LATE DORSET FAUNAL REMAINS FROM THE TASIARULIK SITE, LITTLE CORNWALLIS ISLAND, CENTRAL HIGH ARCTIC, CANADA

by

Christyann M. Darwent

B.Sc., The University of Calgary, 1992

THESIS SUBMITTED IN PARTIAL FULFILMENT OF

THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF ARTS

in the Department

of

Archaeology

SIMON FRASER UNIVERSITY

April 1995

National Library of Canada

Acquisitions and Bibliographic Services Branch

395 Wellington Street
Ottawa, Ontario
K1A 0N4

Bibliothèque nationale du Canada

Direction des acquisitions et des services bibliographiques

395, rue Wellington
Ottawa (Ontario)
K1A 0N4

Your file Votre référence

Our file Notre référence

ISBN 0-612-06626-6

Canadä

APPROVAL

NAME Christyann M. Darwent

DEGREE Master of Arts

TITLE LATE DORSET FAUNAL REMAINS FROM THE TASIARULIK SITE, LITTLE CORNWALLIS ISLAND, CENTRAL HIGH ARCTIC, CANADA

EXAMINING COMMITTEE:

Chair Dr. Cathy D'Andrea

Dr. Jon Driver
Senior Supervisor

Dr. Jack Nance
Professor
Department of Archaeology

Dr. David Pokotylo
External Examiner
Associate Professor
Department of Anthropology and Sociology
University of British Columbia

Date Approved: 11th April 1995

PARTIAL COPYRIGHT LICENSE

Title of Thesis/Project/Extended Essay

LATE DORSET FAUNAL REMAINS FROM THE
TASIARULIK SITE, LITTLE CORNWALLIS ISLAND,
CENTRAL HIGH ARCTIC, CANADA

Author:

(signature)

Christyann M. Darwent

(name)

April 11, 1995

(date)

ABSTRACT

The purpose of this thesis is to examine the faunal remains from the Late Dorset (1000-1500 B.P.) site of *Tasiarulik* (QjJx-10), on Little Cornwallis Island, in the Canadian Central High Arctic. Archaeological investigation of this site involved two seasons of field work (1992 and 1993). A strictly surface examination of the faunal remains, with identification and analysis completed in the field, was employed the first season. The following summer, we returned to *Tasiarulik* to excavate and collect a sample of three major feature types: house depressions, tent ring formations, and middens. This has allowed for the comparison of two different data collection techniques.

The focus of subsistence at this Late Dorset site was marine mammals, specifically, ringed and harp seal, bearded seal, and walrus. Seasonal exploitation of migratory birds (summer) and Arctic fox (likely for winter pelts) also occurred. One of the most significant differences between the surface and the excavated assemblage is the relative increase in the representation of small terrestrial mammal, bird and fish in the subsurface remains. This seems to indicate that the smaller bones tend to be obscured by a thin vegetative cover, and are more subject to destructive processes. Surface fauna appears to have been exposed to much more severe weathering and has been more heavily modified by carnivore (Arctic fox) gnawing than buried bone. The presence of cut marks on the bones is quite rare and reflects both the degree of preservation of the outer bone table, and skilled butchering. Filleting marks were most common. An examination of pinniped skeletal element representation indicates that the spongier, less dense vertebral elements are not as well represented on the surface, with the relative frequency of other elements remaining generally the same between the two assemblages. Body part frequencies suggest that seals were transported to the site as whole carcasses and processed. The spatial density of bone appears to be highly varied on the surface which is generally correlated with the amount of vegetative cover. These two methods of faunal analysis appear to complement each other as a means of accessing different types of information about the taphonomic and cultural processes which have created this multi-component site.

ACKNOWLEDGEMENTS

This thesis could not have been completed without the encouragement and assistance of many people. In particular I would very much like to thank my supervisor Dr. Jon Driver who has been extremely supportive and patient. Much thanks is also extended to the other members of my committee Dr. Jack Nance and Dr. David Pokotylo for their helpful comments. To Dr. James Helmer and Dr. Genny LeMoine for giving me the opportunity to experience the High Arctic. Thanks also to Don Hanna for providing maps of the site and Theresa Schoeber for assistance with field identifications during the first season. Thank you to all the members of the 1992 and 1993 field crews.

Funding for the project was provided by the Social Sciences and Humanities Research Council and the Northern Scientific Training Program, and logistical support was supplied by Polar Continental Shelf Project and Cominco Ltd.'s Polaris Mines operation. Simon Fraser University graduate fellowships provided additional funding.

I am very grateful for the encouragement of my parents, Bob and Audrey Swires. Much gratitude is extended to Andrew Barton, John Breffit, Dr. Cathy D'Andrea and Barb Winter and for their help and friendship. Thanks also to Dr. Brian Kooyman for believing in my ability. To the people of Resolute Bay, especially Angie Amagoaluk, thank you.

I would particularly like to thank my grandmother Ena Swires whose independent spirit, thirst for knowledge and yen for travel, fostered my interest in other cultures and my desire to study archaeology.

Finally, special thanks to my husband John for all of his support and assistance.

TABLE OF CONTENTS

CHAPTER 1:

CHAPTER 2:

CHAPTER 3:

CHAPTER 4:

CHAPTER 5:

CHAPTER 6:

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

1.1 Introduction

> Even when you go to a place you thought was empty, there is always something that tells you that people were there.
> (Ipiak, Chesterfield Inlet, N.W.T., in Brody 1976:202)

This thesis will involve the examination of faunal remains from the Late Dorset (ca. 1500-1000 B.P.) site of *Tasiarulik* (QjJx-10) on the southeastern shore of Little Cornwallis Island, Northwest Territories, Canada. *Tasiarulik* was investigated through the McDougall Sound Archaeological Research Project (MSARP) under the direction of Dr. James Helmer and Dr. Genevieve LeMoine of the University of Calgary. The field work was sponsored by a three year research grant to the investigators from the Social Sciences and Humanities Research Council, along with ancillary funding provided by the Northern Scientific Training Program, and logistical support supplied by the Polar Continental Shelf Project and Cominco Ltd.'s Polaris Mine Operation, located along the southwestern coast of Little Cornwallis Island.

