maxwell 1976).

seal species, walrus, Arctic fox and caribou represent the bulk of the archaeological material These species are problematic for assessing seasonality, because they are locally available throughout the year There is also an unquantifiable cultural component to seasonality Animal procurement may incorporate "cultural concepts of desirability" which make certain species more "abundant" at particular times of the year (Monks 1981 181) For example, in the Foxe Basin region, caribou hunting and fox trapping are possible throughout the year, however the Iglulingmiut Inuit historically preferred to hunt caribou in the late summer and early fall when the animals were fattest and the skins in the best condition (Brody 1976 160) Foxes, also available year round, were obtained primarily in the fall and winter when furs were better and trapping could be conducted in conjunction with other activities such as caribou hunting or visiting caches (Brody 1976 166) Similar preferences may also have existed among Palaeoeskimo peoples, age data from Arctic fox teeth recovered from the Early Palaeoeskimo site of Qeqqertassusuk in Disco Bay, Greenland, suggests that most foxes were killed in the winter (Gronnow and Meldgaard 988 Gronnow 1994)

Patterns of seasonally preferential hunting have also been noted for walrus, which in the Igloolik region were primarily killed in winter, spring, and late summer/early fall (Brody 1976 164) In the case of walrus, seasonal hunting may have related less to animal condition and more to the inherent dangers of the activity and the social circumstances of any given group For example, throughout the North American Arctic, walrus hunting was generally a co-operative activity Hunting parties ranged in size from two individuals (Boas 1964) to ten or more (Hughes 1984) In some places walrus hunting was also a seasonal activity For example in northern Quebec, walrus hunting was primarily conducted during the summer when the animals were hauled-out on land At such times groups of people would aggregate and large collective hunts would be organized (d'Anglure 1984) Hunting at haul-out places was somewhat safer than hunting in open water or on the thin and /or moving ice In open water a walrus could quickly turn against the hunters and smash the boats into pieces, while hunting on the thin ice was equally risky as

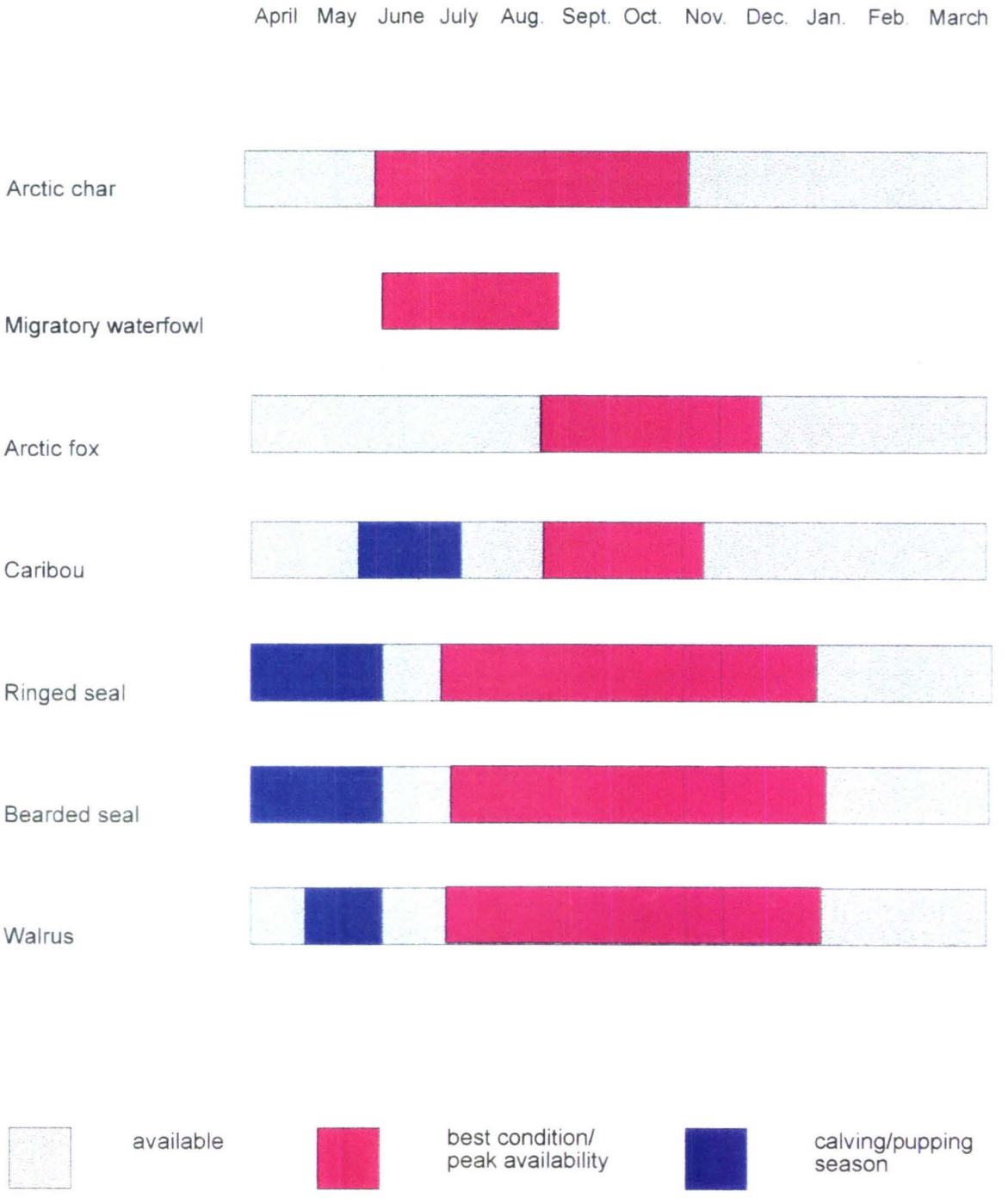

Figure 4.3 Seasonal availability of species identified. Best condition refers to the time when animals are the fattest or have the best quality hides. Peak is when migratory species are available in the Igloolik area in the greatest numbers.

walrus could smash up through the ice. Hunters could be easily drowned in this way (Mary-Rousseliere 1976, 1984).

Assessing or recognizing selective seasonal hunting of species that are generally available year-round is difficult. It is usually based on analogy with ethnographic examples like those discussed above. This is not always reliable but suggestions about the seasonally-specific procurement of these species can be bolstered if there is evidence to indicate procurement of certain age classes - in particular, foetal/neonate individuals. While it is impossible to age pinniped species beyond the broad categories of foetal/neonate, juvenile, immature and adult because of the rapid rate of body growth, slow rate of epiphyseal fusion and the sexual dimorphism in these species, the presence of foetal/neonate bone in a faunal assemblage would indicate some procurement during late winter and very early spring. Ringed seals pup in the greatest numbers around the beginning of April (McLaren 1958: 58), bearded seal in late April and early May (Mansfield 1963: 23) and walrus from mid-April to early June with a peak in births around mid-May (Mansfield 1959: 7). Similarly, the presence of foetal/neonate caribou bone would indicate some procurement during late winter and early spring as caribou in the region generally calve in late spring (Williams 1989: 144).

The use of presence/absence data in archaeological interpretation is problematic, particularly if there is only a single indication of a particular season (for example, one migratory bird bone). This can be a reflection of sample size, and a parallel can be drawn with over-inflating the economic importance of poorly represented species in small samples (Grayson 1978). However, the presence of a variety of seasonally-restricted species in a given assemblage can support an interpretation of seasonality, as can complementary patterns of seasonally-available resources in different types of structures.

For some periods (PreDorset) and places (the central Arctic), explicit archaeological criteria have been established for assessing structure seasonality. This includes the presence/absence of migratory species in the faunal assemblages (McCartney 1989), the presence/absence of clearly defined perimeters, the size of the living floor, and the general location of a structure with respect to prevailing winds, and

suitable building materials (Ramsden and Murray 1995) In other periods, seasonality has been more generally inferred on the basis of ethnographic analogy with historic Inuit groups, or the archaeologically better known Thule-Inuit (Maxwell 1985)

In the following section the general nature of dwelling features is considered within the context of the current understanding of seasonal variability in Palaeoeskimo houses In those cases where explicit structural criteria have not been established, seasonality is based primarily on the evidence of the faunal remains Similarly, estimates of site seasonality are based on faunal data, dwelling form, and the range of structure types present on any given site

PreDorset Structure and Site Seasonality

NiHf 58

Located on the highest point on the western portion of Igloolik island (48 metres above sea level), along the bank of an ancient beach ridge, NiHf 58 is estimated to date to roughly 3800 B P It is likely one of the earliest PreDorset sites in the Foxe Basin region (Rowley 1993a) The site consists of 29 features, 22 of which are described as intact tent rings and the remains of disturbed tent rings There are also several midden areas Six dwellings (Features 1, 3, 4, 14, 24 and 30) have been excavated (Rowley 1992, 1993a, 1993b) and all produced zooarchaeological and artefactual material Unexcavated structures at the site are similar to the six excavated features and are summarized in Appendix II The excavated structures are summarized below in Table 4 1 and illustrated in Figure 4 4 All features contained some fire cracked rock suggesting hearth areas and Features 14 and 30 had the clearly defined perimeters frequently associated with Palaeoeskimo tent remains Feature 3 also had a paved floor, while Features 14 and 20 had paved entrances

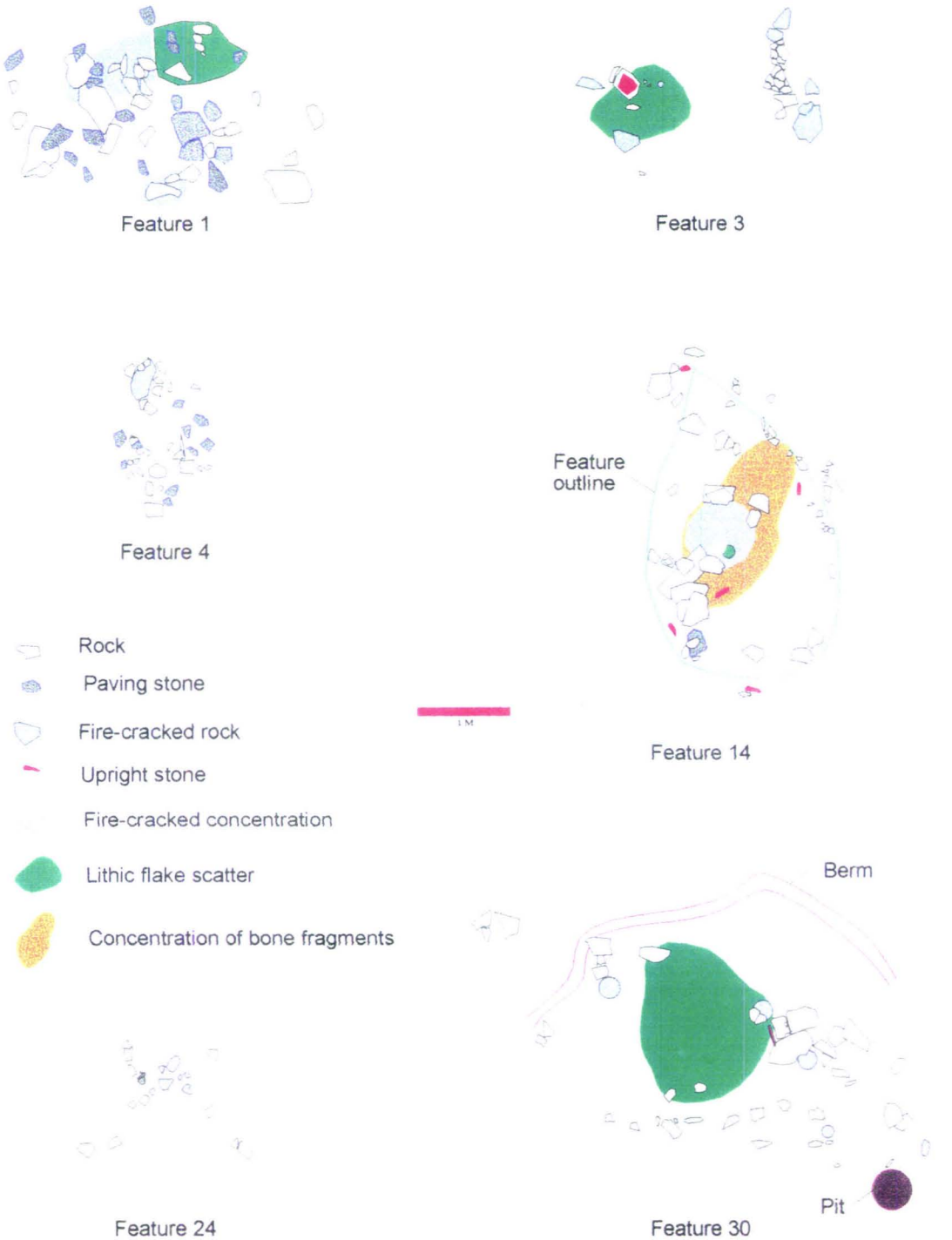

Figure 4.4 Excavated structures at NiHf 58 (after Rowley 1993a, 1993b).

Feature	Dimensions	Shape	Defined Perimeter	Internal Features	Faunal Sample Size
1	3.8m x 3.4m	ellipse	possible	hearth	410
3	3.5m x 3.2m	oval	possible	hearth, paved area	63
4	1.9m x 1.2m	ellipse	no	hearth	71
14	3.0m x 2.4m	oval	yes	hearth, paved entrance	159
24	2.4m x 1.7m	ellipse	possible	hearth	167
30	4.4m x 2.2m	oval	yes	hearths paved entrance	393

Table 4.1 Feature summary, NiHf-58

The zooarchaeological samples from each feature are summarized in Tables 4.2 and 4.3. The relative abundance of each species is indicated by NISP, and rank [2]. Fish remains were identified in two samples (Features 1 and 30), bird remains in three (Features 1, 24 and 30), terrestrial mammal remains four (Features 3, 14, 24, and 30) and marine mammal remains in all six. Sample size and species representation are similar to zooarchaeological collections from PreDorset structures elsewhere in the central and eastern Canadian Arctic (see for example McGhee 1979, McCartney 1989, Ramsden and Murray 1995).

Class	Feature 1		Feature 3		Feature 4		Feature 14		Feature 24		Feature 30	
	N	%	N	%	N	%	N	%	N	%	N	%
Unidentified	127	30.9			15	21.1	63	39.6	15	8.9	40	10.1
Fish	2	0.4									1	0.2
Bird	29	7.0							15	8.9	4	1.0
Mammal	252	61.4	62	100	56	78.8	95	60.3	137	82	348	88.5
TOTAL	**410**	**99.7**	**62**	**100**	**71**	**99.9**	**159**	**99.9**	**167**	**99.8**	**393**	**99.8**

Table 4.2 Zooarchaeological sample summary

[2] Rank is calculated on the basis of NISP. The species with the highest NISP is ranked 1, the species with second highest is ranked 2 and so on.

[3] N = NISP = Number of Identified Specimens. A zooarchaeological term referring to the total number of fragments identifiable to a given taxonomic level.

Species	Feature 1		Feature 3		Feature 4		Feature 14		Feature 24		Feature 30	
	N	R[1]	N	R	N	R	N	R	N	R	N	R
fish	2	5									1	5
duck	9	3							1	4		
goose									2	3		
gull	4	4										
ptarmigan									1	4		
owl	1	6										
caribou			1	2					1	4		
arctic fox							1	4			2	4
ringed seal	181	1	33	1	46	1	71	1	42	1	128	1
bearded seal	19	2	1	2			2	3	4	2	1	5
walrus			1	2			8	2	1	4	4	3
Total	**214**		**36**		**46**		**82**		**52**		**136**	

Table 4.3 Species abundance

At Prince of Wales Island in the central Arctic, cold-season PreDorset dwellings were small, (average 4.3 m^2), with no visible perimeter. They were located in the lee of a slope and produced faunal assemblages of ringed seal, caribou and arctic fox (Ramsden and Murray 1995:112-115). In contrast warm weather dwellings were larger (average 20 m^2) and had well-defined perimeters or internal pavements, sometimes with internal features such as hearths. They were located on ridge tops and produced faunal assemblages of migratory waterfowl and ringed seal (Ramsden and Murray 1995:110-112).

The six excavated structures at NiHf-58 are scattered along the tops of several raised beach ridges (Rowley 1993a) and while none have all of the criteria used to define warm-season occupation at Prince of Wales, five have two or more of the warm-season markers identified by Ramsden and Murray (1995). Feature 1 is large with a hearth and some pavement and contains migratory waterfowl suggesting an occupation between June and August. Features 3 and 30 are also large with hearths and pavements. Feature 30 also has a well defined perimeter. The size and internal organization of Features 3 and 30 and

[1] R= rank

the fish in Feature 30 suggest a warm season occupation, but Feature 3 contains caribou, and there is fox in Feature 30. Caribou skins are in the best condition in late summer (Brody 1976:160). Bulls are fattest prior to the rut (mid October) and cows are fattest from late summer into early winter (Urquhart 1989:70). Fox are in the best condition from late summer into early winter (Brody 1976). Both these features probably represent late summer/early fall occupations.

While Features 14 and 24 are smaller than the warm season structures identified at Prince of Wales, they do contain internal structures and pavements. Feature 14 also contains fox bone. Feature 24 contains migratory waterfowl and caribou suggesting a June through August use of that structure. Feature 4 is somewhat anomalous. It is very small, has no internal structures, no defined perimeter, and the faunal assemblage consists only of ringed seal, a species that is available all year round. The evidence from Feature 4 is most consistent with structures identified at Prince of Wales as cold-season, snow-walled dwellings. These data are summarized below in Table 4.4.

F #	Migratory bird	Fox	Caribou	Ringed seal	Bearded seal	Walrus	Season when migratory species are available and others are preferable at the same time
1	4.2%	0	0	84%	9%	0	June - September
3	0	0	2.7%	91.6%	2.7%	2.7%	August - October
4	0	0	0	100%	0	0	July - January
14	0	1%	0	87%	2%	10%	July - January
24	4%	0	2%	81%	8%	2%	June - September
30	0	1.4%	0	94%	<1%	3%	August - January

Table 4.4 Structure seasonality

Superficially, all 22 dwellings at NiHf-58 fall within the loosely defined category of PreDorset tent rings - they are ephemeral, with thin deposits, and those excavated produced small artefactual and faunal assemblages. Five of the six excavated structures were probably used during the warm months of the year but no two are identical. They may have been used at slightly different periods during the warm season

The variability at NiHf 58 is greater than initially noted in the settlement pattern study, but not inconsistent with that described for other PreDorset sites in the eastern Arctic (McGhee 1979, Schledermann 1990, Ramsden and Murray 1995)

The widespread linear distribution of dwellings over several beach ridges and the large number (22) suggests that NiHf 58 was probably occupied over a number of years, though is not possible to establish which structures might have been used during any specific occupation episode The six excavated dwellings represent a 27% sample of the total number of dwellings The thin depositional layers, sparse cultural and faunal remains and the lack of evidence for re-use indicate that these structures were occupied on a short-term basis and probably not re-used after initial abandonment In the absence of cache structures (which suggest storage) and foetal/neonate animal bones which suggest early spring hunting, the bulk of the evidence points toward the repeated use of NiHf 58 on a short-term seasonal basis, primarily, but not exclusively in the late spring, summer and early fall.

NiHf 2 - Lyon Hill

Archaeological field work in the 1950s[5] established NiHf 2 as a large PreDorset settlement (133 features) located between 44 and 48 metres above sea (Meldgaard 1965) More recently, the excavation of four PreDorset structures at the site has added to the artefact assemblage and produced three zooarchaeological samples (Rowley 1991a 4) These are summarized in Table 4 5 The material culture indicates an early occupation roughly contemporary with NiHf 58 at around 3800 B P although the elevation of NiHf 2 (42-48 masl) is congruent with the 44 metre level at the Kapuvik site on Jens Munk island which has been radiocarbon dated to 3008 ± 140 B P (Rowley 1991a 7-8) so the site could be somewhat younger

[5] Meldgaard excavated at the following locations 48 masl, feature 4 (four artefacts), 44 masl, feature 1 (two artefacts), 43 masl, feature 6 (68 artefacts), 43 masl, feature 8 (50 artefacts), and 42 masl, feature 16 (5 artefacts) and recovered burins, burin spalls, microblades, needles, harpoon foreshafts, a single harpoon head, an arrow head, a flint flaker and an awl (Meldgaard 1965, 1969)

Feature 1 (Figure 4 5) was completely excavated There was an area of fire-cracked rock in the northeast portion of the feature, a second in the southern portion and a large flake scatter (1 0 m by 1 0 m) in the northwest (Rowley 1991a) Feature B was not completely excavated so the dimensions are probably under-estimated The depositional layer was less than five centimetres deep (Rowley 1991a 4) No plan of Feature B was available at the time of writing

Feature C was located at 45 5 masl It was quite large, in excess of 22 m^2 A concentration of paving stones may indicate one dwelling (Figure 4 5), however the large quantity of material recovered, and the jumbled nature of the deposit suggests that the area was re-used as a midden (Rowley 1991a 4) The evidence for repeated deposition means that the zooarchaeological collection from Feature C is not directly comparable to the other collections from Igloolik which appear to be derived from single occupation episodes Given this, any assignment of seasonality is highly speculative However, the zooarchaeological data are relevant to defining long-term subsistence trends discussed in Chapter Five so the faunal remains were sampled. Fauna was identified from the following units N13 E15, N13 E16 N13 E17, N13 E18, N14 E19, N15 E18, N15 E19 and N16 E17 These eight units represent a 36% sample and cover a portion of the possible structure as well as areas immediately adjacent

Feature D was an isolated structure A single bowhead whale vertebra was the only faunal material recovered (Rowley 1991a 11-12) There was no plan available at the time of writing

Three of the four features (1, B and D) are similar in size, shape, and the absence of a clearly defined perimeter These are summarized in Table 4 5 Only Feature 1 has a paved area and possible hearths Migratory bird and marine mammals were identified in all features Faunal remains are summarized in Table 4 6 Terrestrial mammals were identified in Features 1 and C

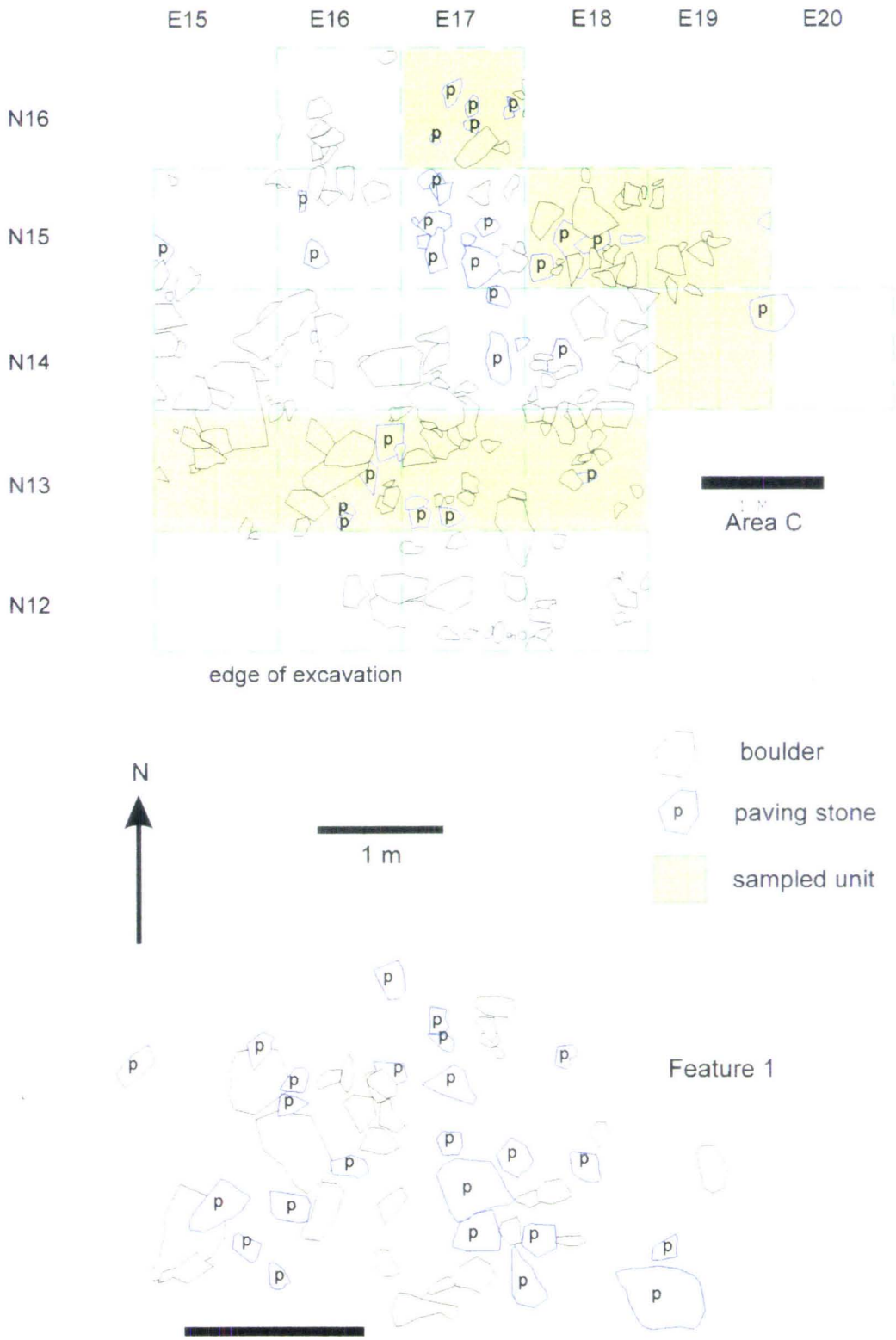

Figure 4.5 Features 1 and C (after Rowley 1993a, 1993b).