Little Cornwallis Island is located at 75° 30'N, 96° 20'W, northwest of the larger island of Cornwallis, and east of Bathurst Island (Figure 1.1). To the north of Little Cornwallis are both Queen's and Maury Channels. McDougall Sound lies to the south, and to the east and west sides of the island are Pullen and Crozier Straits, respectively. All of these waters are abundant in marine mammal resources. It is a small (410 km^2) island divided into two parts by a low narrow isthmus, characterized

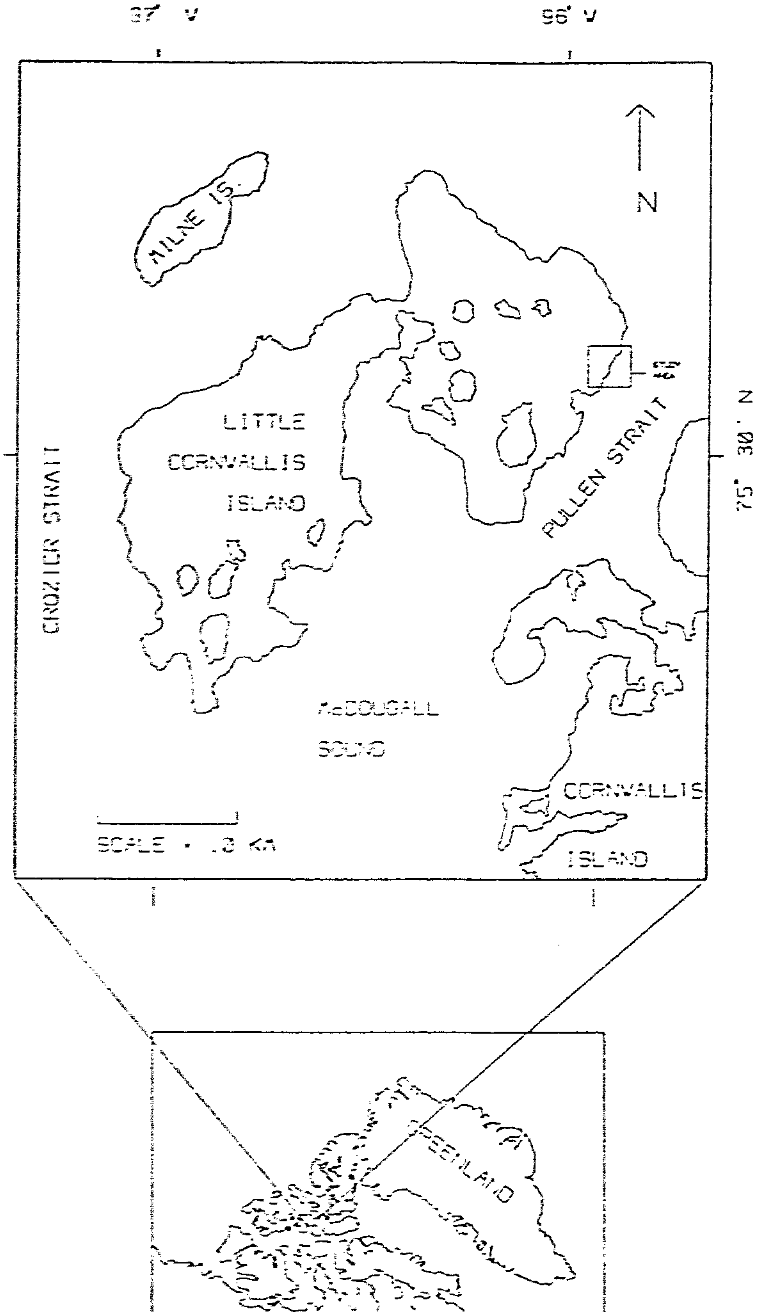


Figure 1.1 - Location of study area

by numerous lakes intermingled with low knobby hills, the highest of which is 137 m above sea level (Miller et al. 1977) and located along the southwestern coast of the island. The numerous lakes and meltwater ponds inspired the name given to the site of *Tasiarulik*, an Inuktitut word which translates roughly as "place of many lakes" (Simeonie Amagoaluk, Resolute Bay, 1992).

The McDougall Sound Archaeological Research Project involved three field seasons, 1992, 1993, and 1994 (six weeks long, during the months of July and August). The investigation focused on two large multi-component Late Dorset sites on the eastern side of the island: QjJx-10 (*Tasiarulik*) and QjJx-1 (*Arvik*) situated approximately one kilometer from each other along the same beach ridge (approximately 5 to 10 metres above sea level). Our research also included a smaller isolated site, QiLa-3, from a similar time period, located about 10 km south of the other two sites (Figure 1.2).

Previous archaeological research conducted on Little Cornwallis Island has been limited to areal and ground survey. The area in the vicinity of Cominco's Polaris lead-zinc mining operation was assessed prior to its construction by Robert McGhee (Helmer et al. 1993). As part of the Polar Gas Pipeline Project's environmental mitigation program, subsequent areal and limited ground survey of the island's northwestern and southeastern shores was conducted by Schledermann (1978a, 1978b, cited in Helmer et al. 1993). The large Late Dorset site of QjJx-1 was recorded at this time. The southeastern shore was revisited during an archaeological survey by Helmer (1989, cited in Helmer et al. 1993) for two proposed barge off

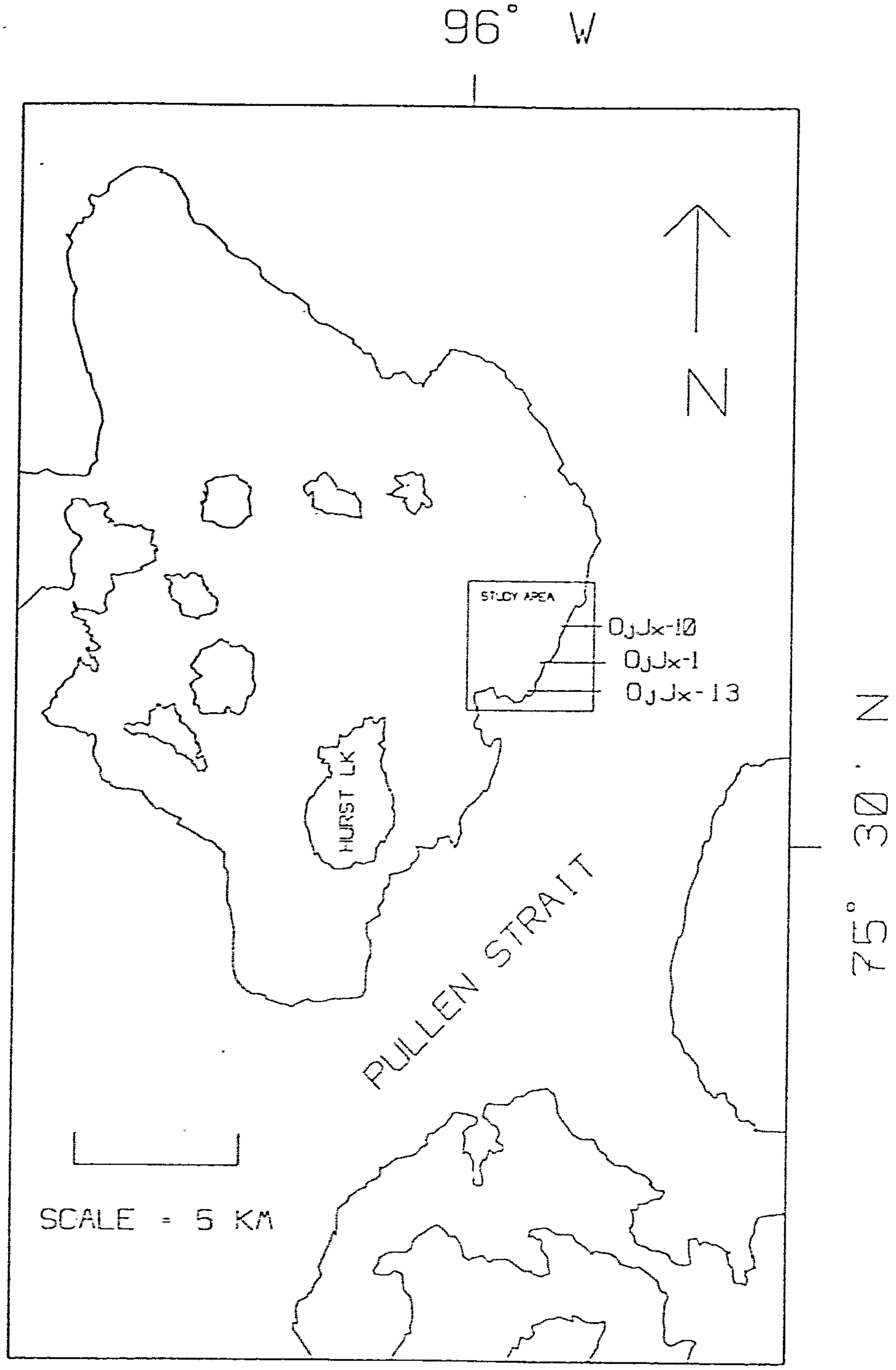


Figure 1.2 - Location of Late Dorset sites on Little Cornwallis Island

loading sites intended to service a proposed Cominco drill site. During ground survey to the north of QjJx-1, Helmer encountered a large, previously unrecorded, complex of winter and summer Late Dorset Horizon features, which was designated as QjJx-10. The following summer, Helmer (1991a) and associates sponsored by Cominco Ltd., returned to map and record the cultural features associated with QjJx-10 (116 features) and QjJx-1 (100 features). They also discovered and mapped a third Late Dorset settlement located about one kilometer south of QjJx-1, designated as QjJx-13 (26 features). Further ground survey of the eastern half of the island (37 prehistoric sites recorded) was conducted by Hanna (see Helmer et al. 1993) during the course of the MSAR Project.

Initially, the research goal proposed for the 1992 field season was to excavate a "representative sample of feature types at QjJx-10, as well as the probabilistic sampling of areas between features" (Helmer et al. 1993:5). The investigators were interested in assessing Late Dorset subsistence-settlement strategies, along with examining inter- and intra- site variability in both the artifact and faunal assemblages (Helmer et al. 1993). Plans for excavation were hampered due the inability to obtain formal approval of the archaeological permit. Less than one month prior to the beginning of the field season, the Hamlet of Resolute Bay denied all archaeological projects in their region permission to excavate. Although not fully explained, permit denial appears to have been a question of the relevance of archaeological research to the local Inuit residents. Linked to this issue were land claim disputes, cultural resource management and the political mesh of local, Territorial and Federal governments. Unwilling to abandon the project so close to the start of the season, permission was obtained from the Resolute Bay Hamlet Council to intensively surface examine the site, without excavation or collection. The methods used to collect information, without collecting artifacts, will be discussed in a later chapter.

During the 1992 field season members of the Hamlet Council and elders from the community of Resolute Bay were flown to visit the site by a Cominco sponsored Twin Otter. The following spring, the project directors returned to the community to present a video and slides of the field work. Permission was granted by the Council to excavate QjJx-10 during the summer of 1993, and a subsequent permit was given for the excavation of QjJx-1 and QiLa-3 in 1994. Presentations on the archaeological research, and artifacts recovered, to members of the community, and visits by the people of Resolute Bay to Little Cornwallis Island have continued throughout the project.

The focus of my thesis will be the discussion of the faunal remains from the site *Tasiarulik* (QjJx-10). This will involve the comparison of two different archaeological methods, employed during the 1992 and 1993 field seasons, for retrieving information on non-artifactual bone material and the type of results these two techniques produced.

CHAPTER 2

2.1 The Central High Arctic Environment

Little Cornwallis Island falls within a geographic region referred to as the Central High Arctic. This area, particularly Little Cornwallis, is considered to be a polar desert environment. It is characterized by long cold winters, short cool summers and low precipitation (Miller et al. 1977:14). The limited vegetation found in this region, due to low precipitation, lessens the number of insects inhabiting the island. Snow typically does not begin to melt until early to mid-June, but then rapidly disappears, except in sheltered areas where snowbanks remain throughout the summer. Much of the snow facilitates the creation of meltwater ponds. Mean temperatures generally do not rise above 0° C until mid-June, and winter begins when the mean temperature dips below 0° C in mid-September (Miller et al. 1977:14). Winter storms tend to occur in September and October, with the remainder of the winter dominated by anticyclones, frequent calms, clear skies, light snow, and bitterly cold temperatures (Miller et al. 1977:14). Summer temperatures range from around +15° C to -2° C, and the climate can range from clear and calm, to severe winds and snow. Open water leads, or polynia, generally begin in early July, and large ice free straits are abundant by early August. It is these large bodies of open water which generate the characteristic fog of the Central Arctic.