Feature	Type	Dimensions	Shape	Perimeter	Internal Features	Faunal Sample Size
1	structure	3.0m x 2.1m	oval	none	two hearths paved area	600
B	structure	3.0m x 2.0m	oval	none	unknown	52
C	structure/ midden	unknown	unknown	unknown	paved area	286
D	structure	3.0m x 2.0m	oval	none	unknown	none

Table 4.5 Feature summary

Class	Feature 1		Feature B		Feature C	
	N	%	N	%	N	%
unidentified	134	22.4	3	5.7	7	2.4
bird	70	11.4	24	46.1	181	63.2
mammal	396	66.2	25	48	98	34.2
Total	**600**	**100**	**52**	**99.8**	**286**	**99.8**

Table 4.6 Zooarchaeological sample summary

The zooarchaeological samples from the Features at NiHf 2 are similar in species composition to samples recovered from other PreDorset sites in the eastern Arctic and those from NiHf 58 (Table 4.7). Ringed seal is the most common species and terrestrial mammals are very poorly represented. The presence of migratory bird in all samples suggests a June through August use of these features, while the caribou and fox remains in Features 1 and C suggest a fall through winter occupation. Some late winter/early spring use of Feature C is indicated by thirteen fragments of foetal/neonate seal bone.

Species	Feature 1			Feature B			Feature C		
	N	%	R	N	%	R	N	%	R
duck	5	3.8	3	1	4.1	2	44	31.8	2
goose	-	-	-	-	-	-	3	2.1	5
caribou	1	0.7	5	-	-	-	2	1.4	6
Arctic fox	4	3.1	4	-	-	-	4	2.8	4
ringed seal	109	84.4	1	22	91.6	1	78	56.5	1
bearded seal	6	4.6	2	-	-	-	2	1.4	6
walrus	4	3.1	4	1	4.1	2	5	3.6	3
Total	**129**	**99.7**		**24**	**99.8**		**138**	**99.6**	

Table 4.7 Species abundance

Table 4 8 summarizes the data used to determine feature seasonality The criteria are the same as those used in the analysis of the structures at NiHf 58 Feature 1 is a warm-season dwelling Features B and D may be the remains of similar structures although Feature B is difficult to interpret because of the small sample The amorphous nature of the feature, the absence of a defining perimeter and interior structures implies a cold-season occupation, while the migratory bird bone indicates a warm-season occupation Feature D is impossible to assess for seasonality because there are no fauna The paucity of remains and shallow deposits indicate short-term use of these three features In contrast, Feature C has greater depth of deposit and a greater amount of fauna The feature is ambiguous It appears to be a dwelling that was reused for refuse disposal Thus the deposit may have accumulated during a number of different times of the year

Fea.	Migratory bird	Fox	Caribou	Ringed seal	Bearded seal	Walrus	Migratory species are available and other species are preferable.
1	4%	3 2%	0 8%	87 2%	4 8%	0 8%	August
B	4 1%	-	-	91 6%	-	4 1%	June - August
C	34%	1 4%	2 1%	56 5%	1 4%	3 6%	April - August[b]
D	-	-	-	-	-	-	-

Table 4 8 Feature seasonality

The large number of structures at NiHf 2 (possibly as many as 133), dispersed over a very large area and a number of beach ridges, suggests that the area was used repeatedly over a long period of time It is probable that parts of the site would have accumulated refuse associated with a number of occupation episodes The three dwellings represent only a two percent sample of the site but they can be associated with a warm time of the year An early spring through fall use of the site is more likely than a winter use, given that three of the four excavated areas produced migratory bird remains (spring and summer), and that the frequency of caribou and fox (fall/early winter) is very low While it is true that winter occupation

[b] April occupation is indicated by foetal/neonate seal bone

cannot be ruled out, the absence of cache features at the site would suggest that if it occurred it was probably quite limited and short-term in nature

NiHf 47

NiHf 47, (Figure 4 6), is a large Early Dorset settlement, that was originally registered as part of NiHf 1, a multi-component Palaeoeskimo site (Rowley 1992 11-12) NiHf 47 consists of 21 structures,[1] some of which are threatened by the growing garbage dump and sewage pools of the modern community of Igloolik A number of the features at the site were tested and partially excavated in the 1950s, however the zooarchaeological sample from the more recent excavation of Feature 18 forms the basis of the following discussion Feature 18 was selected for excavation because it was in danger of destruction (Rowley 1992 8)

Feature 18 (Figure 4 7) is located at 18 6/18 85 metres above sea level (Rowley 1992 8) It is a rectangular, low walled, semi-subterranean dwelling, (3 68 metres by 4 95 metres), with a multiple hearth axial feature (Rowley 1992 11) The faunal sample is summarized in Table 4 9

Class	NISP	Percentage of Total
Unidentifiable	17	2 3
Fish	0	0
Bird	88	12
Mammal	624	85 6
TOTAL	**729**	**99,9**

Table 4 9 Zooarchaeological sample summary

Structurally Feature 18 compares to those dwellings most commonly identified as Dorset winter features it is semi-subterranean, has a finely constructed mid-passage with two box hearths, and a paved floor (Harp 1976, McGhee 1981 Maxwell 1985) Although some of the species of fauna are the same as those identified in the PreDorset structures at Igloolik I would extend the range of occupation for Feature

[1] These are summarized in Appendix II

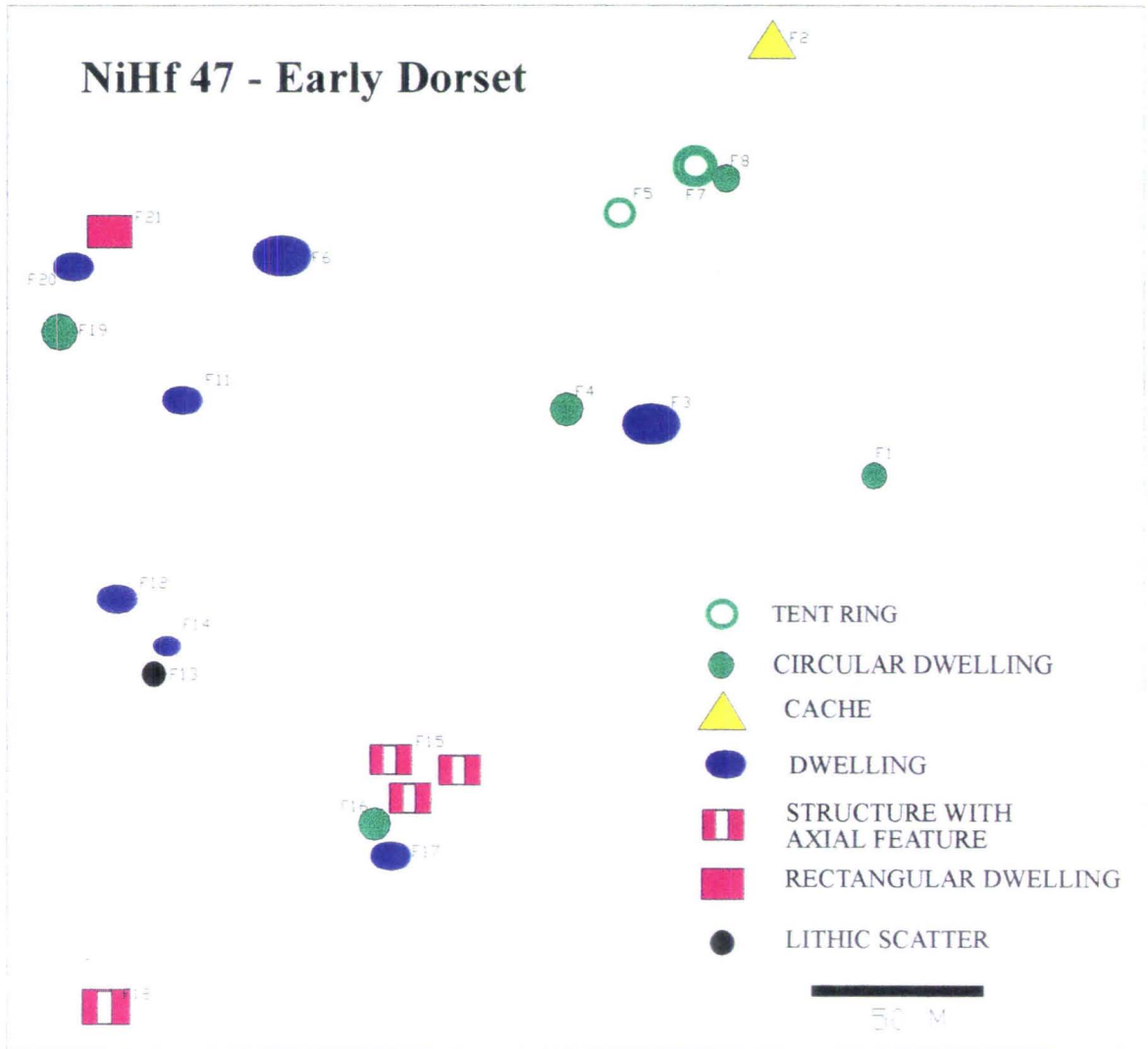

Figure 4.6 NiHf 47 (after Rowley 1992)

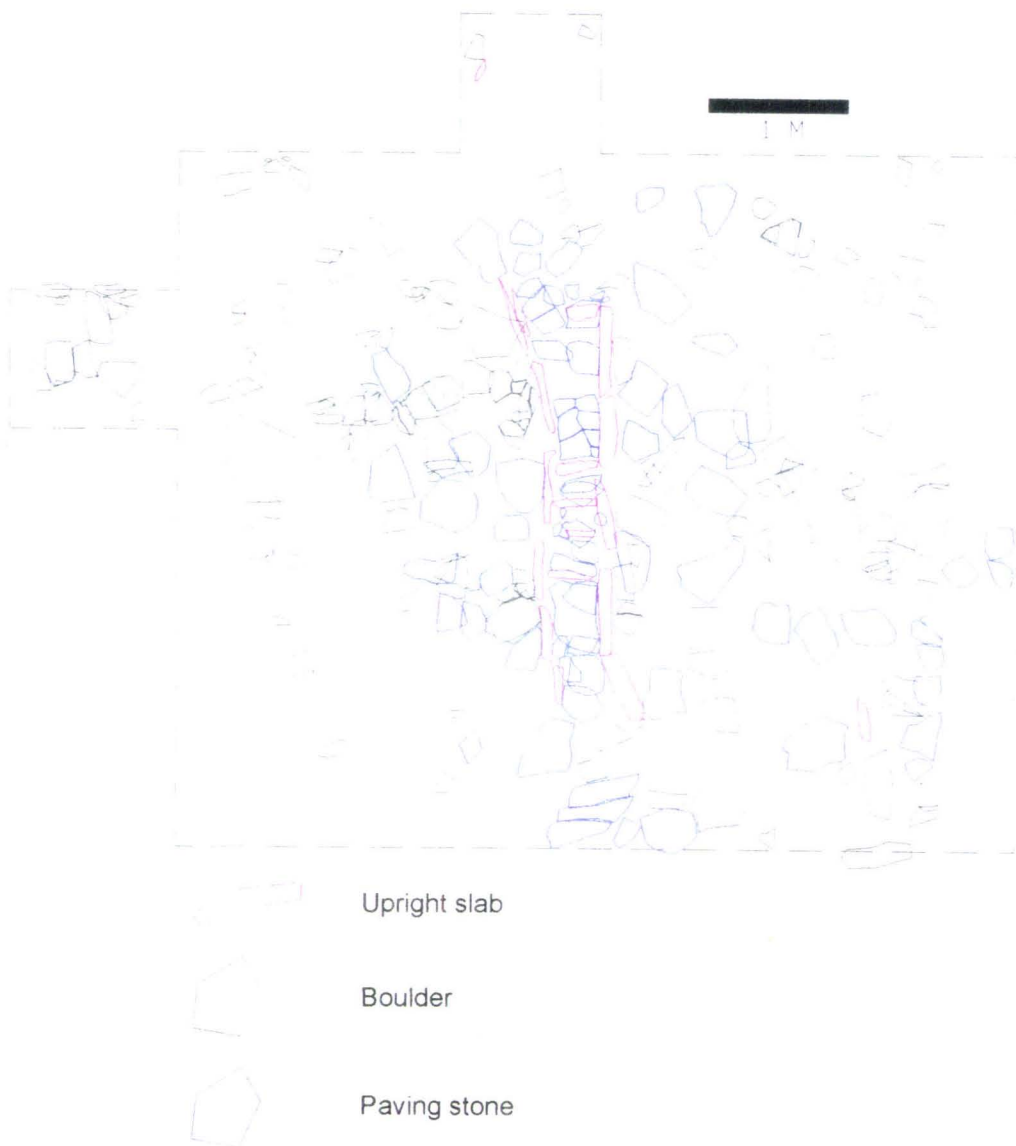

Figure 4.7 Feature 18, NiHf 47 (after Rowley)

18 for three reasons First there is a greater range of bird species in the sample from NiHf 47 Second, the fall and early winter indicators, caribou and Arctic fox (141 or 45 3%), are more abundant than in the PreDorset samples (caribou and fox = 11 or 7 5% at NiHf 2, and 5 or 12% at NiHf 58) Third, there is ptarmigan in the sample and ptarmigan is a winter resident in the area This is reasonable evidence for occupation from June into January The only season where use cannot reasonably be demonstrated is late winter/early spring (March though May) as no foetal/neonate bone was identified

Species	N	Percentage of total	Rank order
Duck	15	4 8	6
Goose	1	0 3	8
Gull	3	0 9	7
Ptarmigan	1	0 3	8
Caribou	35	11 2	4
Arctic fox	106	34 1	**1**
Ringed seal	50	16 1	**3**
Bearded seal	19	6 1	5
Walrus	78	25 8	**2**
Total	**308**	**100**	

Table 4 10 Species abundance.

With respect to duration of site occupation, Feature 18 obviously indicates multi-seasonal use as do the other similar semi-subterranean houses the tent rings, cache features, and lithic scatters Multi-seasonal settlement can be modeled in several ways The site may have been sequentially occupied through different times of the year by a number of households over a period of one or more years The site could also represent the re-use of a single location in different times over a greater time period, with significant gaps between seasonal occupations It is impossible on the basis of the artefact assemblages to define significant chronological difference between the structures (Meldgaard 1960), and I will argue in Chapter Five that the first model, a pattern of sequential seasonal occupation, is the most consistent with the general economic patterns in the Early Dorset period

NiHf 45

This Late Dorset site (Figure 4.8) is located on the western part of the island at 10 5-11 metres above sea level at the head of Ikpiarjuk/Turton Bay Occupation is estimated to date to approximately 1000 B P (Rowley 1991b 9) The settlement consists of 28 features[8] which include two semi-subterranean houses, two tent rings, caches, artefact scatters, and a fox trap (Rowley 1991a 11-14) Feature 1, a semi-subterranean dwelling, was excavated in 1990 and 1991, and part of Feature 28 (a midden) was excavated in 1991 The tent rings were surface collected but no faunal material was recovered (Rowley 1991b)

Feature 1 (Figure 4 9), was roughly rectangular in shape, oriented on a northwest-southeast axis (9 45m by 8 10m) and slightly excavated into the beach ridge The interior floor was partially paved and there was a paved entrance porch (2 30 metres long and 1 10 metre wide) on the southeast side of the structure There was one cache on the north wall, and possibly a second on the east wall (Rowley 1991b 9-19) Excavation produced 3034 bone fragments The animal class distribution is summarized in Table 4 11 Mammalian bone dominates the assemblage at 90 4% Birds comprise the remainder of the identifiable material at 2 8%

Class	NISP	Percentage of Total
Unidentifiable	189	6 2
Fish	14	0 4
Bird	87	2 8
Mammal (unidentifiable)	2745	90 4
TOTAL	**3035**	**99.8**

Table 4 11 Zooarchaeological sample summary

The range and frequencies of identified species are summarized in Table 4 12 Among the seasonal indicators are migratory waterfowl (2%) and char (0 1%) Char are obtainable throughout the year but historically were caught under the lake ice during the fall spawn (land-locked variety) or in the shallow

[8] These features are summarized in Appendix II

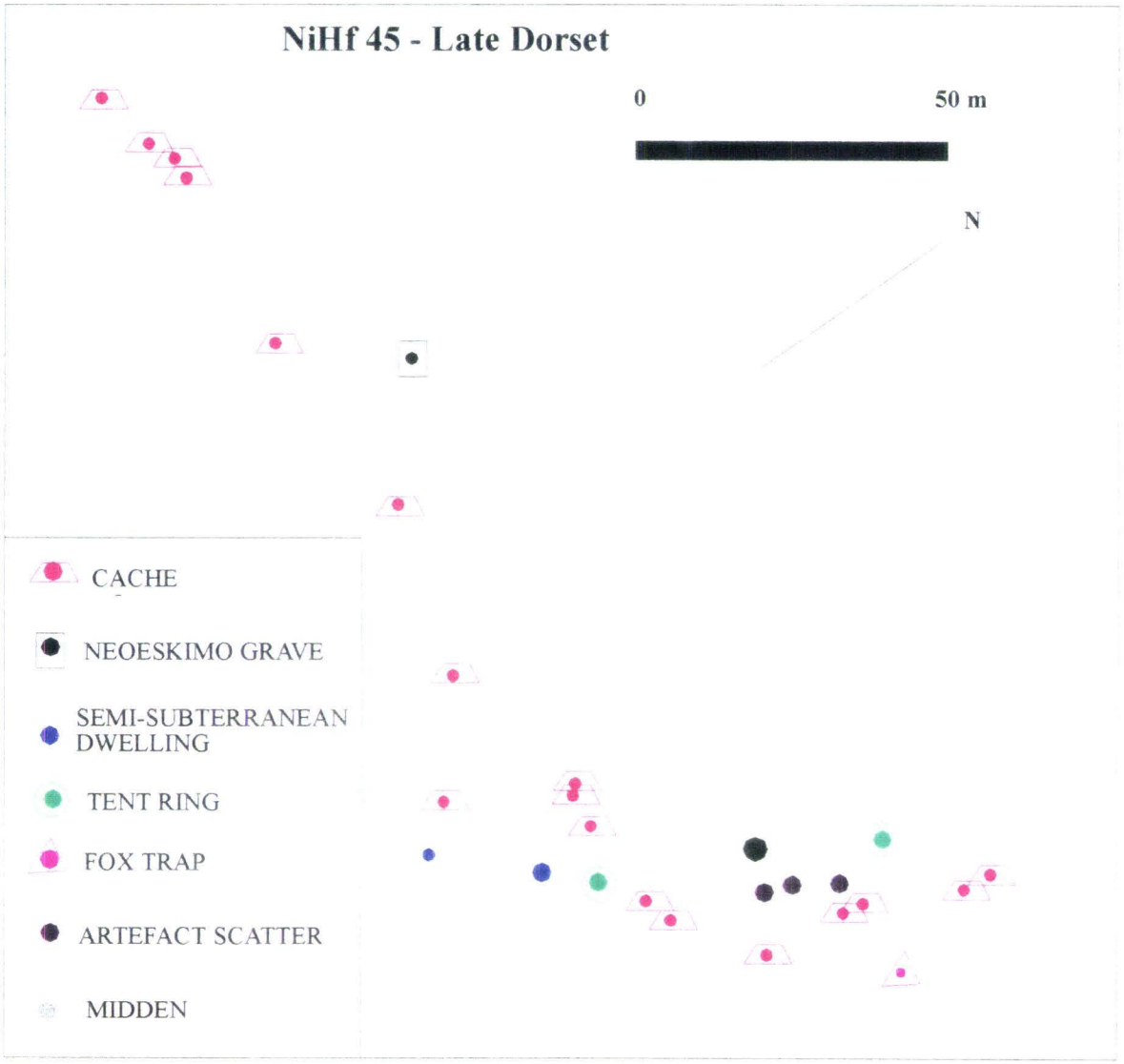

Figure 4.8 NiHf 45 (after Rowley 1991b)

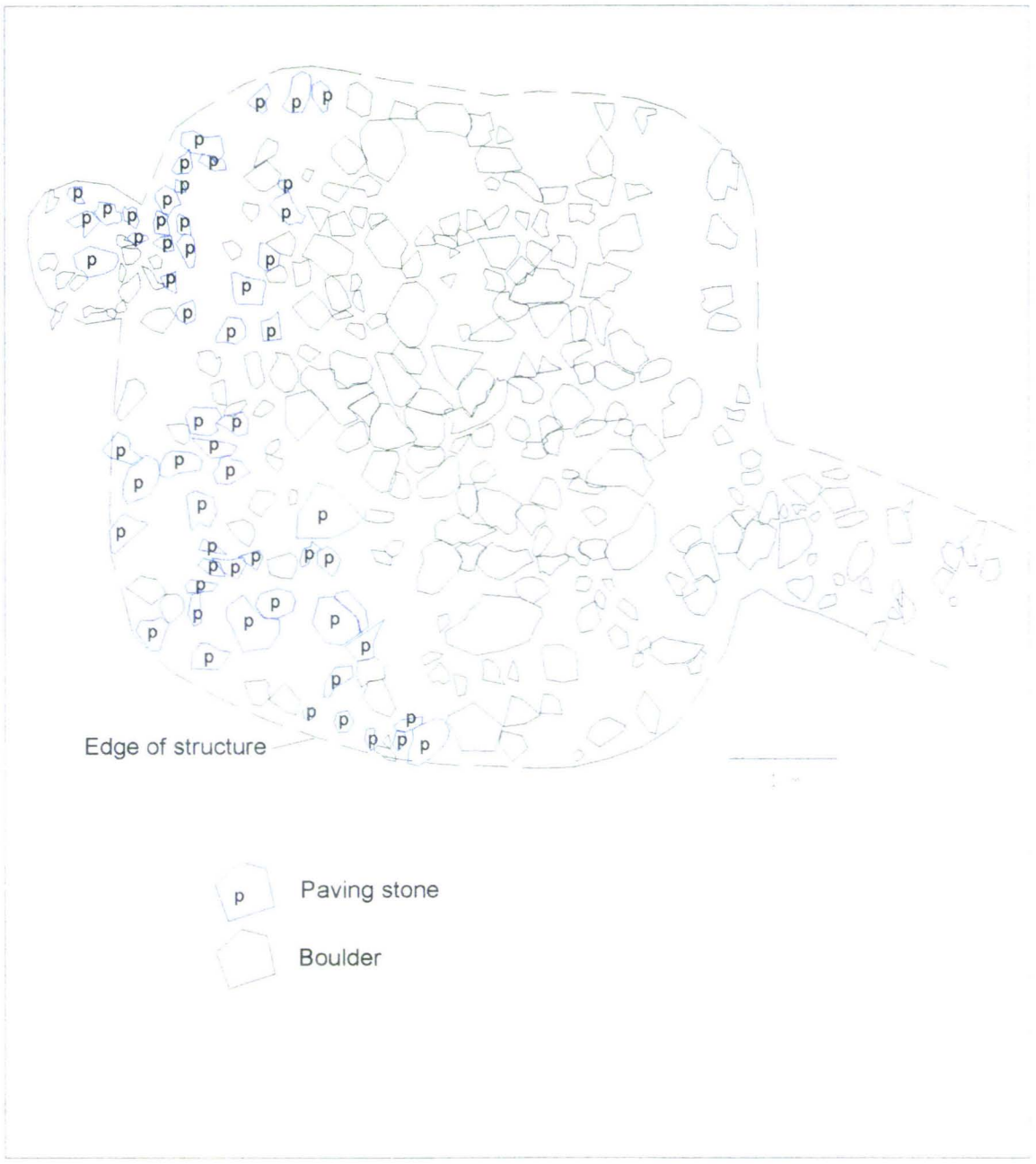

Figure 4.9 Feature 1, NiHf 45 (after Rowley 1991b).