2.2 Sea Mammal Resources

Ringed seals (*Phoca hispida*; *Natsiq, Nattiq*)[1] are abundant in the Central High Arctic throughout the year. The McDougall Sound, Prince Regent Inlet and Barrow Strait regions, along with other areas, "...possess a year-round population of seals which maintain breathing holes in the ice during winter months. This population is augmented by seals that migrate into the region in spring and out of the area in fall" (Riewe 1976:176). This is the only marine mammal living in the circumpolar region which is adapted to a land-fast ice environment. Ringed seals are found along complex shorelines, and are rarely found on floating pack ice (Frost and Lowry 1981; Mansfield 1967; Smith 1973; Smith and Hammill 1981). Cracks in the sea ice develop in the same location annually, due to the shape of the ocean floor and current direction. Ringed seals will maintain breathing holes during the winter in these areas of refreezing tidal cracks and thinner ice by continually abrading the sea ice with the nails of their foreflippers (Balikci 1970, Smith and Hammill 1981). Their common name is derived from the grey and white rings present on the back of the seals after they have shed their white coat at about 2-3 weeks of age.

Seal pups are normally born between mid-March and early-April, with single births being by far the most common (Frost and Lowry 1981; Mansfield 1967; Smith and

---

[1] The Inuktitut words for the various animals are taken from Graves and Hall (1985) and conform with the Inuit Cultural Institute's standard spellings for the Baffin and Keewatin districts, although word usage varies throughout the Canadian Arctic.

Hammill 1981). During the winter months, once a sufficient snow cover has accumulated over their breathing holes, the female will hollow out a birth lair within the fast-ice or between the spaces of rafted ice blocks (Mansfield 1967; Smith and Hammill 1981). During the first few weeks of life seal pups remain in their "cave" environment to be nursed until the ice breaks up, although they are able to swim from birth (Frost and Lowry 1981:39). Baby seals are at their most vulnerable at this time and are often excavated by hungry polar bears or Inuit hunters (Balikci 1970). Smith (1973) indicates that there is a significant correlation between the body size of the ringed seal and the stability of the land-fast ice. Hence, the longer the sea ice remains intact, the longer the period of nutrition and growth for the young seal.

The average weight of an adult male ringed seal is approximately 150 lbs, with the female being somewhat smaller in size (Mansfield 1967:21). This figure can, however, fluctuate dramatically throughout the year with the gain and loss of blubber. Maximum weight gain occurs in late fall or winter. Male seals reach sexual maturity at around 7+ years, while females tend to achieve maturity at approximately 4 or 5+ years (Smith 1973:12). Sexual maturity is somewhat delayed in the higher regions of the Arctic.

These seals tend to be solitary animals. Adolescent ringed seals are distributed in offshore areas, polynias, floe edges or areas of thin ice, exclusively (Smith 1973). Immature seals are thought either to be unable to maintain breathing holes, or they are excluded from the fast ice breeding areas by the adult seals (Smith 1973).

Inuit hunters use this knowledge of the distribution of age classes in their procurement strategies. Several methods of seal hunting have been reported to have been used by historic Inuit populations. In areas or times of open water, at the floe edge where ice was beginning to form, or at cracks formed by sea currents, juvenile seals were typically hunted with harpoons (or more recently, with rifles). Among the Netsilingmiut, the most common method of hunting small seals was communal or individual capture of adults through their breathing holes (Balikci 1970). Another individualistic and more difficult technique was seal stalking. This was a means of obtaining close proximity by imitating the seal's movements (Balikci 1970), which includes basking on the ice and constantly alternating between lying flat and lifting the head to scan the surroundings (an adaptation to their natural predator, the polar bear [Frost and Lowry 1981:48]).

Ringed seals constituted a significant year-round portion of the diet of Central High Arctic Inuit and people of the Arctic Small Tool tradition, with the most intensive exploitation of this food source in the winter months.

Harp seals (*Phoca groenlandica*; *Qairulik*) are a migratory species which move into the region of Lancaster Sound and westward into McDougall Sound and Barrow Strait after the break up of sea ice in July (Riewe 1976). These seals migrate eastward out of this area in late August, facilitating a very short hunting season, and constituting a minor economic importance in this region as opposed to areas further east.

The large dark harp shaped coloration on the dorsal surface provides the common name for this seal (Ronald and Healey 1981). Harp seals weigh on average twice that of a ringed seal, however, their weight fluctuates seasonally. They are an active and gregarious species, with only old males living in small groups or alone (Ronald and

Healey 1981). The diet is varied and consists of both pelagic and to a lesser extent benthic fish (Ronald and Healey 1981). Young are born between February and March on rough hummocky ice which provides shelter for the pups (King 1964 cited in Ronald and Healey 1981). Harps tend to use large channels or leads, but will also maintain communal breathing holes in pack ice (Ronald and Healey 1981). Considered a small seal, harp seals are hunted in generally the same manner as ringed.

Bearded seals (*Erignathus barbatus*; *Ugjuk*) are essentially non-migratory and occupy generally the same regions of the Central High Arctic as the ringed seal, but in much smaller numbers. The ratio of bearded seals to ringed seals in the arctic varies from 1:3, to as low as 1:20 (McLaren 1958). This species of seal maintains a relatively solitary lifestyle, although loose aggregations are occasionally seen between April and June (Burns 1981:158). Bearded seals in the circumpolar region are normally found in relatively shallow waters (less than about 100 metres) due to their dependence on benthos, or bottom dwelling organisms, for food (Burns 1981:152). These seals exploit a wide variety of foods such as shrimps, crabs, clams, and fish, similar to walruses. They are usually associated with moving ice floes or areas where fast currents keep the ice thin (Mansfield 1967, Riewe 1976). These seals will maintain breathing holes in areas of thinner ice, if they become trapped by the ice in the fall (Mansfield 1967). However, they prefer to remain in the polynias or bask on moving ice floes.

The pupping period is quite long, ranging from mid-March to June (Burns 1981, Mansfield 1967, Riewe 1976). The young are born on the ice floes, and are able to swim at birth (Burns 1981). This species of seal is significantly larger than other species attaining an average adult weight of 750 lbs (Mansfield 1967) although the blubber girth will fluctuate annually.

The thick skin of the bearded seal was used by the Inuit for boot soles, heavy thongs, and as a covering for the large *umiaks*, or whaling boats (Balikci 1970; Mansfield 1967). Bearded seals were normally hunted at cracks in the ice or with kayaks in the open water, and less frequently at breathing holes. An interesting technique used by the western Netsilik was collective hunting which involved screaming wildly and rushing at the seal (Balikci 1970). This would cause the seal to become paralyzed with fright and easily harpooned. Butchering of the bearded seal was similar to the pattern used for larger marine mammals rather than seals. The seal would be divided into specific portions which rightfully belonged to those who assisted in the capture (Jensen 1987). Bearded seal hides or products created from these hides were traditionally important to the Inuit economy, and traded with interior groups for caribou resources and northern groups for baleen and narwhal tusks (Jensen 1987).

Walruses (*Odobenus rosmarus*; *Aiviq*) are a highly gregarious species which are most abundant in shallow inshore areas of the circumpolar region which are free of land-fast ice during the winter months (Loughrey 1959; Mansfield 1967). In the Central High Arctic, walruses tend to winter in loose ice regions such as Lancaster Sound, moving into Barrow Strait and McDougall Sound, and other open areas, when the ice breaks up in late spring (Riewe 1976).

As opposed to most arctic marine mammals, this species is almost always found traveling in small groups. These groups are normally segregated by sex; cows with their calves, or bulls (Mansfield 1967). However, they can also be found in mixed groups of several hundred (Fay 1981). Extremely large aggregations are more typical of Pacific groups rather than those occupying the High Arctic regions. Groups of walruses spend much of their time hauled out on ice floes or on land, huddling tightly together, with youngsters often sprawled on top of the adults. It is not atypical to find single animals swimming. However, solitary animals lying on land or ice are not common, and tend to be either intolerant adult males or individuals which are sick or injured (Fay 1981).

The birthing season spans a period of two months, from April to early June, with the peak of calving occurring around mid-May (Fay 1981; Loughrey 1959; Mansfield 1967). This species has a low reproductive rate and will therefore invest considerable attention to raising calves to maturity, suckling and closely guarding it for at least two years (Mansfield 1967). The diet of walruses consists primarily of bivalve molluscs, which may be part of the reason for their enormous tusks (Loughrey 1959). They have also been seen occasionally feasting on ringed or bearded seals (Mansfield 1967).

Walruses can be hunted year-round, but were normally killed in the water by harpoon (or now by rifle) during the spring break up of ice (Loughrey 1959). Economically these animals provide not only meat and blubber, but more importantly a source of raw ivory to create both utilitarian and art objects.

Whales constituted a lesser, albeit significant, economic resource in the Central High Arctic. The white whale or beluga (*Delphinapterus leucas*; *Qinalugaq, Qilalugaq, Qauluqtaq*) along with the narwhal (*Monodon monoceros*; *Tuugaalik, Qirniqtaq qilalugaq, Allanguaq*) migrate into the Lancaster Sound region and northward into

McDougall Sound by June or July and leave the area by freeze up in September/October (Riewe 1976). The beluga occur much more frequently and in larger aggregations than the narwhal, although both are social animals. Neither of these two species of toothed whales have dorsal fins, but are characterized by a dorsal ridge or crest. The characteristic narwhal tusk is typically an eruption of the left anterior tooth, which emerges as a tusk only in males (Hay and Mansfield 1989). Both males and females may develop one or two unerupted tusks, as well.

A wide range of food species is exploited by the beluga from molluscs to fish to zooplankton, with less mobile bottom dwellers providing a food supplement for weaning calves (Brodie 1989). The primary food source for the narwhal in the High Arctic is Arctic cod and shrimp (Hay and Mansfield 1989). In the eastern Canadian Arctic, white whale and narwhal births tend to occur from around the end of July to the beginning of August; single births are the norm (Brodie 1989; Hay and Mansfield 1989).

Belugas have a tendency to become entrapped in ice which makes them easy targets under these circumstances for natural enemies such as polar bears and walrus, along with human hunters (Brodie 1989:125). Stranding may not always be fatal, since these whales can survive partially submerged in shallow areas with little effect on respiration. Brodie describes the beluga as having "...a near seal like adaptation to manoeuvre in shallow and complex coastlines and to move through dense pack-ice, poking its head up between the ice pans, even breaking forming ice, to take a breath" (Brodie 1989:132).

Narwhal is prized for its *muktuk* (skin and a thin layer of attached fat), and strong back sinew (Hay and Mansfield 1989), along with the spiral ivory tusk. Northern Greenlandic Inuit groups used these tusks to trade with more southerly groups for bearded seal thongs (Jensen 1987).

The bowhead whale (*Balaena mysticetus*; *Arvik*) is an Arctic species which is distributed in at least four geographic stocks throughout the circumpolar region (Reeves and Leatherwood 1985). Bowheads are migratory, with the "timing and routes of migration [being] influenced by the distribution of ice cover" (Reeves and Leatherwood 1985:321). The Davis Strait stock summers in the Lancaster Sound region of the Central High Arctic and is often found along the floe edge and close to pack ice (Reeves and Leatherwood 1985).

Compared to other baleen whales bowheads have proportionately larger heads both in length and in vertical thickness, with the head comprising over one-third of the entire bulk of the whale (Eschricht and Reinhardt 1866; Reeves and Leatherwood 1985). Bowhead whales typically achieve lengths of 14-18 metres, with females attaining a greater size than males (Reeves and Leatherwood 1985). Dorsal fins are absent on these whales.

Mating is believed to take place between January and February with births occurring typically in late Spring (Eschricht and Reinhardt 1866). Although this varies from region to region (Reeves and Leatherwood 1985).

Bowhead baleen is notably longer than other species, with lengths up to 3 to 4 metres (Reeves and Leatherwood 1985). The baleen is used as a filtration feeding system enabling the whale to skim large quantities of zooplankton. Baleen was a prized commodity among Arctic peoples (Jensen 1987), as was the use of skeletal bowhead remains in the construction of Thule houses (McCartney and Savelle 1985).

2.3 Terrestrial Mammal Resources

Arctic hares (*Lepus arcticus*; *Ukaliq, Ukaliarjuk*) are found in the Canadian Arctic above the tree line in areas with adequate vegetation to support them (Banfield 1974; Riewe 1976). On the islands of the higher latitudes the hares remain almost white year round, with only a slight grey or cinnamon discoloration on the back and face during the summer months (Banfield 1974). These hares weigh between seven and twelve pounds full grown; females reaching a slightly larger size on average (Banfield 1974). Arctic hares are typically born in June and by early September are full grown. As an economic resource they provide lean meat, and the hind legs are usually split for marrow extraction. The skins however, are quite thin and brittle and the guard hairs tend to be soft, which lessens their use for clothing (Banfield 1974).

The collared lemming (*Dicrostonyx torquatus*; *Avinngaq*) inhabits the tundra zone of the northern circumpolar region (Banfield 1974). Although not likely of any direct economic importance to human inhabitants of the arctic, the collared lemming provide a source of food for arctic fox and assist in the distribution of tundra vegetation. This is the only rodent which turns white in the winter, and demonstrates a greater adaptation to the high arctic environment than any other rodent (Banfield 1974). The lemmings inhabit shallow sod burrows in the summer (often in prior human habitation features where organics have accumulated), and often burrow into snowbanks in the winter. The litters are born between early March and mid-September and likely two to three births occur during this time (Banfield 1974).