bays and in rivers in the spring (sea-going variety) Char can be caught in nearly all the rivers and lakes in the Foxe Basin area (Brody 1976 168-169) Migratory waterfowl account for 2% of the identifiable sample, and are available from June through August The abundance of caribou (45%, rank number 1) suggests a fall occupation, while the small amount of Arctic fox (4%) indicates fall/winter The pinniped species are available year round, and the presence of a single foetal seal bone suggests there may have been some late winter occupation The minimum period when all of these species could have been obtained with maximum benefit (best hides, most numerous, fattest) would have been the late summer/early fall The maximum period would of course be the entire year

Species	NISP	Percentage	Rank	Best Period for Procurement
Char	5	0 1	6	June - October
Duck	50	1 8	4	June - August
Goose	2	0 07	7	June - August
Caribou	1241	44 7	**1**	August - September
Arctic fox	103	3 7	**3**	August - January
Ringed seal	1225	44 1	**2**	July - January
Bearded seal	45	1 6	5	July - January
Walrus	104	3 7	**3**	July - January
Total	**2775**	**99.8**		

Table 4 12 Species abundance

Semi-subterranean structures, particularly those with entrance passages and attached caches like Feature 1, are commonly interpreted as cold-season dwellings (Maxwell 1985), however the lack of internal hearth features may indicate some warmer-season use Semi-subterranean structures lacking obvious internal organization (such as formal axial features, clearly defined hearth areas, and sleeping platforms) have been described from Dorset sites elsewhere in the eastern Arctic (for example Mary-Rousselière 1976, Renouf 1991) but this aspect of structural variability is poorly understood One possibility is that such dwellings may have functioned as *qarmat* (Murray 1992) *Qarmat* generally combined the architectural elements of tents, snow houses and semi-subterranean sod houses and among

the Historic Inuit, were typically used at transitional times of the year such as in the spring before movement into a summer tent or in the fall before movement into a substantial permanent winter house *Qarmat* were also used by short-term visitors to permanent settlements and such occupations would sometimes last through the winter (Park 1988)

NiHf 45 (Late Dorset) is similar to NiHf 47 (Early Dorset) The range of structure types is the same cache features, semi-subterranean dwellings, tent rings, and lithic scatters However, there are far fewer dwellings at NiHf 45 than at NiHf 47 (Table 4 13) Only four of the total number of structures at NiHf 45 are identified as dwellings, although Rowley (1991) has suggested the possibility that the lithic scatters may represent the remains of snow houses Compared as a percentage of the total number of structures, 80 9% of the features at NiHf 47 are dwellings, while at NiHf 45 only 14% of the total number of structures are identified as dwellings Even if the possible snow house features are included, that figure increases only to 25% Clearly settlement at NiHf 45 was less intensive than at NiHf 47

Site	Unknown house	Fox trap	Cache	Lithic scatter	Tent ring	Semi-subterranean house
NiHf 45 Late Dorset	-	1	15 3 possible	3	2	2
NiHf 47 Early Dorset	2	0	1	1	2	14

Table 4 13 Structural variability at NiHf 45 and NiHf 47

The large number of cache features suggests that NiHf 45 was a convenient location for storing goods but that the actual occupation of the site was relatively limited The nature and number of dwellings suggests several possible types of occupation 1) a short-term sequential occupation from the warm season (as indicated by the tent-rings) through the mid-winter (semi-subterranean houses) and possibly even into the late winter (possible snow-houses) by one or two household groups, or 2) re-occupation of the site over a period of years, in different seasons, by as many as seven different households As only one feature at the

site has been excavated, it is impossible to make a definitive statement about the contemporeniety of these dwellings. I would argue on the basis of data to be presented in Chapter Five, (upcoming), that the former pattern is more consistent with Late Dorset economic activities than the latter

NiHf 4

This site was first reported by Parry and Lyon (1823), then by Mathiassen (1927) and in 1939 and 1949 it was visited and tested by G Rowley who recovered Dorset and Thule material (Rowley 1993b 3) The site is very large and consists of several mixed Late PreDorset /Early Dorset components, an unmixed Late Dorset component, a mixed Late Dorset /Thule component, and an Historic Inuit component (Rowley 1993a 2) Features are spread along various beach ridges from 20 to seven metres above sea level Meldgaard excavated extensively along the 20 metre beach ridge for Early Dorset material and also in a small area of unmixed Late Dorset deposit (Meldgaard 1965)

The Late Dorset component of NiHf 4 dates to approximately 1200 to 800 B P and consists of 12 features located at eight metres above sea level There is little ground cover in the area and almost no depth of archaeological deposit There is no site plan included here, however, of the 12 features, eight are rectangular dwellings, all longer on the north-south axis than the east-west The entranceways face the south and none have evidence of formal internal axial features or pot supports Only one appears to have a paved floor In addition to the eight dwellings there is one surface scatter of flakes, and three cache features (Rowley 1993b 8) These features appear to be similar to Feature 1 at NiHf 45

The Late Dorset/Thule cluster, (Figure 4 10), consists of large sod and stone Thule winter houses at 11 metres above sea level, several less visible house/cache structures, and an extensive midden containing much Dorset material In total there are 22 features (Rowley 1993b 3)

Rowley (1992, 1993b) has excavated three Late Dorset structures at NiHf 4 Feature 4 and Feature 9 and Feature 17a, Features 4 and 9 produced the faunal samples discussed below Both features are located

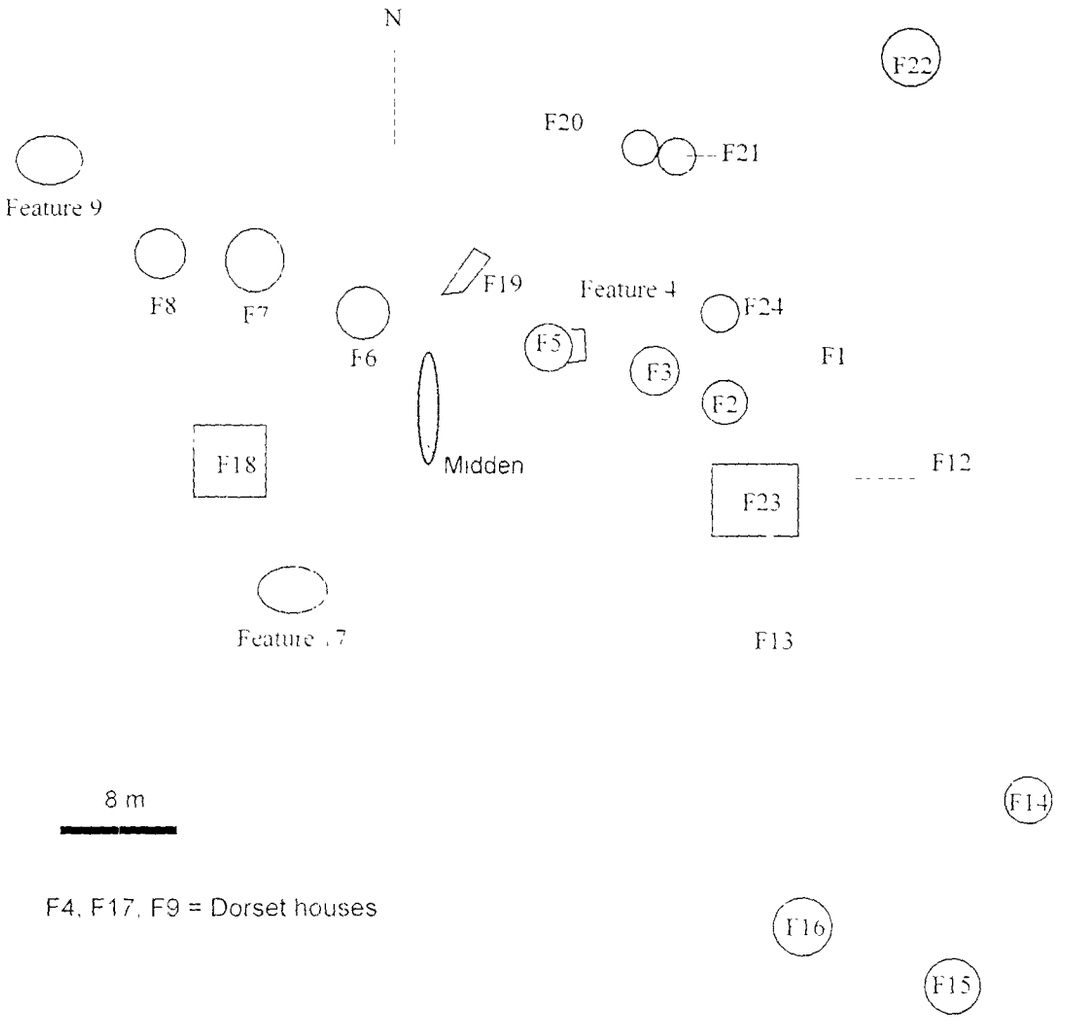

Figure 4.10 Late Dorset Thule component at NiHj 4 (after Rowley 1992, 1993b)

in the mixed Late/Dorset Thule cluster at the site and Feature 4 lies partially beneath a large Thule sod house There is little information available with respect to the unexcavated features at the site, although the range of dwelling types appears to be more restricted than at both NiHf 47 (Early Dorset) and NiHf 45 (Late Dorset) There are no tent rings and only one lithic scatter There are few caches (three) and the remainder of the structures are semi-subterranean, and relatively shallow It is probable that there were other Palaeoeskimo structures in this mixed component (there are extensive Late Dorset midden deposits) but that they have been obscured by the later Thule occupation

Feature 4 was partially excavated It is a rectangular semi-subterranean dwelling partly obliterated by later Thule house construction However, a complete mid-passage feature (measuring 4m by 1m) was uncovered (Figure 4 11) It contained an upright pot stand at one end and a pit feature at the other (Rowley 1993b) There were two stratigraphic levels defined in Feature 4 an upper peat layer containing mixed Dorset and Thule material, and a lower black soil layer containing only Dorset material The faunal remains from the peat level were excluded from the following analysis as they could not be definitely associated with the Dorset occupation

Feature 9 was an oval semi-subterranean dwelling with low gravel walls and a paved floor There were no recognizable internal arrangements (Rowley 1993b) and as such, Feature 9 was similar to Feature 1 at NiHf 45 There were two stratigraphic levels an upper peat level, and a lower black soil level As with Feature 4, the faunal remains from the peat level were excluded

The seasonality of Features 4 and 9 at NiHf 4 was assessed on the basis of the faunal remains recovered from the black soil levels These are summarized in Table 4 14 Samples of 1598 and 832 bone fragments were recovered from Features 4 and 9 respectively

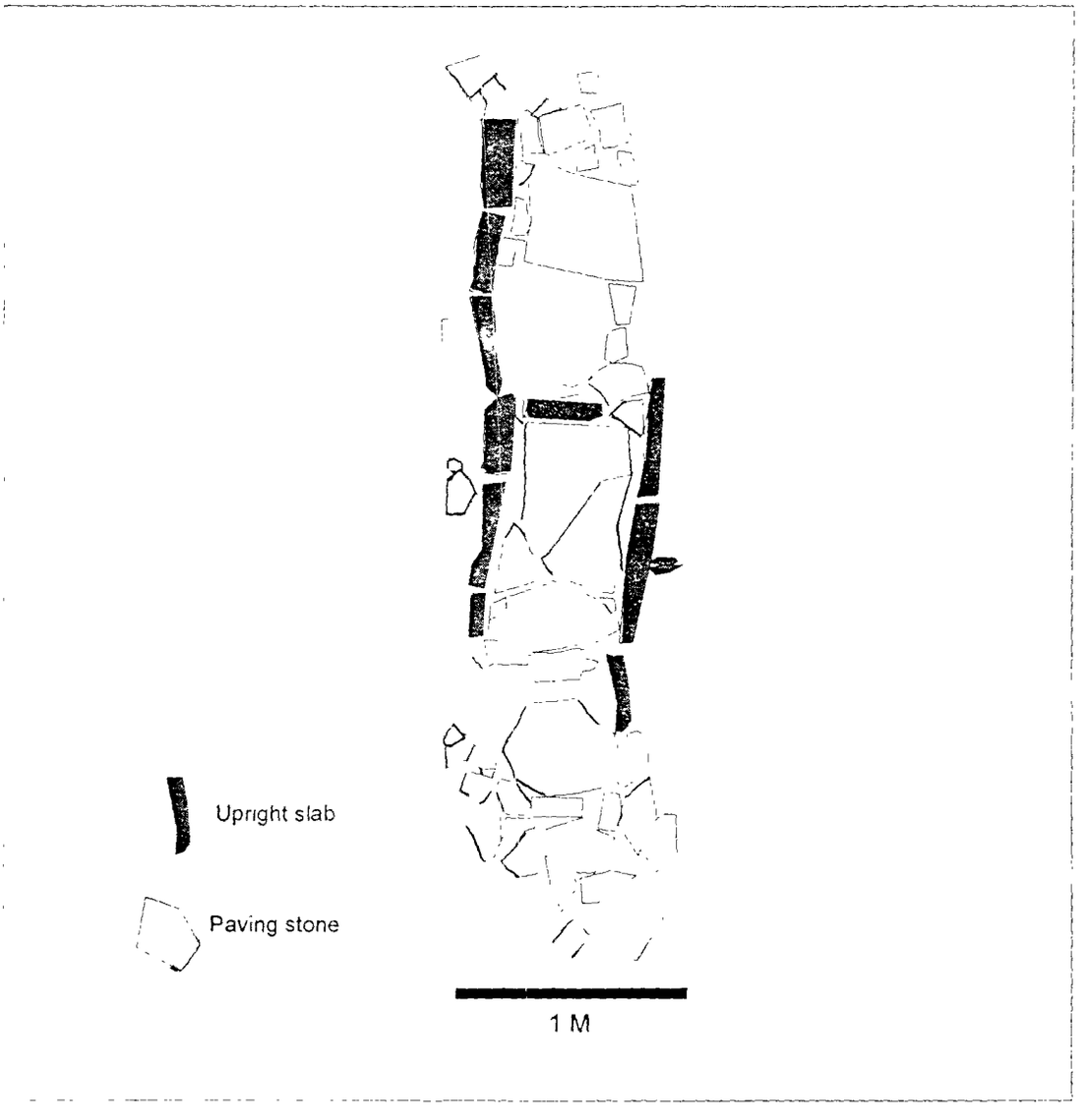

Figure 4.11 Feature 4, NiHt 4 (after Rowley 1993b)

Class	Feature 4		Feature 9	
	NISP	%	NISP	%
Unidentifiable	404	25.2	44	5.2
Fish	60	3.7	0	
Bird	229	14.3	54	6.4
Mammal	905	56.6	734	88.2
TOTAL	**1598**	**99.8**	**832**	**99.8**

Table 4.14 Zooarchaeological sample size

While mammal bone dominates both assemblages, there are some significant differences between Features 4 and 9. There is fish (3.7%) in Feature 4 and none in Feature 9. The percentage of bird is greater in Feature 4 (14.3% as compared to 6.4%). The distribution and frequencies of identified species from each sample are summarized in Table 4.15. Feature 4 also contained 52 fragments of whale bone. These were not identifiable, and consisted of small (less than 20 cm) fragments.

Feature 4 contained a number of seasonal indicators: char (8.3%) which suggest June to October, duck and goose (combined 8.7%) which indicate June to August, and caribou (6.9) and fox (36.6%) which are thought to be August to September and August to January indicators. Ptarmigan (0.3%) is a winter resident species. The *Canis* species (dog/wolf) and the polar bear can be obtained throughout the year. Historically, polar bears were hunted year round in different locations in the Foxe Basin (Brody 1976:167). The pinniped species (combined 37.4%) are available year round. To summarize then: warm-season indicators represent 17% of the sample, fall/winter indicators represent 43.8% of the sample and year-round indicators represent 38.6% of the sample. There is one foetal/neonate seal radius that indicates the possibility of a late winter/spring occupation, thus the maximum period of use for Feature 1 could be the entire year, and the minimum period would be late summer through mid-winter.

Species	Feature 4			Feature 9		
	NISP	% of Total	Rank	NISP	% of Total	Rank
Char	51	8 3	**3**	-	-	-
Duck	8	1 3	9	11	2 6	6
Duck/Goose	12	1 9	8	-		-
Coose	34	5.5	6	2	0 4	8
Ptarmigan	2	0 3	11	-		-
Caribou	42	6 9	4	68	16 6	**3**
Arctic fox	223	36 6	**1**	117	28 6	**2**
Canis sp	7	1 1	10	8	1 9	7
Polar bear	1	0 1	12	-		-
Ringed seal	176	28 9	**2**	127	31 1	**1**
Bearded seal	13	2 1	7	13	3 1	5
Walrus	39	6 4	5	62	15 1	4
Total	**608**	**99.4**		**408**	**99.4**	

Table 4 15 Species abundance

Feature 9 contained fewer species and seasonal indicators than Feature 4 No fish ptarmigan or polar bear remains were identified Migratory waterfowl (3 2%) suggest occupation from June to August, while caribou (17%) and foxes (29 2%) indicate fall and winter There were no foetal/neonate remains of any species that would indicate a late winter/early spring occupation, thus the minimum period of use for Feature 9 would be late summer through early winter, and a maximum occupation would be late spring through early winter

All identified Dorset features at both the isolated Dorset component and the mixed Dorset/Thule component of NiHf 4 appear to be semi-subterranean houses Based on the analysis of fauna from Features 4 and 9, I would suggest that the Dorset occupation at NiHf 4 was multi-seasonal As with the other sites discussed above, (NiHf 47 and NiHf 45), the only time of year for which there is no solid indication of occupation is late winter

Summary

As indicated by the settlement patterns discussed in Chapter Three, the general nature of Palaeoeskimo settlement at Igloolik changed significantly over time. To briefly recap this chapter, zooarchaeological data from five sites and a total of 14 features, indicates that there were significant seasonal and occupational differences between PreDorset and Dorset dwellings and sites at Igloolik. PreDorset tent rings and sites appear to have been used on a short-term repeat basis. The evidence is that most structures were used during the warm part of the year, and by extension that the sites were primarily warm season settlements. In contrast, Dorset semi-subterranean houses are larger and appear to have been occupied for a greater part of the year.

Within Dorset, semi-subterranean houses exhibit a range of structural and zooarchaeological variability. Some, like Feature 1 at NiHf-45 and Feature 9 at NiHf-4, are less elaborately organized on the interior and appear to have been occupied most intensively in the fall and winter as indicated by the predominance of caribou and fox remains. In contrast, Feature 18 at NiHf-47 and Feature 4 at NiHf-4, have carefully constructed mid-passage features and a larger complement of identified species, including more warm season species. It is unclear what this variability indicates, although one possibility is that it related to seasonal emphasis or duration of occupation. For example the less formal features may be equivalent to Inuit *qarmat* and have been occupied for shorter periods, or less permanently than the more formal dwellings. In any case, the multi-seasonal nature of Dorset houses and the range of structural types on Dorset sites indicate that Dorset settlement at Igloolik was more variable and occurred for a greater portion of the year than PreDorset settlement. In PreDorset, occupation occurred primarily in the warm season. Dwellings were used for a short period of time and sites appear to have been used repeatedly over many years. By Early Dorset times, more intensive settlement was occurring. This was characterized by longer occupations in particular structures, as well as multi-seasonal use of the same structures and locations. The pattern of multi-seasonal occupation in semi-subterranean houses established in Early Dorset continued in the Late period.

In Chapter Five a comprehensive picture of Palaeoeskimo subsistence strategies will be drawn. This, in combination with the preceding data on settlement and seasonality, will be used to model basic patterns of socio-economic organization in both the PreDorset and Dorset periods.

Chapter Five

Interpreting Palaeoeskimo Economics

The major focus of this thesis is the development of an understanding of the long-term economic trends in Palaeoeskimo prehistory and the relationship of these to social organization and symbolic behaviour. Patterns of PreDorset and Dorset settlement and seasonal use of sites and dwellings were established in the previous two chapters. In this chapter, zooarchaeological data from the sites discussed in Chapter Four are used to: 1) build a picture of the general nature of Palaeoeskimo subsistence economies at Igloolik; and 2) document shifts in marine mammal hunting. Differences in patterns of marine mammal use between Palaeoeskimo periods are linked to changing geologic circumstances, settlement strategies, and the structure of the basic economic unit. Artefactual data indicate that technological developments facilitated changes in subsistence strategies and that over time one strategy, walrus hunting, became economically important and possibly also socially and symbolically significant in Dorset society.

1) The PreDorset Subsistence Economy

The Early PreDorset period in the eastern Arctic spans two climatic episodes, a warm interval from about 3900 B. P. to 3500 B. P.; and a cold interval from about 3500 B. P. to 3000 B. P. (Maxwell 1985) The PreDorset settlements, (NiHf 58 and NiHf 2) from which the following data were obtained date to approximately 3800 B. P., the earlier and somewhat warmer part of the PreDorset period. In contrast to warm periods, cold periods may benefit ringed seal populations due to an expansion of the fast-ice that the seals use for breeding. At the same time, cold periods may lead to later break-up and earlier freeze-up. This may be disadvantageous for walrus and bearded seals as those species prefer open water and broken ice. Over the long-term, in cool periods the expectation is that ringed seals should be more accessible than walrus or bearded seal.

The subsistence data from NiHf 58 and NiHf 2 indicate that PreDorset people utilized at least ten different animal species including fish (Arctic char), waterfowl, gull, ptarmigan, owl, caribou, Arctic fox, ringed seal, bearded seal, and walrus. Ringed seal is the only species identified in all samples,[1] and it is the most abundant species in all samples, ranging from 57% to 100% of identifiable fauna.

Species	**Feature 1**	**Feature 3**	**Feature 4**	**Feature 14**	**Feature 24**	**Feature 30**
Arctic fox				1% (4)		1% (3)
Caribou		2.7% (2)			2% (4)	
Ringed seal	**84% (1)**	**91.6% (1)**	**100% (1)**	**87% (1)**	**81% (1)**	**94% (1)**
Bearded seal	9% (2)	2.7% (2)		2% (3)	8% (2)	>1% (3)
Walrus		2.7% (3)		10% (2)	2% (4)	3% (2)
Waterfowl	4% (3)				5% (3)	
Other (fish, other birds)	3% (4)				2% (4)	>1% (3)
Total	100%	99.7%	100%	100%	100%	100%
Sample size	214	36	46	82	52	136

Table 5.1 NiHf 58, species abundance. Rank is the number shown in parenthesis.

Species	**Feature 1**	**Feature B**	**Feature C**
Arctic fox	3% (4)		3% (4)
Caribou	>1% (5)		1% (5)
Ringed seal	**84% (1)**	**92% (1)**	**57% (1)**
Bearded seal	5% (2)		1% (5)
Walrus	3% (4)	4% (2)	4% (3)
Waterfowl	4% (3)	4% (2)	34% (2)
Other (fish, other birds)			
Total	100%	100%	100%
Sample size	129	24	138

Table 5.2 NiHf 2, species abundance. Rank is the number shown in parenthesis.

In addition to ringed seal, there are small amounts of bearded seal and walrus (10% or less) and smaller amounts of Arctic fox and caribou (3% or less). In four samples, waterfowl represent 4-5% of total fauna, but in one sample, Feature C, they comprise 34% of the total fauna.

[1] Six samples from NiHf 58 and three from NiHf 2.

The consistent, high frequency of ringed seal in all samples indicates that PreDorset subsistence at Igloolik was focused on that species. An emphasis on ringed seal hunting has also been noted for PreDorset in the Arctic islands and on Ellesmere Island (McCartney 1989, McGhee 1979, Ramsden and Murray 1995, Schledermann 1990). At Igloolik, evidence for the exploitation of other species is present but they were obviously of secondary importance.

PreDorset dwellings at Igloolik were exclusively tent rings, which were small, ephemeral features, with sparse contents. They were scattered in small clusters (one to several dwellings per cluster) across the sites. Tent ring size and contents indicate that these dwellings were occupied for a short period of time by small households, while the pattern of scattered feature clusters indicates that sites were probably occupied by only a few households at any one time. The general absence of storage features, and the zooarchaeological data (primarily the waterfowl remains) suggest that settlement was short-term and seasonally restricted, mainly to the warm part of the year. This being the case, PreDorset people must have spent some parts of the year at locations other than Igloolik. For example, the fall could have been spent inland hunting caribou, and the winter could have been spent on other coasts or on the sea-ice hunting ringed seals. The temporary and seasonally restricted nature of PreDorset settlement at Igloolik is consistent with data from other parts of the Eastern Arctic which indicates that in general, PreDorset sites were occupied on a seasonal basis, and that mobility was an important organizing principle in PreDorset society (Bielawski 1982, 1988, McCartney 1989, McGhee 1979). For example, Bielawski (1982) has reported an inland/coastal pattern of seasonal movement for PreDorset on Somerset Island, with inland sites corresponding to summer settlement and coastal sites to winter settlement.

The suggestion that PreDorset groups at Igloolik were relatively mobile, and that this mobility related to the seasonal exploitation of resources implies that some of the secondary animal species used at Igloolik may have been more heavily exploited in other locations. This is particularly true for caribou which would have been more abundant elsewhere and which would have had a peak period of availability (late summer and fall) and probably also of preference (late summer and fall) (Driver 1990). It is clear from data in other regions that caribou was an important subsistence species during the PreDorset period. It was heavily

exploited in the western Canadian Arctic (Arnold 1981, LeBlanc 1994) and in the Barrenlands (Gordon 1975). On Devon Island, PreDorset people hunted both ringed seal and caribou and positioned themselves to take advantage of both by settling in coastal areas (for seals) close to interior lowlands (for caribou) (McCartney and Helmer 1989:151). The PreDorset people using Igloolik to hunt seals and waterfowl, could have hunted caribou on the Melville Peninsula or on Baffin Island during seasons when Igloolik was not a preferred hunting location or during periods when caribou were more accessible or necessary than seals or waterfowl. The Archaeological Survey of Canada records list many PreDorset sites on the coast and in the interior of the Melville Peninsula. It seems likely that some these sites, particularly those in the interior, were used for caribou hunting, and possible also for fishing, trapping and bird hunting.

In addition to caribou, other important subsistence species could have been bearded seal and walrus Despite the cold climatic conditions in the Early PreDorset period, bearded seal and walrus would have been available to some extent and they could have been hunted at some of the same locations as ringed seals For example, like ringed seals, bearded seals occasionally use breathing holes, and they are also found at the ice-edge and in leads (wide cracks) in the ice. While they are most common in open water, regardless of the time of year (McLaren 1962:171) they could have been hunted in these other locations. However, bearded seals have a low population density (approximately one for four ringed seals) and they are relatively solitary animals (McLaren 1962) Contemporary Inuit hunters report that bearded seals are rarely in the same locations from year to year or obtainable in any abundance from year to year (Smith 1991:84) Consequently, bearded seals are not as accessible as ringed seals, and they are not as reliable as a primary subsistence species

Walrus do not keep breathing holes, but they do occasionally smash through the thin ice to breathe They are more commonly found congregated at the ice edge and hauled-out on land or ice pans. They are also found in open water, and, in contrast to bearded seals, are available in concentrations and found regularly from year to year in suitable feeding places and haul-out locations Any group of people choosing to exploit walrus would have had access to an abundance of meat, hide, blubber and ivory. However, there is no evidence for extensive walrus use by PreDorset groups anywhere in the eastern Arctic No walrus

remains were recovered in the PreDorset samples from Port Refuge (McGhee 1979:94), and on the Bache Peninsula walrus remains in a PreDorset context are limited to a few flakes of ivory (Schledermann 1990:167). Similarly the PreDorset assemblages from Devon Island contain very little walrus (McCartney 1989) Bearded seal is also very poorly represented in samples from locations outside of the Foxe Basin (McGhee 1979, Ramsden and Murray 1995, Schledermann 1990)

PreDorset people may have lacked an effective open water hunting technology (McCartney 1989) which would have limited their ability to hunt walrus and bearded seal in the summer, and in broken ice. Walrus could have been hunted at haul-out locations however, but this does not appear to have occurred Present data indicate that at Igloolik the exploitation of walrus and bearded seal was limited and in contrast to caribou, there is no archaeological evidence from elsewhere which would suggest that bearded seal and walrus were exploited more heavily in other seasons or locations

The settlement and subsistence data from the PreDorset period at Igloolik are consistent with the suggestion that, much like the Netsilik (Balikci 1964), the primary economic unit in PreDorset was the nuclear family or small household (McCartney 1989 296) Dwellings are small, and when hearths are present there is normally only one per dwelling indicating a single family occupation. Similarly, the zooarchaeological data indicate that subsistence practices were consistently within the capabilities of individual households. For example, the most important subsistence activity, ringed seal hunting, is easily practiced by a single hunter in variety of circumstances, including at breathing holes (Boas 1964), at pupping dens,[2] and at the ice edge (Nelson 1969). In contrast, activities requiring the co-operation of larger households or larger hunting parties (for example walrus hunting) appear to have been unimportant I will return to this point in greater detail further in this chapter

To summarize then, the settlement and subsistence data from Igloolik indicate that the Early PreDorset occupation occurred primarily in the warm part of the year and was short-term but repeated in nature Sites were occupied by small numbers of households and dwellings by small, self-sufficient households Subsistence was focused on ringed sealing, and in some instances waterfowl hunting. Some of the other

[2] In the historic period, Alaskan Eskimos used dogs to sniff out pupping dens (Nelson 1969 240)

species used at Igloolik, particularly caribou, may have been more heavily exploited at inland locations in other times of the year. There is no good evidence for long-term settlement or multi-seasonal settlement at Igloolik during this period but there is evidence from other locations of PreDorset settlement in different seasons and hunting of different species, most notably, caribou. Together these data structure a model of PreDorset society which incorporates the seasonal exploitation of resources by small, mobile, self-sufficient households

The Early Dorset Subsistence Economy

The Early Dorset site, NiHf-47, from which the following zooarchaeological data were obtained dates between 2400 B. P. and 2000 B. P. In the eastern Arctic, this spans a climatic episode which is variously interpreted as a very cold interval following a period of increasing cold (Maxwell 1985), or a cold period following a period of climatic instability (Renouf 1990). As noted above, prolonged cold periods may result in an increase in ringed seal and caribou populations and a decrease in walrus and bearded seal populations

During the occupation of NiHf-47, Igloolik was two large islands separated by a narrow passage and surrounded by a broad expanse of shallow continental shelf. Compared to the PreDorset period there was a significant increase in land area. This may have attracted more caribou because of increased forage and birds because of the appearance of suitable nesting sites and wetlands. Ringed seal may have been locally more available due to expansion of the coastline and increased fast-ice areas for breeding, and foxes might have been more common due to increases in the numbers of birds, eggs and seal pups upon which they prey. Climatic conditions suggest that ringed seal and caribou should have been abundant while the changed local conditions suggest that Early Dorset subsistence may have been more broadly based than PreDorset subsistence.

The zooarchaeological data from NiHf-47 indicate that Early Dorset people were hunting the same compliment of species as PreDorset people: a variety of birds, fox, caribou, ringed seal, bearded seal and walrus. Fox is the most abundant species in the sample and could have been used as a source of both food and fur. However, it takes approximately ten foxes to equal one ringed seal in weight, and fox lacks the

important layer of blubber that makes marine mammals so economically and nutritionally important for northern peoples (Moran 1981:15). While foxes were more important in the Early Dorset economy at Igloolik than they were in the PreDorset economy, they represented an insignificant dietary contribution.

Species	Percentage of total sample	Rank
Arctic fox	34%	1
Caribou	11%	4
Ringed seal	16%	3
Bearded seal	6%	5
Walrus	**26%**	**2**
Waterfowl	5%	6
Other (fish, other birds)	1%	7
Total	99%	
Sample size	310	

Table 5.3 NiHf 47, species abundance.

The second most abundant species is walrus, and it is the most important subsistence species. No other species can equal the potential contribution of walrus for meat, blubber and hide. For example, excluding the blood, the average walrus weighs about 675 kg (Banfield 1974); this is equivalent to 22.5 ringed seals, 5.6 caribou or 2.2 bearded seals. A review of the walrus skeletal element frequencies indicates a minimum of three individuals in this sample.[3] Table 5.4 shows the body part representation for walrus.

Body Part	NISP	Percentage
Head (cranial fragments, mandible, post canine teeth)	27	34.6
Trunk (vertebra, sternal segments, ribs)	12	15.3
Front limbs (scapula, humerus, radius, ulna)	12	15.3
Hind limbs (pelvis, femur, tibia, fibula)	4	5.1
Long bone fragments	3	3.8
Flippers (carpals, metacarpals, tarsals, metatarsals, phalanxes)	20	25.6
Total	78	99.7

Table 5.4 NiHf 47 walrus body part representation.

[3] Summarized in Appendix III. Minimum number of individual is based on counts of humeri.

All parts of the walrus are present. Head fragments are most abundant and this reflects fragmentation of the cranium and maxilla, probably for extraction of the tusks. Age data indicate that none of these animals was juvenile. In combination with the skeletal element representation, NISP and rank, this suggests that walrus hunting was the most important subsistence activity during this period, and that hunters were capable of procuring adult walrus individuals with regular success.

Ringed seal was the second most important subsistence species (16.2%), followed by caribou (11.3%) and bearded seal (6.1%). Compared to the previous period, Early Dorset subsistence was broadly based, with an intensification of walrus exploitation. In connection with this, Maxwell (1976:69) has noted that the slate knives from Early Dorset sites at Igloolik and Lake Harbour are most suitable for separating blubber from hide. He has suggested that they were part of a tool kit developed in conjunction with an increase in the exploitation of marine resources during Early Dorset. Zooarchaeological data from Igloolik indicate that this may have been related specifically to the intensive use of walrus.

There are at least eight, positively identified Early Dorset sites at Igloolik.[4] These sites have a wide range of feature types including semi-subterranean houses with axial features, tent rings, external hearths, and lithic scatters. All sites contain cache features indicating that storage was an important component of the Early Dorset economy. Most sites contain the range of other features, although some sites such as NiHf 47 have more semi-subterranean houses (n=17) than tent rings (n=1), while others such as NiHf 38 have more tent rings (n=25) than semi-subterranean houses (n=3). Zooarchaeological data from Igloolik indicate that semi-subterranean houses were relatively permanent dwellings, minimally occupied from late spring into early/mid-winter. Studies from other parts of the eastern Arctic indicate that Dorset tent rings were comparatively temporary dwellings, occupied primarily in the warm season (Helmer 1981). At Igloolik, the semi-subterranean houses are significantly larger than the tent rings and some have multiple hearth features. This suggests that some were multi-family dwellings, in contrast to tent rings that were probably occupied by single families. As both dwelling types were used during the warm weather, one possible explanation for the abundance of tent rings is that during the summer the local population increased temporarily.

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[4] See Appendix I for the summary of each site

A second possibility is that some people abandoned the larger, multi-family houses for a short period each summer to move into single family tents. In any event, as compared to the PreDorset period, some Early Dorset households were clearly less mobile, as some people spent the summer and at least part of the winter at Igloolik, in contrast to PreDorset, when most settlement occurred in the summer. The impression of reduced mobility in Early Dorset is reinforced by the abundance of storage features. The practice of storage is normally associated with semi-sedentary and sedentary settlement, as dependence on stored goods restricts mobility (Kelly and Todd 1988:239). The success of a storage strategy is usually dependent upon access to a reliable and aggregated food source (Binford 1983:332). The periodic intensification of previously or normally minor resources reduces the risk associated with a heavy reliance on one resource and on stored goods (Rowley-Conwy 1984:301). At Igloolik, in the Early Dorset period, surplus for storage was obtained through walrus hunting. Walrus is the only species in the Early Dorset archaeological sample large enough to provide an abundance of edibles and raw materials and it is the only large mammal species, regularly and abundantly available year round in herds in the northern Foxe Basin.

Data from Early Dorset occupations elsewhere in the region also indicate that walrus was an important part of the economy. At the Early Dorset Tyara site on Sugluk Island in northern Hudson Bay, midden deposits contained a wide range of animal species, including, in all three levels, a consistent representation of walrus (19%, 19% and 17%), ringed seal (27%, 39% and 48%), caribou (10%, 7% and 3%) and birds (10%, 7%, and 6%), in addition to fluctuating amounts of bearded seal (26%, 3% and 18%), and fox (5%, 26% and 8%) (Taylor 1968). This pattern is similar to the Igloolik pattern, but no structures were identified at Tyara (Taylor 1968).

Outside of the Foxe Basin/northern Hudson Bay regions, walrus was important, but generally secondary to ringed seal. At the Baculum site on the Bache Peninsula, walrus ranked second in the faunal assemblage at 20%, behind small seal at 41.5%. The assemblage from the Shelf site, in the same area, contained less than 1% walrus and ringed seal was most abundant at 58.6%. In both cases, terrestrial mammals were less than 6% of the total samples. The structural remains at both sites were primarily tent rings and external hearths suggesting that they were warm season settlements (Schledermann 1990:176-

189). Similarly in the Crozier Strait region, walrus exploitation was more intensive in the Early Dorset period than in the PreDorset period, but in contrast to Igloolik, the sites and dwellings were seasonally restricted and storage features were less common (Helmer 1981).

To summarize, in contrast to the previous period, the Early Dorset occupation of Igloolik occurred during both warm and cold seasons, and was less mobile as indicated by the range of dwelling types, and the abundance of storage features. Faunal remains indicate that some dwellings were multi-seasonal and dwelling size and composition suggest that household size was more variable. This variability in household size may have been related to season of occupation and or permanence of settlement as tent rings, used in warm weather are significantly smaller than semi-subterranean, multi-season, multiple hearth houses.

Again, in contrast to the PreDorset period where the risk of subsistence shortfall was buffered by mobility, in the Early Dorset period, risk of subsistence shortfall was buffered by the extensive exploitation of walrus which enabled the accumulation of stores. Concurrently the resource base became broader with the heavy exploitation of Arctic fox (34%), and, as compared to the PreDorset period,[5] a relatively equivalent exploitation of ringed seal (16%) and caribou (11%). Walrus exploitation was more pronounced at Igloolik during this period than in other regions (with the possible exception of northern Hudson Bay) as was terrestrial mammal exploitation.

In addition to the general pattern of Early Dorset subsistence and settlement outlined above, it is worth noting that the data from Igloolik suggest no correlation between climate and resource use during that period. Both the early PreDorset and Early Dorset occupations of Igloolik occurred during relatively cold periods and PreDorset subsistence patterns, with a heavy reliance on ringed seal, conform to expectations about the abundance of that species during such periods. However, data from the Early Dorset period differ significantly, suggesting instead an increase in walrus populations and or an increase in Palaeoeskimo exploitation of walrus. It appears that, as indicated in the Arctic Islands (Helmer 1981), the impact of climatic episodes on animal populations and Palaeoeskimo hunting strategies is not entirely predictable.

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[5] In PreDorset the amount of ringed seal present in any given sample ranges from 57% to 100%. Caribou ranges from 0% to 3%.

3) The Late Dorset Subsistence Economy

The Late Dorset period spans 1400 B. P. to 900 B. P. and the sites from which the following zooarchaeological data were derived fall within that temporal range. At the time these sites were occupied Igloolik Island was similar in size and shape to that of today and the climate was warmer and wetter than that of today and that of the previous period (Maxwell 1985). Warm and wet climatic conditions could contribute to the expansion of walrus and bearded seal populations at the expense of ringed seals. Warm periods may also decimate caribou herds, if accompanied by episodes of spring freeze and thaw that create an impenetrable ice crust over forage (Heard and Gray 1989). Given these climatic and ecological conditions, Late Dorset people should have become increasingly reliant on walrus and less reliant on ringed seal and caribou. However the archaeological data suggest otherwise. This is consistent with earlier findings indicating that these climatic episodes are not useful for predicting human behaviour.

The samples from the sites at Igloolik indicate that Late Dorset people were exploiting the same range of species as PreDorset and Early Dorset people. These included the major mammal species, as well as a variety of waterfowl and Arctic char. However, there was a change in the use of these species which

Species	NiHf 45 Feature 1		NiHf 4 Feature 4		NiHf 4 Feature 9	
Arctic Fox	3.7%	(3)	**36.6%**	**(1)**	28.6%	(2)
Caribou	**45%**	**(1)**	6.9%	(5)	16.6%	(3)
Ringed seal	**44%**	**(2)**	**28.9%**	**(2)**	**31.1%**	**(1)**
Bearded seal	1.6%	(5)	2.1%	(7)	3.1%	(5)
Walrus	3.7%	(3)	6.4%	(6)	15.1%	(4)
Waterfowl	1.9%	(6)	8.7%	(4)	3%	(5)
Other (fish, birds, *canis* species, polar bear)	>1%	(7)	9.8%	(3)	1.9%	(6)
Total	100%		99.4%		99.4%	
Sample size	2775		627		400	

Table 5.5 Late Dorset resource use. Rank is the number in parenthesis

indicates that during Late Dorset, the economy continued to broaden. This is reflected by a significant decline in walrus exploitation and a real increase in ringed seal and caribou exploitation. For example, although ringed seal ranks first in only one case (Feature 9), its relatively abundant and consistent

representation in all three samples suggests it was much more important than walrus in the subsistence economy. While it is true that the difference between ringed seal and walrus body size allows for some leveling with respect to the overall dietary contribution of each species, the large numbers of ringed seal bones as compared to walrus bones suggests that more effort was placed on ringed sealing in Late Dorset than in Early Dorset.

Caribou is also much more abundant in the Late Dorset samples than it was in either the Early Dorset or PreDorset samples. The representation of caribou body parts indicates that this abundance is not just an apparent increase due to the decline in walrus, but rather an increase due to intensified exploitation of caribou. This caribou hunting may have occurred either at Igloolik or elsewhere, but the main point is that caribou shows up in increased amounts in the Late Dorset samples and that this increase, along with the increase in ringed seal use, reflects a further widening of the subsistence economy from Early Dorset

Body Part	NiHf-45 Feature 1	
	NISP	%
Head (cranial fragments, mandible, teeth)	40	3.2
Trunk (vertebrae, ribs, sternum, costal cartilage)	280	22.5
Front Limbs (scapula, humerus, radius, ulna)	53	4.2
Hind Limbs (innominate, femur, tibia, fibula)	49	3.9
Long bone fragments (fragments and metapodials)	510	41
Carpals, tarsals, phalanxes and sesmoids	86	6.9
Flat bone and other fragments	223	17.9
Total	1241	99.6

Table 5.6 Caribou body part representation

In two samples, Features 4 and 9, Arctic fox is also very abundant. However, compared to ringed seal, caribou and walrus, this represents a minor subsistence contribution. In the third sample, (Feature 1) caribou is slightly more abundant than ringed seal, but this is partly due to the extensive fragmentation of caribou long bones, possibly for marrow extraction and grease production. For example, 452 or 36% of the identifiable caribou bones are long bone fragments. This is a real contrast to the identifiable seal and walrus bone which is not heavily fragmented, probably due to the fact that long bones of these species do not have

useable marrow and are therefore not subject to the same type of processing or to the same kind of post-depositional fragmentation (Lyman et. al. 1992). Nonetheless, there is more caribou in the late Dorset samples than in either the Early Dorset or PreDorset samples and there may be an inverse relationship between caribou and Arctic fox. Both caribou hunting and fox trapping are thought to have been fall activities with fox trapping extending into the winter. One possible explanation for this pattern is that in years when the caribou catch was poor, fox trapping was more common. It could have supplemented a diet of marine mammal and made up for a shortfall in caribou hides. Savelle and McCartney (1988:29-30) have noted a similar pattern in Thule assemblages and have suggested that foxes function as a replacement for caribou when the latter are rare or absent.

Bearded seal and walrus are present in all the samples and both species have a consistent and low representation in all the samples. The decline in walrus[6] from the previous period is unexpected given that this should be a period of abundance for that species. However, this decline is not unique to the Late Dorset period at Igloolik. Helmer (1981) reports a decline in walrus representation in samples from Early to Late Dorset in the Crozier Strait area and the five Late Dorset sites on the Bache Peninsula that produced faunal assemblages all contained less than 5% walrus (Schledermann 1990). Similarly, on Little Cornwallis Island, Late Dorset dwellings and middens, regardless of seasonal affiliation, contain on average 3% walrus in their zooarchaeological samples (Darwent and LeMoine 1995:4).

Settlement data discussed in previous chapters indicate that Late Dorset sites at Igloolik generally exhibit the same range of variability in feature types as Early Dorset sites. Some sites contain a mixture of semi-subterranean houses and tent rings, while others are dominated by one of these two dwelling types. Some semi-subterranean houses have complex axial features with multiple hearths, others have no obvious axial feature or hearth. Most sites have cache features indicating storage, and some sites also contain lithic scatters, and possible graves. Zooarchaeological data indicate that semi-subterranean houses were multi-seasonal; minimally occupied from late summer to early/mid winter and maximally occupied through the

[6] All walrus fragments from NiHf-4 combine to make a minimum of one individual. The same is true for NiHf-45.

entire year. Tent-rings are presumed to represent short-term warm season occupation. Some sites may have been occupied for most or all of the year, while others may have been used for short periods in the summer. Consistent with the persistence of reduced mobility from the Early Dorset period is the further broadening of the subsistence economy. Ringed seal and caribou exploitation increased and walrus exploitation decreased. All of these species may have been stored for future consumption, although the size of walrus and data from Late Dorset sites in other locations (Darwent and LeMoine 1995:9) suggest it was the primary storage species. The exploitation of secondary resources, in particular caribou and to a lesser extent waterfowl and fish, was intensified as compared to the Early Dorset period, probably to serve as a buffer against the risk associated with reliance on stored goods. The increase in the exploitation of fish and birds, which in Early Dorset comprise only 6% of the sample, but in Late Dorset comprise nearly 18% in one sample, would also have buffered the increased reliance on caribou. Interestingly in the Late Dorset sample, (Feature 4), where caribou representation is the lowest, waterfowl, fish and other birds have the best representation. This exploitation of minor resources like fox, birds, and fish would have been important because as compared to marine species, caribou have relatively unstable population levels from year to year (McCartney 1989). Table 5.7 shows the relative difference in the frequency of caribou, fish and waterfowl use in Early and Late Dorset.