Arctic foxes (*Alopex lagopus*; *Tiriganiaq*) can be found in various densities in the Central High Arctic depending on the availability of resources. These animals are solitary except during the breeding season, and both sexes provide for their young (Banfield 1974). They are known as the thieves of the arctic. Arctic foxes with their keen sense of smell, will scavenge just about anything they can access, edible or not (particularly in human encampments). Their primary food sources are lemmings, which they will dig out of snowbanks; they also consume nesting birds and their eggs, and abandoned carcasses, particularly those left by polar bears. They tend to dig their dens in light sandy soil, with the tunnels sloping down toward the permafrost (Banfield 1974). Fox holes are often found dug into abandoned human habitation features. In the arctic islands the foxes tend to give birth in June and the pups are left to scavenge on their own by the end of August. The fur of arctic foxes is highly prized, particularly the pure white winter coat.

Wolves (*Canis lupus arctos*; *Amaruq*) are rare in the vicinity of Little Cornwallis Island. Denning areas are known south of Polar Bear Pass on Bathurst Island, but in recent times hunters have encountered them infrequently and harvested them only rarely (Riewe 1976). This may be due to the low density of their main prey source, ungulates. Wolves in the arctic have been important economically for both fur and breeding with the closely related domestic dog for the production of strong sled dogs.

Polar bears (*Ursus maritimus*; *Nanuq*) are circumpolar in their distribution. They are common to the Central High Arctic in areas where their main prey, ringed seals, is abundant (Riewe 1976), tending to avoid the open sea and areas of solidly frozen ice (Banfield 1974). Breeding occurs during April and May, but implantation is delayed until the Fall when the females dig maternity dens in snowbanks usually along rivers (Stirling et al. 1979). Only females den for the entire winter. Normally males will only use a den for a few days due to a winter storm (Stirling et al. 1979). Cubs are born hairless and blind in mid-winter, weighing less than two pounds, and do not emerge until March or April when they weigh about twenty pounds (Banfield 1974, Stirling et al. 1979).

Polar bear hides are highly desired for warm, waterproof clothing and blankets. Meat, but not the poisonous liver, is also valued. Bears are typically killed in the spring, either by excavating hibernating bears from their dens or out on the ice (Banfield 1974). In the summer their fur becomes yellow and worn, and are not as sought after. During the Thule period elaborate bear traps were often constructed.

The Peary caribou (*Rangifer tarandus pearyi*; *Tuktu*), is a small, lighter coloured subspecies of caribou or reindeer, with narrow upright antlers, which occupies the Queen Elizabeth group of Islands in the Canadian High Arctic along with northwestern Greenland (Allen 1902, cited in Banfield 1974). Within the Central High Arctic the Inuit recognize a northern group of Peary caribou which inhabit Bathurst, Little Cornwallis and Cornwallis Islands, and a southern group which is found on Somerset and Prince of Wales Island and the islands in Peel Sound (Riewe 1976). The northern group is smaller and in poorer condition than the southern group.

These tiny caribou subsist mainly on lichen. Considered to be a more primitive member of the deer family, antlers can be found on both males and females. Adult males tend to develop their velvet buds in March, growth is rapid in May through July, the velvet is worn off by mid-September, and the antlers are shed by the older bucks in November and by the younger males by February (Banfield 1974). Does develop their antlers during the summer months, shed their velvet in October and drop their racks just before the birthing season in April or May (Banfield 1974). Rutting occurs in October and November, and in the higher latitudes births tend to occur in June.

Although their has been an overall dramatic decrease in Peary caribou in the Central High Arctic over the past thirty years, due to hunting and movement of the herds to more southern grazing areas, Little Cornwallis Island has seen a slight increase (from 0 to 12 between 1961 and 1974) in caribou (Miller et al. 1977). Economically caribou are an important resource not only for meat, but also for hides, sinew, bone and antlers. An example of intensive caribou hunting using an elaborate system of drive lanes has been documented in western Greenland (Grønnow et al. 1983; Grønnow 1986).

The largest concentration of muskox (*Ovibos moschatus*; *Umingmak*) in the Central High Arctic was reported by the Resolute Inuit hunters to occur on southern Bathurst Island (Riewe 1976:176). Although the overall population of muskox in the Canadian Arctic increased between the early 1960s and the mid-1970s (Miller et al. 1977), due mainly to federal restrictions on hunting, the herds appear to be fluid in their movements between islands. In the summer they seek out sedge, willow or grassy slopes and low areas along rivers. In winter they are normally found on hills, slopes and plateaus where the vegetation is kept relatively free of snow by strong winds (Banfield 1974; Tener 1965).

Muskox can be found in herds which can range in size from 3 to 100, and are composed of cows, calves and young bulls (Banfield 1974; Tener 1965). Smaller herds are the norm in the High Arctic Islands. Solitary males are at present occasional visitors to Little Cornwallis. Bulls tend to wander alone or in small groups until they charge each other in head-on battles for access to the females during the July-August rutting season (Banfield 1974; Tener 1965). Cows bear calves every second year during late April and early May (Banfield 1974). They are characterized by their soft fleece and an overcoat of thick guard hairs which is collected for clothing and bedding. Both sexes produce horns which develop to full size by six years of age (Tener 1965). The entire animal was hunted for meat, hide and horns.

2.4 Avian Resources

There are a variety of species of migratory birds which inhabit the Canadian Arctic. The following discussion will focus on species which are commonly found in the Central High Arctic.

Geese and Ducks (family Anatidae) are only available in the Central High Arctic between June and September and are "usually harvested only incidentally to other more important game, such as seals" (Riewe 1976:174). Both the snow goose (*Chen* *caerulescens*; *Kanguq* - white phase; *Kararjuk, Qaviq* - blue phase) and the brant (*Branta bernicla*; *Nirlirnaq, Nirlirnaarjuk*) typically nest in loose colonies, in a ground depression, lined with down, mosses and tundra vegetation (Godfrey 1979). They are found summering along coastal plains, ponds, lakes, or streams, in well-vegetated areas. The common eider (*Somateria mollissima*; *Amauligjuaq, Amaulik, Mitiq, Amauligijuap arnallunga, Amauligjuap nuliajaanga, Arnaviaq*), king eider (*Somateria spectabilis*; *Qingalik, Mitiq, Qingalaaq, Qingaliup arnallunga, Qingaliup nuliajaanga, Arnaviaq*) and oldsquaw (*Clangula hyemalis*; *Aggiq, Aggiarjuk, Aa'aangiq, Arnaviaq*) ducks can be found breeding in the High Arctic Islands (Godfrey 1979). The common eider is a marine species feeding on mussel beds and reefs. It is colonial and tends to nest near salt water in low depressions or rock shelters lined with plant material and down (Godfrey 1979). In contrast the king eider is less marine, preferring tundra freshwater lakes and ponds and is not colonial. The oldsquaw is similar to the king eider, choosing depressions near tundra ponds for summer nesting (Godfrey 1979).