Species	NiHf 47 Early Dorset Feature 18	NiHf 45 Late Dorset	NiHf 4 Late Dorset Feature 4	NiHf 4 Late Dorset Feature 9
Arctic fox	34%	3.7%	36.6%	28.6%
Caribou	**11%**	**45%**	**6.9%**	**16.6%**
Ringed seal	16%	44%	28.9%	31.1%
Bearded seal	6%	1.6%	2.1%	3.1%
Walrus	26%	3.7%	6.4%	15.1%
Waterfowl	**5%**	**1.9%**	**8.7%**	**3%**
Fish, other birds	**1%**	**>1%**	**9.8%**	**1.9%**
Total	99%	100%	99.4%	99.4%
Sample size	310	2775	627	400

Table 5.7 Highlighting changes in secondary resource use between Early and Late Dorset groups

The subsistence and settlement pattern for Early and Late Dorset at Igloolik may be restricted to the Foxe Basin as data from other locations, particularly the Arctic islands, indicate that both Early and Late Dorset groups there were comparatively mobile. In the Crozier Strait area, structures and sites appear to be seasonally specific (Helmer 1981) while at Port Refuge, on Devon Island, the absence of semi-subterranean houses suggests that Late Dorset settlement there was short-term and probably restricted to the warm season (McGhee 1981:79). Late Dorset settlement on south Baffin Island, in the Lake Harbour district, consisted of small seasonal camp sites (Maxwell 1985:233-235) and even the Late Dorset sites with longhouse features[7] were occupied on a relatively short-term, seasonally-restricted basis (Damkjar 1990:6).

This regional difference in the relative mobility of Dorset peoples is related to regional variability in the resource base. As compared to the northern Foxe Basin and northern Hudson Bay, the Arctic Islands, and Hudson Strait are relatively impoverished (Fitzhugh 1976b, McGhee 1976), particularly with respect to walrus (Mansfield 1959) which would have been the primary species used for storage in Early Dorset and probably also in Late Dorset. The High Arctic Islands are also comparatively impoverished with respect to caribou, which are much more abundant on Baffin Island and the Melville Peninsula. Some of the high Arctic islands do have musk ox populations, and when these animals were available it seems that Dorset people exploited them (Helmer 1981). However musk ox are susceptible to the same types of population crashes as caribou (Helmer 1981), and they were probably as unreliable as caribou from year to year. Given the low density and instability of caribou and musk ox populations and the generally low walrus population, people living in the High Arctic would not have had access to as much in the way of storable resources as people in the Foxe Basin and therefore would have had greater difficulty maintaining a comparatively settled lifestyle. As I will argue below, it was primarily the availability and abundance of walrus in the Foxe

[7] Longhouses appear in Middle Dorset (Damkjar 1990) and persist very late into Late Dorset. They are generally interpreted as seasonally used, communal structures (Maxwell 1985, Damkjar 1987, 1990, Schledermann 1990), but their specific function is unclear. For example, the Longhouse site on the Bache Peninsula contained one 4.5 metre by 5.5 metre boulder structure divided into compartments by semi-circular stone walls. There was a clear passage down the centre and 24 associated external hearths (Schledermann 1990:205). Fauna consisted primarily of small seal (54%) and birds (32.8%), while walrus comprised only 3% of the total sample. Similar longhouse features are known from Cresswell Bay, on Somerset Island (Damkjar 1987, 1990), and from the Ungava region of northern Quebec (Maxwell 1985).

Basin that led to the changes, in that region, between PreDorset and Dorset in settlement and subsistence strategies and to the development of Dorset patterns of social organization and some symbolic activities.

Changes in Patterns of Palaeoeskimo Marine Mammal Exploitation

Marine species, (ringed seal, bearded seal and walrus), in various combinations were the backbone of Palaeoeskimo subsistence systems at Igloolik. In the PreDorset period, ringed seal was the most important species. By contrast, the Early Dorset period was characterized by significant increase in walrus exploitation and a real decline in ringed seal use. In the Late Dorset period, walrus use continued, although much less intensively than in the Early Dorset period, and ringed seal became more important. Bearded seal exploitation was relatively consistent in all periods, although it peaked in Early Dorset.

Species	NiHf 58 PreDorset						NiHf 2 PreDorset		
	F1	F3	F4	F14	F24	F30	F1	Fb	Fc
Ringed seal	**90.5**	**91.6**	**100**	**87.6**	**89.3**	**96.2**	**91.5**	**95.6**	**91.7**
Bearded seal	9.5	2.7		2.4	8.5	0.7	5		2.3
Walrus		5.5		9.8	2.1	3	3.3	4.3	5.8
Total	100%	99.8%	100%	99.8%	99.9%	99.9%	99.8%	99.9%	99.8%
Sample size	200	36	46	81	47	133	119	23	85

Table 5.8 PreDorset samples. Each species is shown as a percentage of the total marine mammal count.

Species	NiHf 47 Early Dorset	NiHf 45 Late Dorset	NiHf 4 Feature 4 Late Dorset	NiHf 4 Feature 9 Late Dorset
Ringed seal	33.5	**89.2**	**71.2**	**65.4**
Bearded seal	12.7	3.2	5.2	6.7
Walrus	**53.6**	7.5	23.4	27.8
Total	99.8%	99.9%	99.8%	99.9%
Sample size	149	1373	247	194

Table 5.9 Dorset samples. Each species is shown as a percentage of the total marine mammal count.

The difference in marine mammal use among PreDorset and Early Dorset peoples is a consequence of the heavy exploitation of walrus in the Early Dorset period. This shift to walrus hunting is related to changes in the local geological conditions and ongoing uplift in the northern Foxe Basin. Walrus are

shallow water bottom feeders that prefer areas of open water and broken ice and depths ranging from 15 to 18 metres (Banfield 1974). Figure 5.1 illustrates the location of this optimal feeding zone with respect to Igloolik Island during the PreDorset, Early Dorset and Late Dorset periods. During the PreDorset period this zone is extremely narrow. In Dorset times the zone was much wider, and closer to shore

The fluctuations in Palaeoeskimo walrus use at Igloolik correspond to changes in the size and location of optimal walrus feeding habitat around the island. By the Early Dorset period, ongoing isostatic rebound in the Foxe Basin had contributed to an expansion of the optimal zone and this should have resulted in an increase in the numbers of walrus in the immediate area, and possibly to an overall increase in the population of walrus in the Northern Foxe Basin as the waters became generally shallower thoughout the basin. The consequence of an increase in the walrus population would have been a reduction in the local availability of ringed seals.

> "Walrus are at the top of the interspecific social hierarchy among northern pinn peds, and their dominance over phocid seals of some genera is particularly strong, even in captivity. Ringed seals especially tend to desert or avoid areas occupied by walrus" (Fay 1969:113)

The process of rebound and change in the structure of the animal resource base occurred gradually between Early PreDorset and Early Dorset. Over this period peoples would have had to cope with regular annual and interannual fluctuations in the resource base (not measurable archaeologically), as well as the longer term changes brought about by geological processes. Mine and Smith (1989:9) have identified four basic human responses for coping with a changing resource base. These are, 1) diversification, 2) a change in mobility, 3) a change in storage practices, and 4) a change in exchange strategies. Archaeological data suggest that at some point between the Early PreDorset period and the Early Dorset period, Palaeoeskimo peoples must have begun to shift away from ringed seal toward walrus as a primary subsistence species and to diversify economically. There are no data from Igloolik that could confirm more precisely when this occurred but

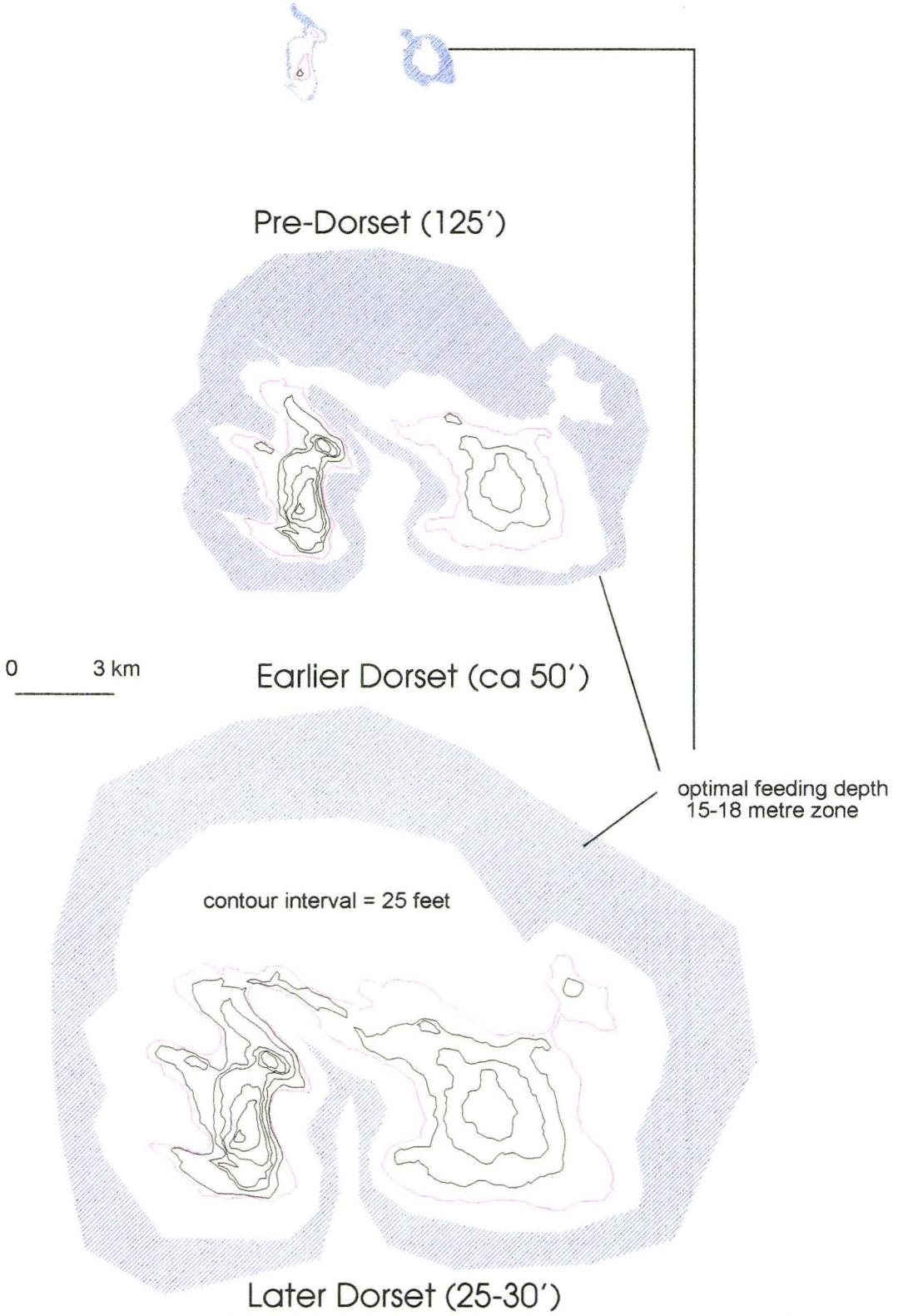

Figure 5.1 Changes in the 15 to 18 metre optimal feeding zone zone for walrus around Igloolik.

clearly by the Early Dorset period, walrus hunting was an integral part of the local economy, storage was commonly practiced and mobility was reduced. Walrus hunting declined in Late Dorset. This decline may be related to the gradual shift of walrus habitat farther from the island, making the animals less accessible during some parts of the year.

The decline in walrus hunting may also have been related to the continued broadening of the resource base as indicated by the significant increase in caribou exploitation and minor increase in fish and bird exploitation. Even with a reduction in the scale of walrus hunting, these animals would have remained an important component of the Late Dorset subsistence economy. However the incorporation of caribou into the economy would have buffered some of the risks associated with heavy reliance on walrus. Caribou are a herd species, available year round in dispersed groups and for short periods during migration and rut in large numbers, reasonably close to Igloolik (on the Melville Peninsula, or south Baffin Island). A two or three week caribou hunting season would have provided additional storable goods for groups at Igloolik. In effect, caribou, when abundant, could have served as a partial replacement for or supplement to walrus, and the exploitation of both species would have helped to ensure subsistence security.

Walrus Hunting - Risk, Potential and Impact

The size of an animal and the nature of its behaviour dictates to some extent the methods by which it can be successfully hunted. The method and organization of the hunt, whether it is a solitary, co-operative, or a communal activity will have consequences for the ways in which community members interact because co-operative or communal hunting requires a level of organization and some form of leadership which is not required during solitary hunting. The practice of various hunting strategies will in turn impact the character of social and economic relations within any given community. The co-operative hunting of whale is a case in point. Among the North Alaskan Eskimo, whaling was an important economic activity involving the co-operative effort of married couples, and whaling crews. Crew members had specialized positions including the *umialik* (captain) and the harpooner, and butchering and processing of the whales involved additional members of the community. Each person involved in the hunting and processing was entitled to a certain

share of the whale as determined by their contribution of labour (Bodenhorn 1990). The organization of North Alaskan society around whaling and the unequal nature of the distribution of whale by-products was part of process that led to the development of social differentiation within that society (Sheehan 1985).

For Early Dorset people, walrus was the most important subsistence species. The aggressive nature of walrus, the locations in which they would have been available and their massive size suggests that they would have been hunted differently than the smaller ringed and bearded seals. For example, in contrast to the latter two species which are relatively solitary, walrus are gregarious animals that travel and feed in herds. They exhibit "huddled behaviour" clustering in tight groups, and in the summer, they regularly haul-out on land or ice-floes (Mansfield 1963:25). Their tendency to congregate on land is more common at the southern end of their range where the pack ice disappears in the warm weather (Mansfield 1959:4). In the northern Foxe Basin, year-round ice cover enables herds to stay in the water and haul-out on ice pans (Mansfield 1963:25).

Walrus are significantly larger than the other pinniped species, and the potential raw materials from them are exceeded only by those derived from whale. An adult walrus has no predators other than humans (Banfield 1974). Because of their massive size, herding tendencies, aggressive nature and preferred habitat walrus present great potential risk to hunters and their families. For example, walrus will attack and capsize kayaks and umiaks, turn over ice pans, chase hunters, and break through the thin ice beneath them (Freeman 1974:150, Nelson 1969:363). Walrus that are harpooned when hauled out on ice floes have a tendency to roll into the water if they are near the edge and sometimes other members of the herd will drag or push a wounded animal into the water, dragging a hunter along (Fay et. al. 1994:369). In the historic period the dangers of walrus hunting were reflected in the high mortality rate of Iglulingmiut hunters in the Foxe Basin, as compared to lower rates among Inuit living in areas where walrus hunting was uncommon (Mary-Rousselière 1976:56).

Northern peoples have hunted walrus on land at haul-out locations, and using boats, they have driven them ashore, and hunted them in the pack ice and in open water. They have also hunted walrus on foot from the ice-edge, and occasionally through the thin ice close to shore (Brody 1976:164). All these methods are

the least risky and most effective when employed by the co-operative and co-ordinated effort of two or more hunters. Among Inuit and Eskimo groups, communal or co-operative walrus hunting was a common practice which minimized risk and maximized return. For example, in order to avoid being capsized by walrus when hunting in open water, the Iglulingmiut would tie several kayaks together (Mary-Rousseliere 1984:431). Similarly the Inuit of northern Quebec would hunt individual walrus on ice pans or in open water in groups of three or four hunters to keep the harpooned animal from escaping and or dragging a hunter out to sea. On other occasions, hunters in kayaks would surround walrus and drive them into shallow water to be harpooned (d'Anglure 1984:489). Hunting at haul-outs was also a co-operative effort. In such circumstances, several hunters would go ashore and harpoon one or more animals before they could escape into the water (d'Anglure 1984:489).

In the western Arctic, the Siberian Eskimos hunted walrus in communal drives (Hughes 1984:250), much like the Inuit of northern Quebec, while the St. Lawrence Island Eskimos hunted walrus in open water co-operatively from umiaks. In Alaska, the most productive hunting occurred during the spring break-up, when herds of Pacific walrus were moving north for the summer (Hughes 1984:272). In some communities in northwest Alaska, walrus hunting was a competitive activity between umiak crews, as each tried to get to the herd first. However, once the herd was reached there was often co-operation between umiaks to maximize the take of animals. Co-operation between crews also facilitated the transport of the animals to butchering locations and reduced the amount of time required to butcher the animals (Nelson 1969:355).

Inuit in the eastern Arctic practiced two additional forms of co-operative walrus hunting. The first was used in broken ice during the summer and involved several kayaks and hunters. The kayaks were lifted out of the water onto an ice floe and the harpoon lines were fastened to the ice. The floe was then paddled to a herd of sleeping walrus where two hunters would harpoon one animal. The fastened lines would normally prevent the walrus from rolling into the water and the hunters would wait until the animal was exhausted from struggling. At that point one of the kayaks would be launched so a hunter could lance or spear the walrus and kill it (Boas 1964:89). The second method was used primarily in the winter. Two hunters, in

single file, would approach walrus on the ice and harpoon it. Both hunters would hold the line, and attempt to anchor it in the ice. The walrus would be killed as it neared exhaustion (Boas 1964:90).

Apart from the co-operation necessary to successfully hunt and kill walrus, co-operation is also required for carcass retrieval and butchering. Depending upon the time of year, carcass retrieval can be extremely difficult. In the summer, a dead walrus will sink immediately, and if hunted in open water, several hunters are needed to keep the animal afloat. Among the North Alaskan Eskimo, the hunters would haul the animal to the edge of the umiak and lash it to the side for towing home. Alternately the walrus would be butchered as it was gradually pulled out of the water. It would take as many as six individuals to pull a grown animal on board (Nelson 1969:365). A similar method was also used by the Inuit of Southampton Island. Depending upon the size of the walrus, it would be butchered into between two and seven parts of roughly similar weight (Freeman 1974:150-151). Butchering required at least two people (Nelson 1969:367).

Consistent with the co-operative nature of walrus hunting and butchering, the animals were shared between the hunters and their families. The North Alaskan Eskimo would divide the walrus between the members of the umiak crew, with each getting a portion of meat, hide and blubber. A share of each was also given to the boat - this was for the boat owner, as were the tusks and baculum (Nelson 1969:84). Among the Central Eskimo a walrus was divided into as many parts as there were participating hunters. Each part was rolled into a piece of skin. This skin was used for making boats and lines (Boas 1964:114). This sharing ensured the general well-being of the communities, and that individual families had sufficient stores of important raw materials, meat and blubber. Generally walrus hunting communities had greater comparative affluence and status than non-walrus hunting communities. Walrus hunters had larger, healthier dog teams, better living conditions, relative subsistence security (d'Anglure 1984:489, Mary-Rousselière 1976) and in contact situations with other communities, were the culturally dominant group[1] (Mary-Rousselière 1976:56).

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[1] This meant that visitors to Iglulingmiut communities would adapt to the ways and customs of Iglulingmiut.

In the PreDorset period, small households were the basic economic unit and all subsistence pursuits could have been accomplished by individual hunters. This was not the case in either the Early or Late Dorset periods when walrus hunting was a significant economic activity. For Dorset people, walrus hunting would have been equally risky and equally profitable as for more recent groups of northern hunters. Although not impossible (Boas 1964), it is unlikely that lone individuals regularly hunted walrus. A single hunter would, under most circumstances, have to hold a struggling animal until it was exhausted, before it could be safely killed. Without the use of firearms, it is nearly impossible to kill a walrus outright - to die instantly it must be shot in the brain or the anterior part of the spinal column (Fay et. al. 1994:369). Furthermore if the animal was harpooned in the water the hunter would then have to get it out of the water onto land or an ice floe, butcher it and transport it back to a settlement. Most of the time, walrus hunting must have been a communal activity between two or more hunters.

Following Driver (1990:12), communal hunting is defined as: participation by two or more hunters; active co-operation whereby hunters work together as opposed to passive co-operation in which hunters agree not to interfere with each other's activities; and a system of hunting that requires all hunters to participate in a previously conceived plan. Communal hunting reduces risk in individual households by making up for an individual hunter's shortfall, and it reduces risk by allowing some hunters to focus on other species, resulting in a widening of the diet breadth (Damkjar 1990:4). For example, specialized crews of walrus hunters could have obtained large amounts of meat which could have been shared through the community via a redistribution system of sharing or exchange. Not all hunters in a community would have needed to participate in the walrus hunts and some could have concentrated on the hunting of other species. In the case of Late Dorset, this may have involved the procurement of caribou by hunters not regularly involved in walrus hunting. While it is difficult to assess the ways in which walrus and other species would have been shared, and how hunting activities may have been divided up, it is clear that at the very least the communal hunting of walrus would have reduced the very real personal risk to individual hunters.

Settlement data from Early and Late Dorset sites suggest that that the labour force necessary for intensive and effective walrus exploitation was available in the Dorset communities at Igloolik. Both Early

and Late Dorset dwellings are significantly larger and more permanent than PreDorset dwellings; some have multiple hearths. Multiple hearth houses are known from other Early Dorset locations as well. For example on Somerset Island, Damkjar (1990:8) reports two sites with axial features divided into five and six hearth units. Two hearth houses are common throughout Dorset, with larger houses appearing in Middle and Late Dorset. Small-scale walrus hunting could have been conducted co-operatively by two hunters for most of the year, with periodic intensification of the hunt at other times. This was most likely to have occurred during the summer when hunting would have been primarily in open water, or at haul outs when more hunters would have been required. The settlement evidence from Igloolik suggests that summer occupation on the island was more intensive than winter occupation. For example, there are 52 semi-subterranean houses and 76 tent rings on the Dorset sites at Igloolik. Both of the structure types were used during warm months. While this could indicate a short-term summer abandonment of semi-subterranean houses, it more probably reflects a periodic population influx of Dorset people from other areas coming to participate in larger communal walrus hunts. This is consistent with data from other locations that suggest that Dorset populations outside the northern Foxe Basin were more mobile.

There is a least one location on Igloolik Island, NiHf 57, which appears to have been used during the Dorset period for large scale walrus processing of the sort that might be associated with communal hunting. This site is located at 15 metres above sea level, immediately opposite NiHf 47, on the north side of Turton Bay and consists of a 120 metre scatter of walrus bone (ASC records). There are no Dorset sites in the immediate vicinity and so meat and other materials may have been transported to settlements on the south side of the island and elsewhere.

Technological Innovation and Dorset Walrus Exploitation

The exploitation of walrus by Dorset peoples is clearly indicated by the zooarchaeological data from Igloolik. However, there are additional artefactual data that support the conclusion that walrus hunting developed in Early Dorset and that over the long term it became of major socio-economic importance to

Dorset people. More precisely there is evidence in Early Dorset, for the development of a new form of harpoon head specifically designed for walrus hunting.

Harpoon heads have been used to work out Palaeoeskimo chronological sequences for a number of decades. For example, there is a temporal, stylistic trend from open socket harpoon heads in PreDorset to closed socket harpoon heads in Dorset (Maxwell 1976). Although it is recognized that some of the variation in harpoon head form must be related to function, there have been few formal analyses aimed at understanding what these functions might have been (see Maxwell 1974/75 for an exception). For example, it is not clear whether specific harpoon heads were single purpose (used to hunt one species, or used only in certain conditions) or multi-purpose.

There are several large collections of Palaeoeskimo harpoon heads from sites in the northern Foxe Basin. (Figure 5.2) Those used in the following study are as follows: from Igloolik Island collections from NiHf 1, NiHf 3, NiHf 4; from the Melville Peninsula collections from Alarnerk; from Jens Munk Island collections from Kapuivik and Kaersut (Meldgaard n.d. and 1969). All the harpoons in the collections were grouped based on those attributes more likely related to function than to style or manufacturing technique. These were: the presence or absence of a slot or slots for end or side-blades; the type of line hole (single or double); and the placement of the line hole(s). (Figure 5.3) Using these criteria the 351 harpoon heads from the six sites were placed into six types: Type 1) those with a single line hole perpendicular to the width, with a blade slot; Type 2) those with a single line hole through a raised ridge and parallel to the width, with a blade slot[9]; Type 3) those with a double line hole through front to back, with a blade slot; Type 4) those with a single line hole though front to back, self-bladed and sometimes barbed; Type 5) those with a double line hole through front to back, self-bladed; and 6) those with a single line hole off centre through front to back, self-bladed and sometimes barbed (Figure 5.4)

[9] This type is also known as Dorset Parallel Sliced (Maxwell 1976:63) and the Dorset Parallel (Taylor 1968).