A number of species of Loons (family Gaviidae) range into the Central High Arctic. These include the red-throated loon (*Gavia stellata*; *Qaqsuaq*), the arctic loon (*Gavia arctica*; *Kaglulik*), and the yellow-billed loon (*Gavia adamsii*), of which only the red-throated loon presently summers in the High Arctic islands (Godfrey 1979). Loons inhabit the freshwater ponds and lakes of the tundra, nesting near the shore in a depression lined with vegetation and mud. Feeding occurs along the sea coast or in freshwater lakes (Godfrey 1979).

Sea birds are not a primary economic resource for the Inuit but can be exploited if necessary (Riewe 1976:173). The family Laridae include gulls and terns. Glaucous (*Larus hyperboreus*; *Naujaq, Nauja, Naujajjuaq, Kaumauk*), Thayer's (*Larus tharyeri*), ivory (*Pagophila eburnea*; *Naujavaaq*), and Sabine's (*Xema sabini*; *Iqqiriarriarjuk, Iqiggagiarjuk*) gulls, along with arctic terns (*Sterna paradisaea*; *Imiqqutailaq*) breed in the arctic islands (Godfrey 1979). The tern and Sabine's gull prefer low ground depressions for nesting, while the Thayer's, ivory and glaucous gull nest in cliff ledges (Godfrey 1979).

Three species of Jaegers, pomarine (*Stercorarius pomarinus*), parasitic (*Stercorarius parasiticus*; *Isunngarluk, Isunngaq*) and long-tailed (*Stercorarius longicaudus*; *Isunngarluk, Isunngaq, Kamigalik*) breed in the arctic, nesting near water in sparsely lined depressions (Godfrey 1979). The red phalarope (*Phalaropus fulicaria*; *Siggaq, Saurraq*) is a sandpiper-like shorebird which breeds in lined ground depressions but migrates mainly in the open sea (Godfrey 1979).

Black guillemots (*Cepphus grylle*; *Pittiulaaq, Pitsiulaaq*), black-legged kittiwakes (*Rissa tridactyla*; *Nauluktuapik*) and northern fulmars (*Fulmarus glacialis*; *Qaqulluq*) are marine, nesting in colonies in crevices of cliff faces (Godfrey 1979). Thick-billed murres (*Uria lomvia*; *Akpa*) are also marine, but lay eggs on the bare rock of cliff edges (Godfrey 1979).

In the family Fringillidae both Lapland longspurs (*Calcarius lapponicus*; *Qirniqtaaq*) which nest in lined ground depressions, and snow buntings (*Plectrophenax nivalis*; *Amauligjuaq, Qaulluqtaaq, Qupanuaq, Arnaviaq*) which nest in crevices, breed throughout the arctic and are often found in flocks associated with horned larks

(*Eremophila alpestris*; *Qupanuarjuk*), and water pipits (*Anthus spinoletta*; *Kujamiqtaq, Siusiuk*). Buntings were often used in the production of fermented walrus 'cheese' (A. Amagoaluk 1993, pers. comm.).

Snowy owls (*Nyctea scandiaca*; *Ukpigjuaq, Ukpik*) nest in a thinly lined depression on a high spot on rolling tundra (Godfrey 1979). The common raven (*Corvus corax*; *Tulugaq*) breeds nearly throughout the arctic, nesting in single pairs on cliff ledges and cavities (Godfrey 1979). Gyrfalcons (*Falco rusticolus*; *Qinnuajuaq, Kiggavik, Kiggaviarjuk, Qakuqtaq*) breed sparsely across the Canadian arctic occupying cliffs along rocky coast lines where nesting occurs (Godfrey 1979).

Willow (*Lagopus lagopus*; *Aqiggiviq*) and rock (*Lagopus mutus*; *Aqiggiq*) ptarmigans are ground species which are easily preyed upon. They nest in low depressions lined with vegetation and feathers. The rock ptarmigan makes local migrations within the high tundra region, and occupies the higher latitudes, while the willow variety tends to prefer the low tundra more vegetated areas (Godfrey 1979). Their plumage is white in the winter.

Other arctic breeders include sanderlings (*Crocethia albia*), Baird's sandpiper (*Calidris bairdii*; *Sigjariarjuk, Tuitnaq, Livilivilaaq*), purple sandpiper (*Calidris maritima*; *Sigjariarjuk*), knot (*Calidris canutus*), ruddy turnstone (*Arenia interpres*; *Tallivaq*) and the American golden (*Pluvialis dominica*; *Tullik, Tuulligaarjuk*) and black-bellied (*Squatarola squatarola*) plovers (Godfrey 1979). Sanderlings, sandpipers and plovers favor drier areas, whereas the knot and ruddy turnstone prefer moister environments (Godfrey 1979). All are ground depression nesters, and are of little economic importance.

2.5 Fish Resources

Arctic char (*Salvelinus alpinus*; *Iqaluk*) are found in northern lakes and coastal streams of the circumpolar region. The Eastern Arctic form is restricted to areas east of the Mackenzie drainage (McCart and Den Beste 1979). This species is generally slower growing and reaches sexual maturity slightly later than the Western version, but typically lives longer and grows to a larger size (McCart and Den Beste 1979). In the vicinity of Little Cornwallis Island freshwater char can be found in lakes on Cornwallis and Bathurst Islands (Riewe 1976). The anadromous or marine char "migrate seaward immediately after ice out" (McCart and Den Beste 1979:11), and can range great distances from their home stream (Glova and McCart 1974, cited in McCart and Den Beste 1979). Spawning occurs between late April and November; earlier in the more northern latitudes. Freshwater char feed on insects and crustaceans, whereas marine char eat a variety of fish and crustaceans and achieve a growth advantage due to greater availability of resources (McCart and Den Beste 1979:12).

CHAPTER 3

3.1 Faunal Investigations in the Eastern Arctic During the AST tradition

The analysis of faunal remains in the Eastern Arctic, particularly the Canadian Arctic, has only emerged as an integral part of an arctic archaeological project within the last twenty years. Prior to this time, non-artifactual bone material was often overlooked or relegated to simply a 'laundry list' of identifiable species. The following discussion will examine previous analyses of faunal remains recovered from sites associated with the Arctic Small Tool tradition in the Eastern Arctic (Figure 3.1).