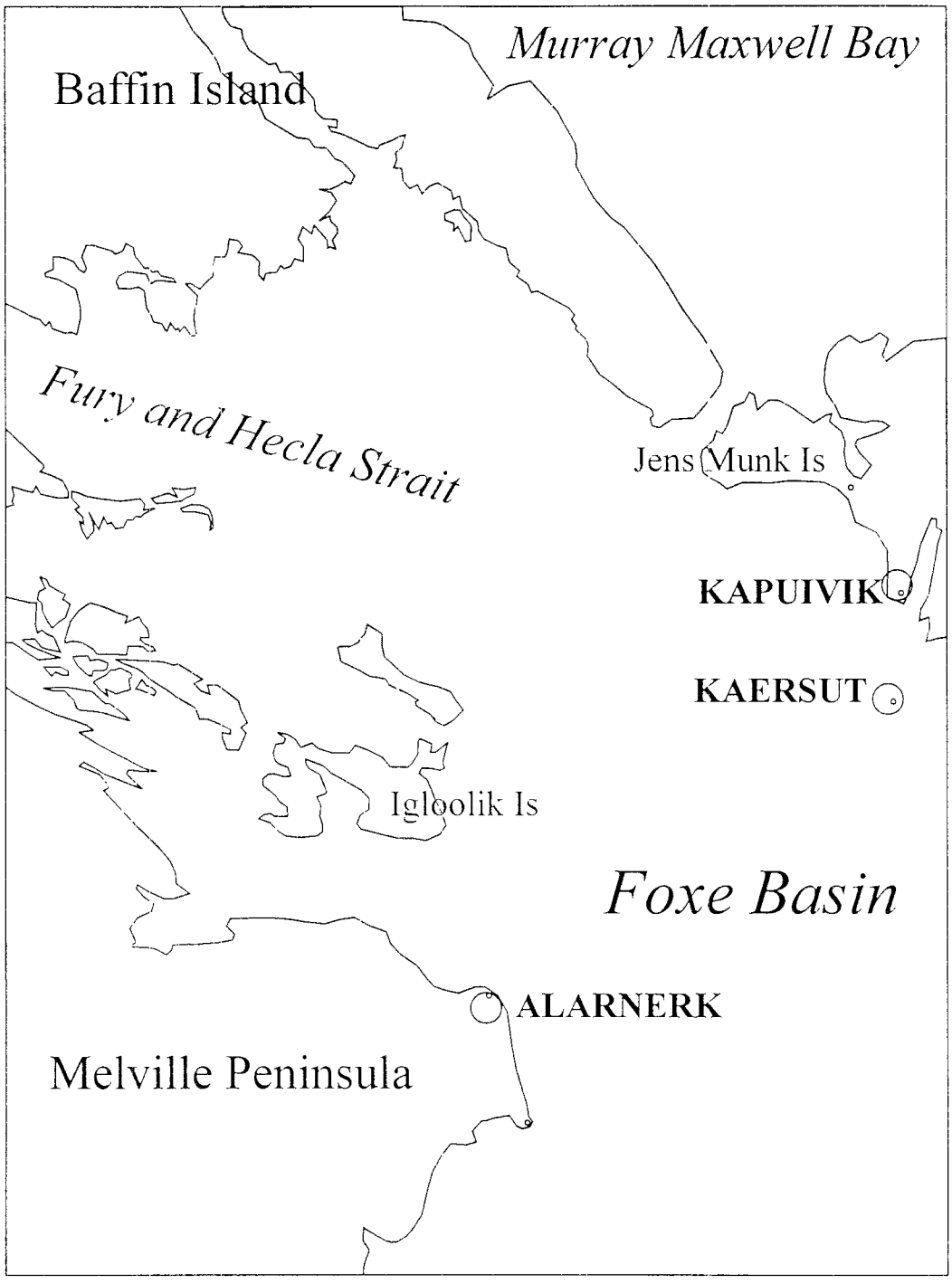
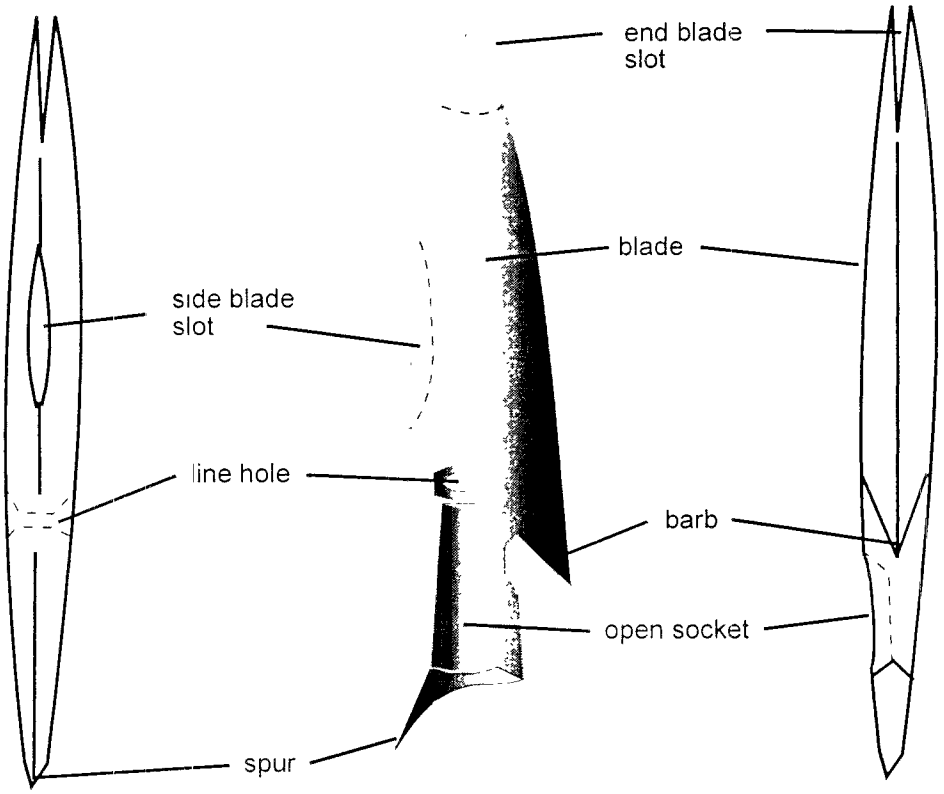
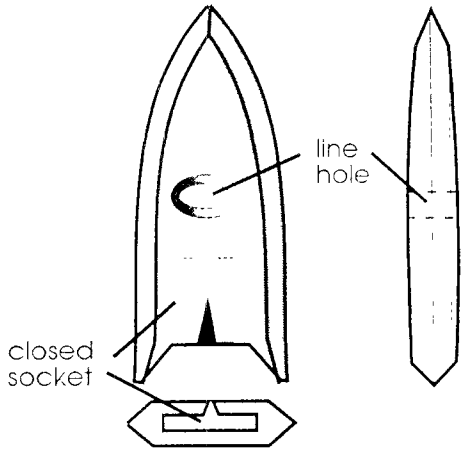


Figure 5.2 Sites in the Foxe Basin

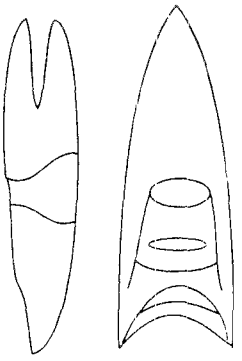


Open socket, barbed harpoon head with blade slots

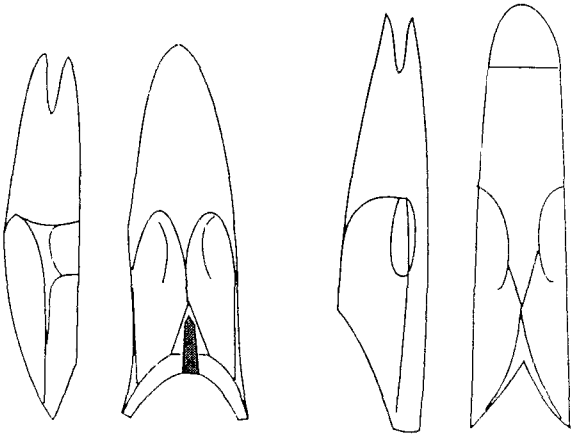


Closed socket, self-bladed harpoon head

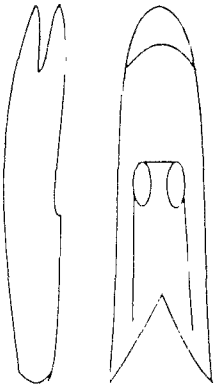
Figure 5.3 Basic harpoon head attributes



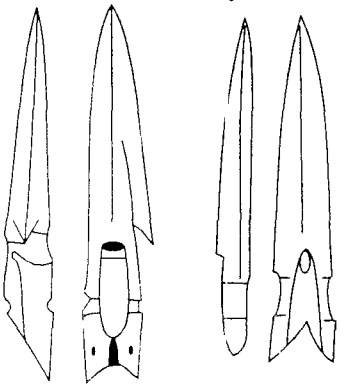
Type 1 - one Early Dorset example



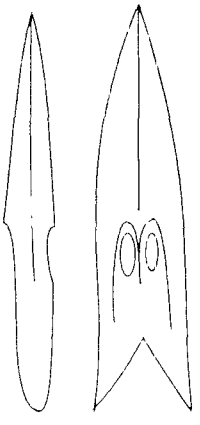
Type 2 - one Early Dorset example and one Late Dorset example.



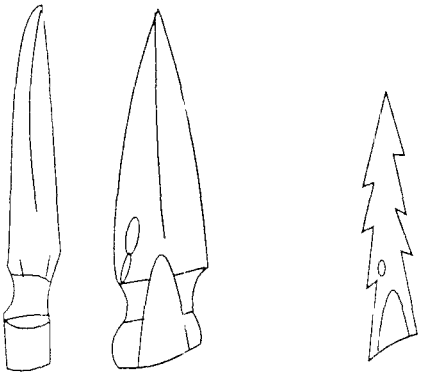
Type 3 - one Late Dorset example



Type 4 - one PreDorset example, one Late Dorset example



Type 5 - one Late Dorset example



Type 6 - two Late Dorset examples

Figure 5.4 Some examples of the six basic harpoon head types in the Paleoeskimo collections from Foxe Basin

Based on the provenience information, the harpoons were also grouped according to site and elevation above sea level. This, along with a comparison to harpoons from dated sites elsewhere, established the chronological context

Harpoon Type	PreDorset	Early Dorset	Late Dorset	Total
1	14	58	23	95
2	-	68	44	112
3	-	-	6	6
4	30	77	15	122
5	-	-	13	13
6	-	-	3	3
Total	2 types 44 total	3 types 203 total	6 types 104 total	351

Table 5.10 Harpoon head types per period

Types 1 and 4 were found in both PreDorset and Dorset assemblages. Types 2 was found in Early and Late Dorset assemblages and Types 3, 5 and 6 were found only in Late Dorset assemblages. There are two points to make about this pattern. The first is that the range of harpoon head types increases over time. This mirrors the increase in diversity of resource use over time. The second point is that of the six types, Type 2 stands out as the only kind to differ significantly with respect to placement of the line hole.

One collection of Palaeoeskimo harpoon heads from Alarnerk[10] was studied further. A series of attributes (length, width, thickness, width of the end-blade slot, and length and width of the line hole) was measured (Figure 5.5) with the following results. The six harpoon head types are variable in length, although there is some weak clustering within types. In contrast, harpoon head thickness is consistent between types, except for Type 2. It is much thicker than all other types (Figure 5.6). Type 2 also differs from the other types with respect to the line hole, which is much larger and longer than those in all other types (Figure 5.7). The general shape and thickness of Type 2 harpoons suggests that they were designed to accommodate a larger line and more stress. This appears to have been a successful design. For example,

[10] I was able to measure 77 of the 95 harpoon heads from Alarnerk.

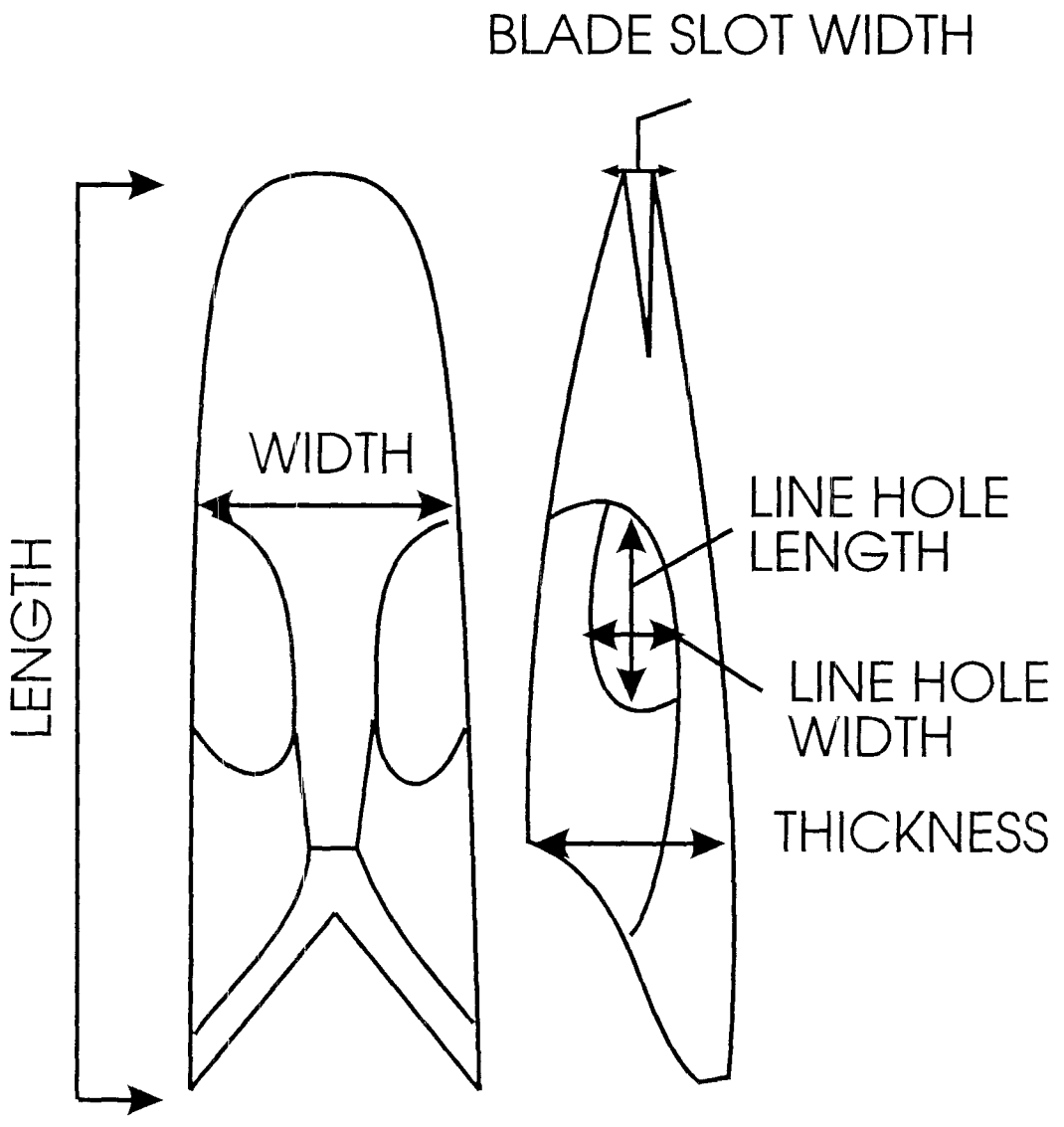


Figure 5.5 Location of harpoon head measurements

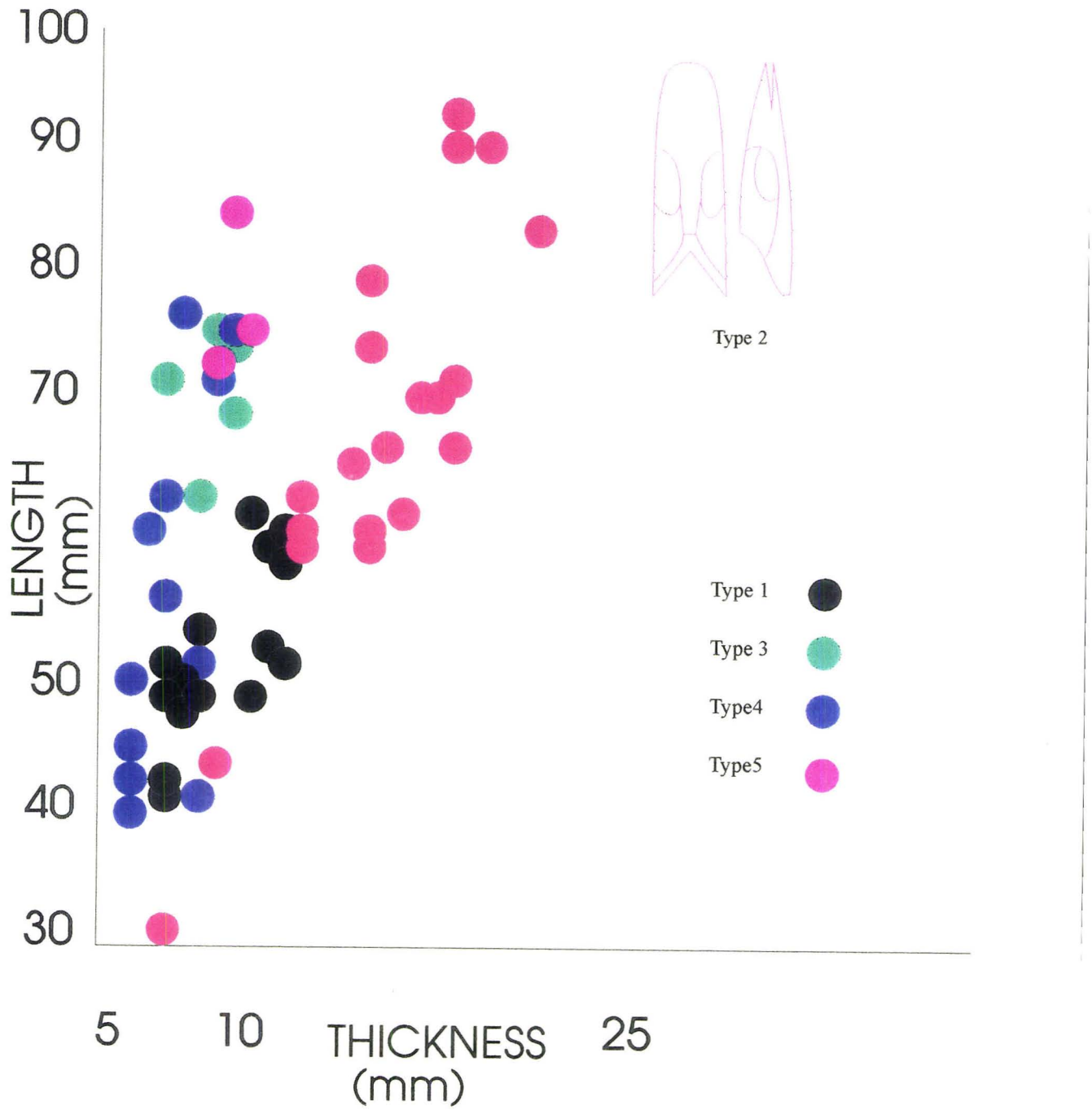


Figure 5.6 Harpoon head length and thickness measurements.
Note the clustering of thickness between types and the greater thickness of Type 2.

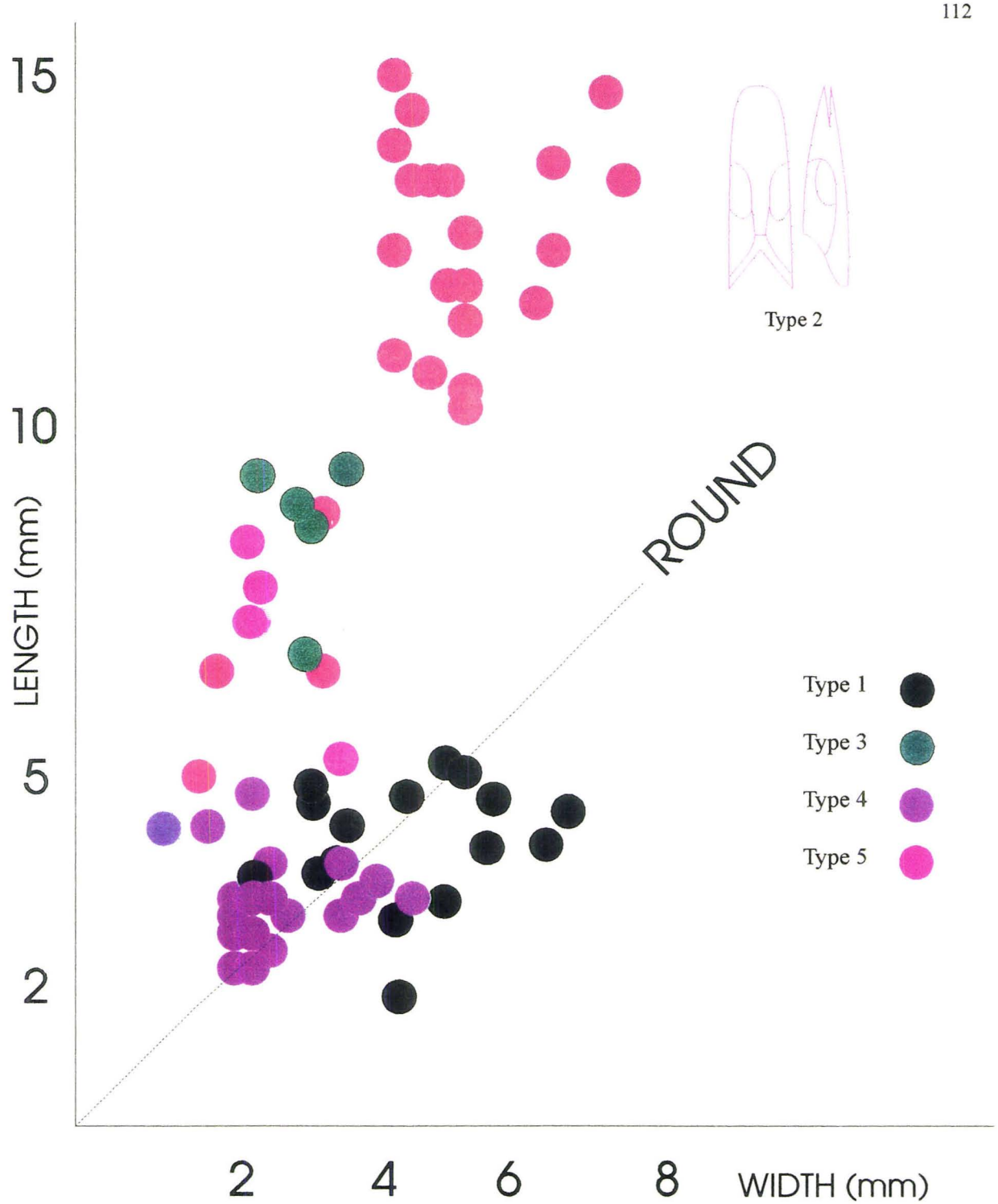


Figure 5.7 Line hole measurements. Note the separate cluster of Type two harpoon heads.

only one of the 27 the Type 2 harpoon heads is broken at the line hole while eight of the remaining fifty (all other types) are broken at the line hole(s).

Type 2 harpoon heads first appear in the Early Dorset period. Zooarchaeological data indicate that this was a period in which walrus hunting was of primary importance. I would argue that Type 2 harpoon heads were developed for walrus hunting. A more reliable harpoon that was less likely to break at the line hole would have reduced failure and increased productivity, both of which would have been important considerations for people who relied on stored goods to any extent (Rowley-Conwy and Zvelebil 1989 49) The Type 2 harpoon was well suited to high risk and dangerous walrus hunting wherein the loss of game could turn into economic and personal tragedy. Maxwell (1976: 63-64) has also suggested that this type was a walrus hunting harpoon, noting its abundance in locations good for walrus hunting, specifically the Foxe Basin and northern Hudson Bay.

To summarize then throughout PreDorset and into Dorset there are five basic variations on a single type of harpoon head, one with a single or double line hole placed perpendicular to the width of the harpoon. In Dorset, concurrent with a decrease in mobility, the appearance of new house types, including some multi-household dwellings, and a large increase in walrus exploitation, there appears a re-inforced, re-designed harpoon head with an extremely large line hole placed parallel to the width of the harpoon This harpoon head helped to maximize the return and to minimize the risk associated with walrus hunting.

Elaboration on Walrus Hunting Harpoon Heads

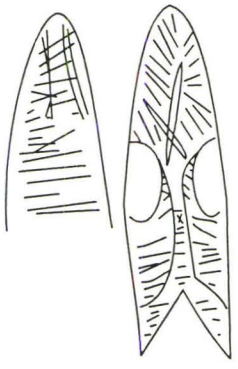
Walrus hunting held the most promise for individual and community prosperity and at the same time posed the greatest threat to individual and community survival The successful procurement of walrus insured a surplus of goods, and relative affluence or subsistence security as compared to previous periods, and possibly also to contemporary communities in different locations. If population size is held constant, (and there is no reason to think there were dramatic population changes) then the combined appearance of more permanent dwellings and storage practices in Early Dorset can be taken to indicate a change in affluence from the PreDorset period As Salisbury (1984) has noted, affluence can have a range of effects

on societies, including increased consumerism, socio-political differentiation between individuals, and or cultural enhancement whereby new goods or activities are given a certain symbolic significance. Archaeologically, increased consumerism might appear as an increase in the quantity of exotic goods from outside of the eastern Arctic. In the Dorset period, there is no evidence for this. Nor is there any indication of the development of socio-political differentiation. In archaeology, some markers of socio-political differentiation can include: differences in the quantity and types of material culture such as the presence of luxury or exotic goods in some houses and not others; differences in the size and or style of dwellings; and differences in burial practices within and between communities. Apart from seasonal difference in dwelling types, there is no real stylistic difference between Dorset houses, nor is there at present any indication of significant differences in the material culture found in different houses and there are no well documented Palaeoeskimo burials. However there is some indication that material culture associated with walrus hunting, a new economic activity, became the focus of decorative elaboration. This elaboration may have been linked to increasing affluence as a consequence of walrus hunting in Early Dorset and or to the risk associated with the activity.

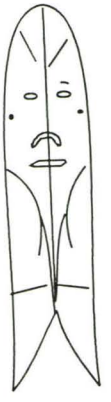
For example, in addition to the structural differences between Type 2 harpoons and all other types, there are also some other differences. Of the 351 harpoon heads examined in this study, 39 are decorated. Of the 39 decorated harpoon heads from Igloolik, 32 are Type 2 harpoon heads, 16 from Early Dorset levels, and 16 from Late Dorset levels. Decorative motifs include faces, skeletal representations, diagonal slashes, and sequences of straight lines and dashes (Figure 5.8 shows some examples). Taçon (1983) noted that in his study of 865 pieces of Dorset art from the eastern Arctic, only 52 or 6% of obviously utilitarian items were decorated, of these, 34 or 65% were harpoon heads. Harpoon heads were more commonly elaborated than any other utilitarian items, and based on the Igloolik data, Type 2 harpoon heads received this treatment more regularly than any other type.

NiHf 47
Type 2 Early Dorset
Incised cross-hatching

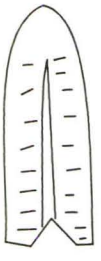
Alarnerk
Type 2 Early Dorset
Diagonal Slash



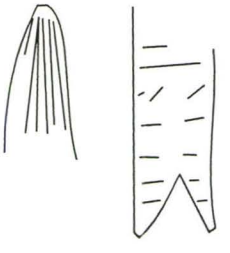
Jens Munk
Type 2 Early/Middle Dorset
Skeletal motif? with cross



Alarnerk
Type 2 Late Dorset
Incised face



Alarnerk
Type 2 Late Dorset
Skeletal motif



Jens Munk
Type 2 Late Dorset
Skeletal motif

Figure 5.8 Type 2 harpoon heads showing motifs found on other objects of material culture

Harpoon Type	PreDorset		Early Dorset		Late Dorset	
	Undecorated	Decorated	Undecorated	Decorated	Undecorated	Decorated
Type 1	14	1	57	1	23	
Type 2			**52**	**16**	**28**	**16**
Type 3					6	
Type 4	30	2	77		15	
Type 5					10	3
Type 6					3	
Total	44	3	186	17	85	19

Table 5.11 Decorated harpoon heads

The elaboration of Type 2 harpoon heads is not restricted to the Foxe Basin, but rather is found throughout the eastern Arctic, although it is much less pronounced in other regions. For example, in Newfoundland, several decorated, non-functional examples were recovered from Port au Choix (Harp 1969, 70). In northern Labrador at the Avayalik site, a Middle/Late Dorset settlement, five harpoon heads were recovered. Three of these were Type 2 and all three were incised with parallel lines: one with lines on the dorsal and ventral surface and two with lines just on the dorsal surface (Jordan 1979). At the Tyara site in northern Hudson Bay, Taylor (1968) noted that some of the early Type 2 harpoons were decorated with incised lines and or carved faces. Finally, at the Longhouse Site (Late Dorset) on the Bache Peninsula, Schledermann (1990: 213) recovered 21 harpoon heads, seven of which were Type 2. Of these, two were decorated with incised faces, and other lines and had holes in the distal tip, possibly for blade attachment or suspension. Schledermann (1990: 214-215) has interpreted the site as being a location for ceremonial activities, and suggested that some of the decoration on the harpoon heads may represent property marks. Similarly, Jordan (1979: 401) has argued that it is unlikely that this elaboration simply represents decoration as these harpoons would have been crucial items of technology and suggested that the elaboration probably represents some kind of symbolic or religious meaning. I would argue that within the Foxe Basin, the regular elaboration of Type 2 harpoon heads reflects specifically the social, symbolic and economic

importance of walrus hunting in that area. In other areas, where walrus hunting was not as important, these harpoons were less regularly used and less regularly elaborated.

Some of the designs that appear on Type two harpoon heads also appear other objects of Dorset material culture such as animal carvings, bone tubes, spatulate objects, toy kayaks and other harpoon head types. Commonly occurring motifs include incised faces, the skeletal motif and the diagonal slash. Objects with these motifs are known from Dorset sites throughout the eastern Arctic including at Dundas Island (McGhee 1974/75), in the Foxe Basin (Meldgaard 1960, Rowley 1940), at Lake Harbour, in the Pond Inlet region and in northern Hudson Bay (Taylor and Swinton 1967). There are also patterns or motifs that are restricted to Type 2 harpoon heads, at least in the Igloolik collections. These consist of combinations of lines, dashes and dots. Figure 5.9 shows some examples.

There are a variety of possible explanations for the elaboration of Type 2 harpoon heads but two possibilities seem most consistent with the other archaeological data. The first possibility is that some of it may have been related to property ownership or the practical economic aspects of walrus hunting. The second possibility is that some of it related to the symbolic elaboration of the role of walrus and walrus hunting in Dorset society. I would argue that the marks restricted only to Type two harpoon heads either represent ownership marks which reflect communal walrus hunts involving more than two individuals or some specific symbolism associated with walrus hunting. The former may be a more reasonable interpretation as these marks are not repeated and no two are alike. Drawing on ethnographic data, a similar argument has been made for marks on hunting equipment from prehistoric sites in North Alaska (Mine and Smith 1989:31) and as Weissner notes (1982:175) ownership marks are most common among groups of hunters who practice storage.

In co-operative hunting situations, there is a need for some form of leadership, and the relationships between hunters must be defined in order for the hunt to function smoothly and for game to be shared out properly. The distinction of hunting equipment is one way of indicating leadership and ownership. Among ethnographically known groups of hunters, property marks on equipment were used to re-inforce ownership and distribution rights. The establishment of such rights was most important during the communal hunting

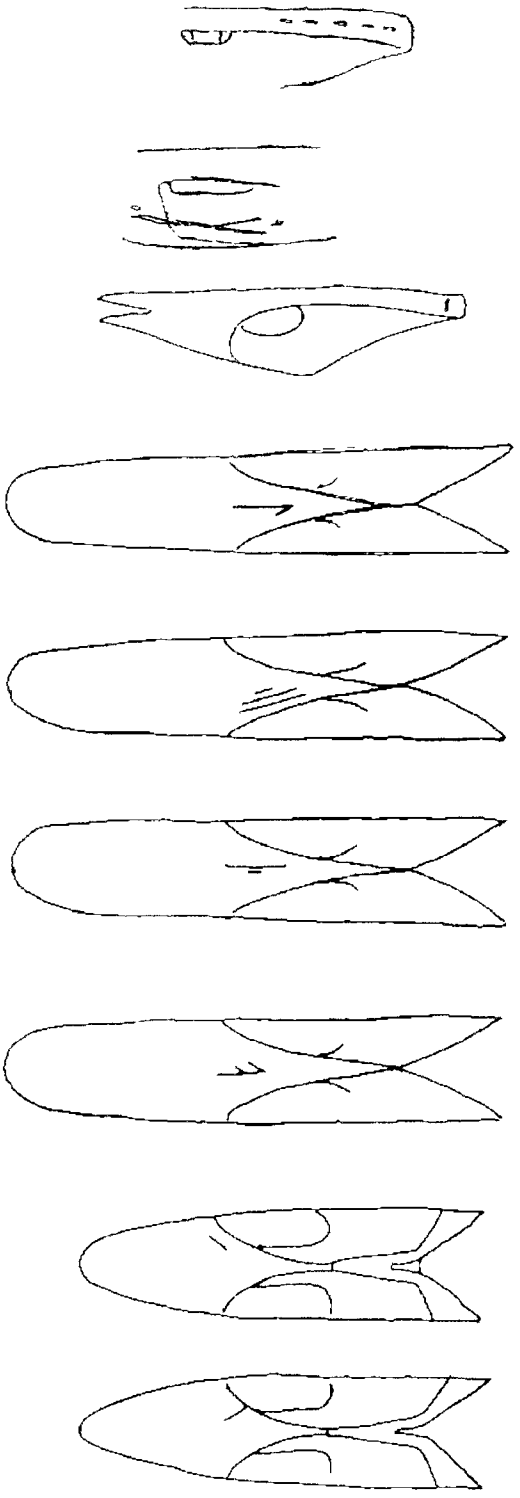


Figure 5.9 Motifs restricted to Type 2 harpoon heads (all from Foxe Basin)

of herd species and or the communal hunting of large and or dangerous game species. For example among the Alaskan Eskimos, property rights were complex and property was owned at a societal level, a local family level, a domestic family level and a conjugal family level (Burch 1991). Food was family property, and the degree of ownership was important. Fish and game were owned by individuals, and if an individual obtained an animal with no witnesses or assistance, it belonged to that individual. Bears, ringed seals, spotted seals, small fur-bearers, bird and fish caught with a hook or leister belonged to the individual who killed them. Beluga whales and caribou that were herded collectively but killed by individual hunters belonged to those hunters. Caribou, bearded seal, walrus, fish that were netted, and ptarmigan, hare or waterfowl that were netted were divided equally among the hunting party. Sometimes the boat owner, or family head would take a larger share. Bowhead whale, hunted communally, was divided unequally, with the particular portion and size of portion depending upon the role of each involved individual (Burch 1991:102-103). "Each individual had a personal property mark, with which most possessions, but especially hunting equipment, were marked" (Burch 1991:102).

Widely distributed motifs that are found on Dorset Type 2 harpoons and other objects may be associated with other forms of symbolic behaviour in Late Dorset. Interestingly, decoration is more common on the Late Dorset Type 2 harpoon heads than on the Early Dorset Type 2 harpoon heads. This, and the restriction of certain motifs to Type 2 harpoon heads suggests that, over time the need for a practical and or symbolic distinction of walrus hunting equipment may have changed and possibly intensified.

Period	Total Sample	Total Decorated
Early Dorset	68	16 (23.5%)
Late Dorset	44	16 (36.3%)

Table 5.12. Early and Late Dorset Type 2 harpoon heads

Hunting is a technical skill, an economic pursuit, and for many northern peoples a sacred act (Rasmussen 1931, Spencer 1959). Rituals and appropriate procedures are integral to hunting and these are often most pronounced in the hunting of species that are dangerous or have significant economic import.

Common among northern hunters is the idea that humans and animals have a reciprocal relationship and that animals give themselves to humans in exchange for proper treatment, which may include how the animal is killed, transported, butchered, shared, disposed of and where it is transformed into clothing or other objects (Bodenhorn 1990, Feit 1994, Tanner 1979). Among the Inuipiat of north Alaska, these activities were accompanied various rituals. The bigger the game, the more important was the participation of both men and women and the proper manipulation of particular objects of material culture in these rituals (Bodenhorn 1990). For example, in the case of whales -

> "The husband [umialik] hired a skilled craftsman to make the special wooden pot from which the wife would offer a welcoming drink of water to any whales caught by him. The wife hired an old women to make special mittens to be worn when carrying the pot and she made the whale hunting boots to be worn by her husband during the whaling season. She played an important role during the launching of the umiaq (whaleboat) and then returned home, placing the special pot and her husband's drum by the entrance of their house. He in turn wore her belt and kept her left handed mitten in the boat. She provided the drink of water to the whale, as mentioned above, then after butchering, offered her husband a drink from the same pot. The pot, cooked meat, hunting charms, amulets, the hammer used to make the pot and shavings from the paddles was then place under a tripod formed by three paddles and the wife threw a parka over the tripod." (Bodenhorn 1990:62-63).

For Dorset people, walrus was the biggest and most dangerous subsistence species they regularly hunted, and for a time it was economically the most important. It is not surprizing then that walrus hunting equipment appears to have been decoratively elaborated. There are several possible explanations for this, including ownership rights over walrus, and rituals or symbols associated with walrus hunting and increased local affluence. In any case, walrus hunting equipment was distinguished from other hunting equipment. This distinction in conjunction with the associated risks and benefits of walrus hunting, and the communal means by which it must have been hunted, suggest that the practice would have been associated with the sharing, distribution and ownership of goods.

Summary

This chapter outlined a model of changes in Palaeoeskimo economic and social organization in three periods of occupation at Igloolik. Building on settlement and zooarchaeological data, and secondary

artefactual evidence, it was argued that PreDorset society was composed of highly mobile, self-sufficient households. PreDorset settlement at Igloolik was short-term, sites were probably occupied by a few households at a time and were re-used over many years. Igloolik would have been a good location for ringed seal hunting in both summer and winter, and ringed seal were the primary subsistence species, however, the presence of waterfowl in most of the archaeological samples from the PreDorset period, suggests that settlement occurred primarily from late spring through summer. Although there was some indication of minor winter settlement, most cold-weather activities must have occurred somewhere else. Given this, it was argued that some of the secondary species used at Igloolik, in particular caribou, may have been exploited more heavily elsewhere during other times of the year. Data from Igloolik are consistent with data from PreDorset settlements in the Central and High Arctic and re-inforce McCartney's (1989) notion that the nuclear family, or small household was the primary economic unit.

In contrast, Early Dorset society was composed of less mobile households of variable size with some possibly consisting of two or more families. The seasonal use of sites was also more variable, and some sites appear to have been occupied throughout the year while others were occupied primarily in the summer or from the summer into the mid-winter. Storage was an important component of the economy which was more broadly based than in the previous period. Walrus hunting was the most important subsistence activity, and the successful procurement of walrus was the result of a change in accessibility, co-operation between hunters and the invention of a more robust harpoon head that helped to reduce the risk and maximize the return from walrus hunting. Walrus provided a surplus for storage; a probable consequence of which was the relative affluence of Early Dorset communities in the northern Foxe Basin as compared to PreDorset communities and to contemporary Early Dorset communities elsewhere. Data from the Central and High Arctic indicate that Early Dorset settlement was comparatively mobile and that walrus was not as important in the local economies in those areas. At Igloolik, the large number of temporary summer dwellings (tent rings) suggests that summer may have been an aggregation period, with Early Dorset families coming in from other areas, possible to participate in communal walrus hunting.

The major change in economic strategies which occurred between PreDorset and Early Dorset - the development of walrus hunting - was attributed to a long-term change in the geological character of the northern Foxe Basin, which either brought more walrus into the region, or made the already existing walrus population more accessible to Palaeoeskimo hunters. The shift to walrus hunting was accompanied by social re-organization, primarily the appearance of multi-family households and the co-operative and communal hunting of walrus. Walrus hunting harpoon heads appear to have been decorated much more commonly than all other harpoon head types and this suggests that in addition to its economic importance, walrus hunting may have also had real social and or symbolic importance in Dorset society, particularly as it related to the development of communal hunting and the consequences of sharing and redistributing large game. the elaboration of walrus hunting harpoon heads may have related to specific ritual activities associated with walrus hunting and or to property and ownership rights over walrus and at the very least indicates that it was important to distinguish walrus hunting from other types of hunting.

The basic settlement pattern which appeared in the Early Dorset period continued into the Late Dorset period. Some dwellings and sites were multi-seasonal, while others were occupied primarily in the summer. Household size continued to be variable, and storage remained an important strategy for coping with shortfall. However, there was a continual broadening of the economy, as walrus procurement declined, and the exploitation of previously secondary resources was intensified. Despite the decline in walrus hunting, it continued to be an important activity and walrus hunting harpoon heads continued to be used. There is some indication that the decoration of those harpoon heads was comparatively more common than in the Early Dorset period, although the sample is relatively small. One speculative interpretation for this increase in elaboration is that over time, the symbolic and social importance of walrus hunting changed, even as the economic importance declined.

Chapter Six

Conclusion

There are several points to make here which have bearing on both Arctic archaeology and hunter-gatherer archaeology. First, is that it is clear that there was a wide range of economic options for Arctic peoples, despite a perception that this might not have been the case. While it is true that the number of different animal resources in the Arctic may have been limited, the ways in which humans chose to exploit available resources were highly variable. Economies varied temporally, geographically and culturally. Second, the Igloolik data are consistent with data from other locations which suggest that neither the climatic nor the archaeological data are sufficiently detailed to positively link culture change and climate change. Third and finally, the integration of zooarchaeological data, with settlement and subsistence data and artefactual data normally used to explore the subsistence practices of prehistoric hunter-gatherers can also be used to illuminate specific social and historical processes in those societies.

In Arctic archaeology as in hunter-gatherer archaeology in general, the tendency has been to collapse prehistoric cultures into Binford's (1980) forager/collector model, and to view change as a shift along this continuum of simple (read forager) to complex (read collector). For example, Early Palaeoeskimos have been described as broad spectrum foragers (McCartney and Helmer 1989) because of their apparent high level of mobility, hunting practices, relatively simple technology and lack of storage. They are presented as a contrast to Thule groups who have been modeled as collectors (Savelle and McCartney 1989) that utilized complex technology, a wide range of site types, and the practice of storage.

The data from Igloolik can be viewed within the forager/collector framework and doing so prompts a re-consideration of the simple to complex Palaeoeskimo - Thule continuum. Within the Palaeoeskimo period both foraging and collecting patterns were present and both were temporally and regionally variable. PreDorset patterns in Igloolik fit those normally associated with foragers, while Early and Late Dorset

patterns are more like those associated with collectors. However, there is temporal variability in local subsistence practices and geographic variability in both settlement and subsistence organization. For example the PreDorset pattern at Igloolik was one of short-term warm season exploitation of ringed seal and waterfowl. Mobility was a crucial components of the subsistence and settlement system, and it was suggested that other species, particularly caribou, were exploited elsewhere, perhaps on the Melville Peninsula and or on Baffin Island. The pattern for Igloolik during this period is similar to patterns described for PreDorset elsewhere, specifically in the central and high Arctic. In contrast to the PreDorset pattern, both Early and Late Dorset groups at Igloolik appear to have been less mobile, and to have lived on the island during both summer and winter. This reduction in mobility was supported in Early Dorset by the shift to walrus hunting which in turn enabled the accumulation of stored goods. In Late Dorset the reduction in mobility was supported by the exploitation of walrus, caribou and ringed seal. Outside of the Foxe Basin, Early and Late Dorset groups appear to have retained a mobile lifestyle, despite a slight increase in the exploitation of walrus in Early Dorset. The retention of mobility as a strategy for coping with resource shortfall was attributed to the different nature of the resource base, in particular the relatively limited numbers of walrus and caribou or musk ox, in those other regions.

The equation of PreDorset with forager and Dorset with collector masks this variability and over-simplifies the complex history of Palaeoeskimo culture change in the Eastern Arctic. For example, while the Dorset period may fit within the collector framework because storage was practiced, sites were multi-functional and settlement was more sedentary than in the PreDorset period, the pattern is quite different from the early Thule pattern of large winter communities, communal whale hunting and other small seasonal camps (Maxwell 1985, Savelle and McCartney 1989). In Arctic archaeology as elsewhere, the widespread use of the forager/collector model[1] as a way of typing hunter-gatherers can be misconstrued as a way of explaining human societal variability rather than as it was intended to explain archaeological site variability (Kelly 1992:43-44).

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[1] Smith (1991) has recently criticized the application of the model to contemporary northern hunters, for the same reasons presented here.

In the Foxe Basin, Palaeoeskimo prehistory was tied to local geological circumstances which affected local ecology and short-term human economic strategies. The role of technology was crucial as the invention of a new item, in this case the walrus hunting harpoon head, began the process of social and economic change. As Salisbury notes (1962:210) given time and free play, a simple technological innovation can result in a totally new form of social organization. This appears to have been the case in the Foxe Basin where the combination of changing local conditions, technological innovation and the re-organization of hunting strategies resulted in significant changes in social organization, in particular the shift from small to large households, the development of communal hunting and possibly also the development of property rights associated with walrus and a new level of subsistence security for Palaeoeskimo communities. Sheehan (1985) has made a similar point with respect to the appearance of social complexity in Alaskan Eskimo society, noting that culture change there was a complex process related to the introduction of drag-float technology, economic specialization and hunting re-organization. In the Foxe Basin, innovation, re-organization and economic specialization on walrus contributed to make a more affluent society, which in this case related to subsistence security. This new level of affluence was part and parcel of the fluorescence of symbolic and communal activities that appears to have characterized the Dorset period and to have intensified in Middle and Late Dorset (Maxwell 1985).

The model of Palaeoeskimo culture change presented here is a real contrast to the prevailing model which implies that the changes in Dorset settlement patterns and the apparent increase in ritual activities and the appearance of communal dwellings were defenses against economic uncertainty. This economic uncertainty is often attributed to changing environmental circumstances, and in the later Dorset period to the Thule expansion into the eastern Arctic and competition between Dorset and Thule groups for resources. For example, Damkjar (1987, 1990) has suggested that longhouses, which appear in the Middle Dorset period and continue into Late Dorset period, represent communal activities[2] that provided a buffer in

[2] In general Dorset longhouses are believed to reflect some form of communal behaviour, including the cooking and sharing of food (Schledermann 1990) and some authors have argued that they may represent aggregation sites where kinship ties were re-established, other social relations maintained and the complex system of magico-religious beliefs was re-affirmed Maxwell (1985:232-233). Plumet (1987) has suggested that they may reflect aggregation at a band level.

periods of social and economic uncertainty. Specifically he has argued that they may reflect the need for Dorset people to work collectively to re-inforce their "Dorsetness" in the face of economic competition with Thule invaders from Alaska (Damkjar 1989) and then more recently, that longhouses may reflect the coming together of large groups in periods of economic instability, such as the end of winter when resources are scarce, or during periods of prolonged cold, warm or unstable climate (Damkjar 1990). Similarly others have suggested that the apparent increase in artwork in the Middle and Late Dorset period represents an increase in ritual activity as a response to difficult conditions which may have included economic and social stress as a consequence of environmental conditions, Thule pressure on resources and an inflexible system of organization (Maxwell 1985, Taçon 1983).

The arguments for Palaeoeskimo culture change as a consequence of these environmental and/or social stresses are not compelling. This study and others more specifically focused on environmental conditions (see for example, Helmer 1981) have noted that there is no solid evidence for economic stress as a consequence of environmental change. Similarly, Park (1994) has pointed out there is almost no acceptable evidence for Dorset/Thule interaction and suggested that Dorset culture was probably significantly diminished if not already extinct by the time of the Thule arrival. A more plausible explanation for the nature of Dorset culture and one in keeping with the archaeological data from Igloolik is that changes in Palaeoeskimo social organization and the increase in the decorative enhancement of material culture were a response to the subsistence security brought about through technological change and the consequent intensification of walrus hunting in the Early Dorset period.

While the idea that the Early Dorset period was one of intensified marine resource use is not new, the linking of this intensification to trends in Dorset social and symbolic behaviour does represent a new approach to the archaeological data. Interestingly, the analysis of new data from Igloolik, suggests that an old concept - that of the "Core Area" - may need to be revisited and revised. For example, Rowley-Conwy and Zvelebil (1989) have argued that in general terms, the ability of hunter-gatherers to put up stores relates to resource availability. Resources fluctuate seasonally, annually, inter-annually and over the long-term (one or more generations). Despite these fluctuations, some regions will always be more productive than others,

and the people in those regions more likely to be suppliers of food or other goods to people in less productive regions. Such circumstances can create an imbalance between communities and regions as suppliers are able to accumulate prestige that receivers are not (Rowley-Conwy and Zvelebil 1989:50). Archaeological data indicate that Palaeoeskimo groups in the Foxe Basin were more settled than groups in the High and Central Arctic and this was directly related to the abundance of walrus in the region. The comparative settlement and zooarchaeological data indicate that, as in the Historic period, regular procurement of walrus ensured a relative surplus of meat, hide, blubber and ivory.[3] Thus there was relative subsistence security and wealth for Foxe Basin communities which in turn translated into the development of a more complex socio-economic system, the decorative elaboration of material culture and possibly also the elaboration of 'ritual' activities. This affluence and complexity may have resulted in a form of cultural influence by Foxe Basin groups over other regional groups[4] as Foxe Basin communities with sufficient storage surplus gained prestige via the exchange of food and raw materials, feasting or other kinds of interaction such as marriage and adoption. This prestige and influence would have translated into the movement of ideas and forms of material culture out of the Foxe Basin and into other regions. Such a model explains the widespread similarity of Dorset material culture across the eastern Arctic (Maxwell 1985) and the appearance large communal settlements outside the Foxe Basin in Middle and Late Dorset (Damkjar 1990, Plumet 1987).

There are many more reported longhouses in areas outside the Foxe Basin (Damkjar 1990) yet outside the Foxe Basin there is not the same economic basis for communal activity as there is in the Foxe Basin. More precisely there are no large herds of walrus. Perhaps counterintuitively, the value placed upon communal social activity was most strongly expressed where it was perceived to be least secure, or where it was not firmly grounded in economic activity. Whereas in the Foxe Basin social collectivity was played out

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[3] Darwent and LeMoine (1995) note that in the High Arctic, walrus ivory was heavily recycled. This suggests it may have been in short supply, in contrast to Igloolik where walrus ivory is abundant in the Dorset archaeological deposits (Rowley 1992, 1993b).

[4] In the historic period, due to their relative affluence, Iglulingmiut exerted a similar cultural influence over their regional neighbours and in mixed communities, Iglulingmiut ways were adopted (Mary-Rousselière 1976).

in the economic activity and associated rituals of walrus hunting, outside the Foxe Basin the social and symbolic collectivity was only perceived, and consequently it was expressed through collective settlement in longhouses, perhaps on a seasonal, ritualistic basis. Longhouses, then, may simply be a symbolic expression of Dorset collectivity that does not find expression in any practical subsistence practice.

The main point with respect to these developments in Palaeoeskimo society is that the social value placed on communal behaviour in the Foxe Basin diffused or was carried outwards and that despite being less well positioned economically, Dorset groups in less productive areas were able to maintain contact with Dorset groups in more productive areas and to participate in Dorset society through symbolic activity. One way of testing this would be to compare the quantity and types of material culture recovered from longhouse sites and other sites outside the Foxe Basin with sites in the Foxe Basin.

In this thesis I have tried to illustrate the dynamics of economic change in one region, the Foxe Basin, and to indicate how this was related to wider social and possibly also ideological changes in Dorset society both locally and in other regions like the central and high Arctic. Far from being static, Palaeoeskimo prehistory was dynamic with the long-term characterized by shifts in environmental conditions and various combinations of scarcity and abundance in temporal and regional resource availability. There was regional and temporal flexibility in subsistence and settlement strategies, and in keeping with this, technological innovation. These factors drove the engine of social change, and over time, contributed to the transformation of practical solutions into ideology both within and without the Foxe Basin.

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Appendix I
Palaeoeskimo Sites on Igloolik Island - Data used in Chapter 3

Table A1.1 All Palaeoeskimo sites, listed according to Borden registration number.

Borden	Affiliation	Elevation (MASL)	Total Features	Feature Types
NiHf 1	early to late PreDorset	51-37	102	oval houses with axial features caches
NiHf 2	early PreDorset	47-44	133 ±	ephemeral tent features
NiHf 3	late PreDorset	26-24	11	ruins - type unknown
	early Dorset	22-20	32	ruins - type unknown
	middle-late Dorset	19-9	15	ruins - scattered, type unknown
NiHf 4	late PreDorset	25-23	43	ruins - type unknown
	early Dorset	20-18	24	ruins - type unknown
	late Dorset	8	12	8 dwellings 1 lithic scatter 3 caches
	late Dorset	11	5+	3 semi-subterranean houses 1 lithic scatter 1 midden
NiHf 7*	PreDorset ?		1	possible cache
NiHf 8*	PreDorset ?		2	possible caches
NiHf 9*	PreDorset ?		1	possible cache
NiHf 10*	PreDorset ?		1	tent ring ~ 3m x 2m
NiHf 11*	PreDorset ?		1	oval slab floor ~ 3.5m x 3m
NiHf 12*	PreDorset ?		1	oval tent ring ~ 3.5m x 2m
NiHf 13	late Dorset	9.36	18	5 houses 3 houses with axial features 2 tent rings 8 caches several walrus bone scatters
NiHf 23	early Dorset	19.88	21	3 houses with axial features 9 tent rings 4 external hearths 5 caches
NiHf 35	PreDorset	26.38	1	tent ring
NiHf 36	PreDorset	25.05	3	2 stone features 1 lithic scatter
NiHf 37	PreDorset	23.58	36	14 tent rings 3 hearths 6 caches 9 lithic scatters 4 unidentifiable structures

Borden	Affiliation	Elevation (MASL)	Total Features	Feature Types
NiHf 38	early Dorset	18.76-18.18	45	3 houses with axial features 25 tent rings 4 hearths 6 caches 3 lithic scatters 3 unidentified structures 1 set of jumping stones
NiHf 40	late Dorset	8.95	29	6 houses 21 tent rings 1 box trap 1 unidentified structure
NiHf 41	Dorset	8.95 - 6.07	19	6 tent rings 7 caches 2 unidentified stone structures 4 lithic scatters
NiHf 45	late Dorset	11-10.5	28	2 semi-subterranean houses 2 tent rings 16 caches 3 possible caches 3 lithic scatters 1 midden
NiHf 47	early Dorset	20-17	21	17 semi-subterranean houses 1 tent ring 1 cache 1 lithic scatter 1 unidentifiable structure
NiHf 52*	Palaeoeskimo	15	1	120 m long scatter of walrus bone possible butchering station
NiHf 53	early Dorset	20	5	4 tent rings 1 cache
NiHf 54	early Dorset	20	1	boulder walled house with axial feature
NiHf 55	Dorset	30	5	1 axial feature 3 caches 1 lithic scatter (48m from other features)
NiHf 56	PreDorset	45	7	7 tent rings
NiHf 57	PreDorset	48	7	7 tent rings
NiHf 58	PreDorset	48	29	22 tent rings (all are ephemeral and oval) several middens one lithic scatter
NiHf 64	Dorset	17	3	1 tent ring 1 cache 1 lithic scatter

Borden	Affiliation	Elevation (MASL)	Total Features	Feature Types
NiHf 65	Dorset	17	6	4 tent rings 1 cache 1 possible grave
NiHf 66	Dorset	17	7	1 semi-subterranean house 1 tent ring 4 caches 1 possible grave
NiHf 67	PreDorset	25	3	2 tent rings ~ 4.5m x 3m 1 external hearth
NiHf 68	PreDorset	44	1	1 tent ring 3.5m x 3m
NiHf 69	PreDorset	44	5	5 oval tent rings ~ 4.5m x 4.5m
NiHf 70	PreDorset	49.5	2	2 tent rings
NiHf 71	PreDorset	45	3	2 oval dwellings 1 oval dwelling with axial feature
NiHf 73	early Dorset and Inuit	20	?	caches fox trap possible tent rings
NiHf 74	PreDorset	~20	12	12 dwellings with axial features
NiHf 75	PreDorset	~25	3	3 dwellings
NiHe 1	late Dorset	12-7	?	dwellings middens
NiHe 6*	Palaeoeskimo	17	3	1 possible tent ring 2 caches
NiHe 19*	PreDorset/early Dorset	22	9+	1 semi-subterranean house 4+ tent rings 4+ caches

* Sites excluded from settlement pattern analysis because of a lack of information about location and/or cultural affiliation.

Table A1.2 Palaeoeskimo sites used to calculate number of features per period.

PreDorset Sites	**Elevation (MASL)**	**Total Features**	**Feature Types**
NiHf 1	51-37	102	oval structures with axial features*caches*
NiHf 70	49.5	2	2 tent rings
NiHf 58	48	29	22 tent rings 1 lithic scatter ? middens*
NiHf 57	48	7	7 tent rings
NiHf 2	47-44	133	133 tent rings
NiHf 56	45	7	7 tent rings
NiHf 71	45	2	2 tent rings
NiHf 68	44	1	1 tent ring
NiHf 69	44	5	5 tent rings
NiHf 35	26.38	1	1 tent ring
NiHf 3	26-24	11	11 ruins
NiHf 4	25-23	43	43 ruins
NiHf 36	25.05	3	2 stone features * 1 lithic scatter
NiHf 67	25	3	2 tent rings 1 external hearth
NiHf 75	25	3	3 dwellings
NiHf 37	23.58	36	14 tent rings 3 external hearths 9 lithic scatters 6 caches 4 unidentified structures*
Total	**(excluding middens)**	**388 - 0 = 388 features**	
Dorset Sites	**Elevation (MASL)**	**Total Features**	**Feature Types**
NiHf 3	22-20	32	32 ruins*
NiHf 53	20	5	4 tent rings 1 cache
NiHf 54	20	1	1 boulder house with mid-passage
NiHf 55	20	5	1 mid-passage structure 3 caches 1 lithic scatter
NiHf 73	20	?	caches fox trap tent rings
NiHf 4	20-18	24	24 ruins*
NiHf 47	20-17	21	17 semi-subterranean houses 1 tent ring 1 cache 1 lithic scatter 1 unidentified structure*
NiHf 23	19.88	21	3 houses with axial features 9 tent rings 4 external hearths 5 caches

Dorset Sites	Elevation (MASL)	Total Features	Feature Types
NiHf 3	19-9	15	15 scattered ruins
NiHf 38	18.76-18.18	45	3 houses with axial features 25 tent rings 4 hearths 6 caches 3 flake scatters 1 set of jumping stone 3 unidentified structures
NiHf 64	17	3	1 tent ring 1 cache 1 lithic scatter
NiHf 65	17	6	4 tent rings 1 cache 1 possible grave
NiHf 66	17	7	1 semi-subterranean house 1 tent ring 4 caches 1 possible grave
NiHe 1	12-7	?	dwellings* middens*
NiHf 4	11	5+	3 semi-subterranean houses 1 lithic scatter 1 midden
NiHf 45	11-10.5	26	2 semi-subterranean houses 2 tent rings 15 caches 3 possible caches* 3 lithic scatters 1 fox trap
NiHf 13	9.36	18+	5 houses 3 houses with mid-passage features 2 tent rings 8 caches several walrus bone scatters*
NiHf 40	8.95	29	6 houses 21 tent rings 1 box trap 1 unidentified structure*
NiHf 41	8.95-6.07	17	6 tent rings 7 caches 2 lithic scatters 2 unidentified structures*
NiHf 4	8	12	8 semi-subterranean houses 3 caches 1 lithic scatter
Total	**(excluding middens)**	**292 - 1 = 291 features**	

*Structures excluded from settlement analysis and summarized below in Table A1.3.

Table A1.3 Unidentified structures excluded from settlement analysis.

Site and Period	Elevation (MASL)	Total Features	Feature Types
NiHf 1 PreDorset	51-37	102	houses and caches - numbers of each unknown
NiHf 3 PreDorset	26-24	11	11 ruins - type unknown
NiHf 4 PreDorset	25-23	43	43 ruins - type unknown
NiHf 36 PreDorset	25.05	3	2 unidentified stone features
NiHf 37 PreDorset	23.58	36	4 unidentified structures
NiHf 3 Dorset	22-20	32	32 ruins - type unknown
NiHf 4 Dorset	20-18	24	24 ruins - type unknown
NiHf 47 Dorset	20-17	21	1 unidentified structure
NiHf 3 Dorset	19-9	15	15 scattered ruins - type unknown
NiHf 38 Dorset	18.76-18.18	45	3 unidentified structures
NiHf 45 Dorset	11-10.5	26	3 possible caches
NiHf 40 Dorset	8.95	29	1 unidentified structure
NiHf 41 Dorset	8.95-6.07	17	2 unidentified structures

Table A1.4 Dwelling sizes: PreDorset tent rings.

Borden reference	Structure number	Size (length x width)	Area (m2)	Elevation
NiHf 2	F1	3.0 x 2.1 m	6.3	47-44
	Fb	3.0 x 2.0	6.0	
	Fd	3.0 x 2.0	6.0	
NiHf 58	F1	3.8 x 3.4	12.92	48
	F3	3.5 x 3.2	11.2	
	F4	1.9 x 1.2	2.28	
	F5	2.5 x 2.2	5.5	
	F8	2.8 x 2.1	5.88	
	F9	2.7 x 2.3	6.21	
	F10	2.5 x 2.2	5.5	
	F14	3.0 x 2.4	7.5	
	F15	2.3 x 2.5	5.75	
	F16	2.2 x 2.5	5.5	
	F18	2.9 x 2.7	7.83	
	F19	3.0 x 2.3	6.9	
	F20	3.0 x 3.3	9.9	
	F21	2.3 x 1.9	4.37	
	F22	2.7 x 4.9	13.23	
	F24	2.4 x 1.7	4.08	
	F25	3.5 x 4.3	15.05	
	F27	3.7 x 2.8	10.36	
	F28	2.4 x 2.0	4.8	
	F29	3.3 x 3.7	12.21	
	F30	4.4 x 2.2	9.68	
NiHf 67	unnumbered	4.5 x 3.0	13.5	25
	unnumbered	4.5 x 3.0	13.5	
NiHf 68	unnumbered	3.5 x 3.0	10.5	44
NiHf 69	unnumbered	4.5 x 4.5	20.25	44
TOTAL = 28	Smallest = 2.28	Largest = 20.25	Average = 8.66	

Table A1.5 Dwelling sizes: Dorset tent rings and semi-subterranean houses.

Borden reference	Structure number	Structure type	Size	Area (m2)	Elevation
NiHf 4	F9	semi-subterranean	4.23 x 2.82	11.92	10
NiHf 45	F1	semi-subterranean	9.45 x 8.10	76.5	10.5
NiHf 47	F4	semi-subterranean	3.2 x 3.2	10.24	
	F5	tent ring	2.48 x 2.48	6.15	
	F6	semi-subterranean	6.20 x 6.20	38.44	
	F7	double walled tent	2.8 x 2.8	7.84	
	F8	semi-subterranean	3.10 x 3.10	9.61	
	F11	semi-subterranean	4.80 x 4.80	23.04	
	F14	semi-subterranean	2.85 x 2.85	8.12	
	F15	semi-subterranean	4.0 x 3.10	12.4	
	F15a	semi-subterranean	4.20 x 3.29	13.81	
	F15b	semi-subterranean	4.20 x 3.29	13.81	
	F16	semi-subterranean	4.20 x 4.20	17.64	
	F17	semi-subterranean	3.9 x 3.9	15.21	
	F18	semi-subterranean	4.95 x 3.68	18.21	18
	F19	semi-subterranean	4.70 x 4.70	22.09	
	F20	semi-subterranean	3.11 x 3.11	9.67	
	F21	semi-subterranean	4.44 x 4.44	19.71	
TOTAL	19				

Type	Smallest	Largest	Average
Semi-subterranean	8.12	76.5	20.02
Tent ring	6.15	7.84	6.99

Appendix II
Descriptions of structures at sites discussed in Chapter 4

Table A2.1 Structures from NiHf 58.

Feature Number	Description
1	elliptical tent ring defined by a scatter of limestone no identifiable internal features
2	midden
3	poorly defined tent ring no identifiable internal features
4	elliptical tent ring but no perimeter small circular hearth of cracked limestone
5	indistinct tent ring 2.5 x 2.2 metres
8	tent ring 2.8 x 2.1 metres
9	tent ring 2.7 x 2.3 metres
10	tent ring 2.5 x 2.2 metres
14	tent ring 2.4 x 2.5 metres
15	tent ring 2.3 x 2.5 metres
16	tent ring 2.2 x 2.5 metres
18	tent ring 2.9 x 2.7 metres
19	tent ring 3.0 x 2.3 metres
20	tent ring 3.0 x 3.3 metres
21	tent ring 2.3 x 1.9 metres
22	tent ring 2.7 x 4.9 metres
24	tent ring 2.4 x 1.7 metres possible axial feature with hearth
25	tent ring 3.5 x 4.3
26	elliptical tent ring with rear periphery defined by rocks
27	tent ring 3.7 x 2.8 metres
28	tent ring 2.4 x 2.0 metres
29	tent ring 3.3 x 3.7 metres

Table A2.2 Structures from NiHf 47.

Feature	Type	Dimensions	Shape	Excavator
1	uncertain	-	round	unexcavated
2	cache	-	-	unexcavated
3	dwelling	~ 7 m	-	Meldgaard
4	dwelling	3.2 m	round	unexcavated
5	tent ring	2.48 m	round	unexcavated
6	dwelling	6.2 m	-	Meldgaard
7	dwelling	2.8 m inside,4.2 m outside	round	unexcavated
8	dwelling	3. 1m	round	unexcavated
9	isolated find	-	-	-
10	isolated find	-	-	-
11	dwelling	~ 4.8 m	-	Meldgaard
12	dwelling	-	-	Meldgaard
13	lithic scatter	-	-	unexcavated
14	dwelling	2.85 m	-	Meldgaard
15	dwelling	~ 4.5 m	-	Meldgaard
15a	dwelling	~ 4.5 m	-	unexcavated
15b	dwelling	~ 4.5 m	rectangular	unexcavated
16	dwelling	4.2 m	rectangular	Meldgaard
17	dwelling	3.9 m	-	Meldgaard
18	dwelling	3.68 x 4.95 m	rectangular	Rowley
19	dwelling	4.7 m	round	Meldgaard
20	dwelling	3.11 m	-	unexcavated
21*	dwelling	4.44 m	-	Meldgaard

Table A2.3 Structures from NiHf 45.

Feature	Type	Dimensions
1	rectangular semi-subterranean dwelling	9.45 x 8.10m
2	cache	large
3	cache ?	-
4	cache	small
5	cache	large
6	cache	-
7	grave?	-
8	cache	-
9	cache	-
10	cache	large
11	dwelling	-
12	cache	small
13	cache	small
14	cache	small
15	oval tent ring	-
16	cache	small
17	cache	small
18	cache	large
19	cache	small
20	cache?	-
21	domed fox trap	large
22	cache	large
23	cache ?	-
24	oval tent ring	-
25	lithic scatter	-
26	lithic scatter	-
27	lithic scatter	-
28	midden	partly destroyed

Appendix III

Table A3.1 NiHf 47 Walrus body parts.

Catalogue number	Element	Portion	Side	Age
124	astragalus	whole	l	imm+
123	calcaneus	whole	l	imm+
194	calcaneus	proximal epiphysis	r	imm
115	cranial	fragment	unk	imm+
116	cranial	fragment	unk	imm+
117	cranial	fragment	unk	imm+
143	cranial	fragment	unk	imm+
144	cranial	fragment	unk	imm+
146	cranial	fragment	unk	imm+
147	cranial	fragment	unk	imm+
137	fibula	distal epiphysis	l	imm
141	fibula	shaft	l	imm+
109	humerus	proximal shaft	l	a
110	humerus	proximal shaft	l	a
112	humerus	distal shaft	l	a
113	humerus	distal shaft	l	a
128	humerus	distal shaft	l	a
129	humerus	proximal shaft	l	ya
160	humerus	distal fragment	l	imm+
111	humerus	proximal shaft	r	a
188	hyoid	whole	axial	u
198	hyoid	whole	axial	u
199	hyoid	whole	axial	u
200	hyoid	whole	axial	u
201	hyoid	whole	axial	u
118	long bone	fragment	unk	imm+
127	mandible	whole	whole	imm
134	maxilla	fragment	l	imm+
138	maxilla	fragment	r	imm+
139	maxilla	fragment	r	imm+
120	maxilla	fragment	unk	imm+
176	metacarpal 2	whole	l	imm
180	metatarsal 1	whole	l	a
179	metatarsal 2	whole	l	a
202	metatarsal 5	shaft	r	imm+
178	phalange 1	whole	unk	a
193	phalange 1	proximal epiphysis	u	imm
175	phalange 2	whole	unk	ya
177	phalange 2	proximal epiphysis	unk	imm

Catalogue number	Element	Portion	Side	Age
181	phalange 2	whole	unk	a
182	phalange 2	whole	unk	imm
183	phalange 2	proximal epiphysis	unk	imm
186	phalange 2	whole	unk	a
190	phalange 2	whole	unk	imm
191	phalange 2	whole	unk	imm
192	phalange 2	proximal epiphysis	unk	imm
196	phalange 2	whole	unk	imm
197	phalange 3	whole	unk	a
150	post canine	whole	unk	imm+
152	post canine	whole	unk	imm+
157	post canine	whole	unk	imm+
158	post canine	whole	unk	imm+
126	post canine	whole	unk	imm+
135	post canine	whole	unk	imm+
136	post canine	whole	unk	imm+
148	post canine	whole	unk	imm+
456	radius	proximal epiphysis	l	imm
162	rib	shaft fragment	unk	imm+
170	rib	whole	l	a
171	rib	whole	l	a
173	rib	dorsal fragment	l	a
450	rib	whole	l	imm+
172	rib	shaft fragment	unk	imm+
114	temporal meatus	fragment	l	imm+
122	tibia	distal fragment	l	a
133	tibia	proximal epiphysis	r	imm
121	tusk	fragment	unk	unk
436	tusk	fragment	unk	unk
130	ulna	whole	l	imm
131	ulna	distal epiphysis	l	imm
159	ulna	shaft fragment	l	imm+
125	long bone fragment	fragment	unk	unk
203	long bone fragment	fragment	unk	unk
119	vertebra cervical	whole	axial	a
132	vertebra cervical	whole	axial	a
140	vertebra thoracic	fragment	axial	a
149	vertebra thoracic	fragment	axial	imm

unk = unknown
l = left
r = right
imm = immature
imm+ = immature plus
a = adult

Table A3.2 NiHf 45 Caribou skeletal element representation.

Skeletal Element	Total number of fragments
Cranial fragments	10
Mandible	11
Teeth	19
Vertebrae	99
Ribs	159
Sternum	10
Scapula	14
Humerus	13
Radius	15
Ulna	11
Carpals	11
Innominate	29
Femur	9
Tibia	11
Metapodial	58
Dew claw	11
Tarsals	25
Sesmoids	17
Costal cartilage	12
Phalanges	22
Flat and other bone fragments	223
Long bone fragments	452
Total	1241