The earliest occupation of the Eastern Arctic began approximately 4000 years ago and "disappears" from the archaeological record in much of this region shortly after ca. 1000 B.P. with the introduction of Thule cultural material (Maxwell 1985). The remains left behind by these early inhabitants are characterized by a tool kit of very small lithic artifacts appropriately named the Arctic Small Tool tradition (ASTt). ASTt of Arctic Canada and Greenland can generally be subdivided into the Independence Stage (4000-3700 B.P.). the Pre-Dorset (3700-2800 B.P.), and the Dorset (2700-1000/500 B.P.) (Maxwell 1985). Whether or not the later Thule occupants actually came into direct contact with the people of the Late Dorset continues to be a source of discussion (Park 1993).

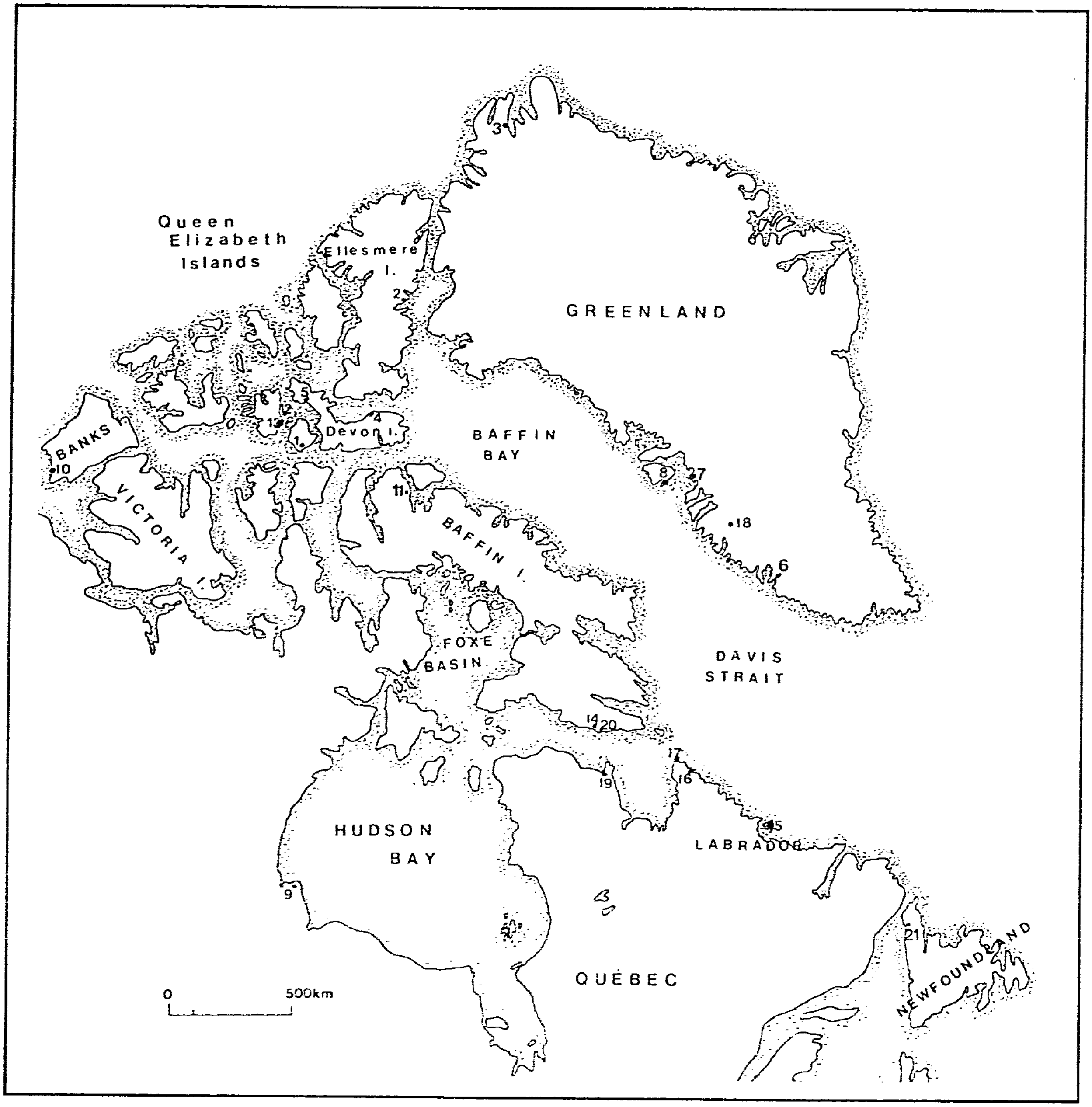


Figure 3.1 - The Eastern Arctic; location of sites mentioned in the text

1. Resolute Bay, Cornwallis Is.
2. Bache Peninsula, Ellesmere Is.
3. Independence Fjord, N. Greenland
4. North Devon Lowlands
5. Port Refuge, Devon Is.
6. Itivnera, W. Greenland
7. Qaja, W. Greenland
8. Qeqertarsuaq, W. Greenland
9. Seahorse Gully, N. Manitoba
10. Lagoon, Banks Is.
11. Navy Board Inlet, Baffin Is.
12. Karluk Island
13. Markham Point, Bathurst Is.
14. Nanook, Baffin Is.
15. Koliktalik, Labrador
16. Avayalik, Labrador
17. Akulialuk, Labrador
18. Aasivissuit,W. Greenland
19. Diana Bay, Québec
20. Shorty, Baffin Is.
21. Phillip's Garden, Newfoundland

3.2 Independence I Faunal Remains

Independence I sites range from Cornwallis Island to Independence Fjord in Northern Greenland (Dumond 1987; Maxwell 1985; Schledermann 1990). Faunal remains from Independence I sites are rare. Four sites in the Bache Peninsula region of Ellesmere Island have yielded a total of 16 bones which consist of small and large seal fragments, along with chips of walrus ivory. Bone material collected during the Danish Pearyland Expeditions on Independence Fjord, in Northern Greenland, was considerably larger. Most notably, a meat cache was discovered in front of one winter house, consisting of at least three mature musk-ox and two calves, along with arctic hare, fox and char (Knuth 1967). Seasonality was tentatively assigned to summer based on the frequent appearance of bird remains, musk-ox calves and arctic char. However, char can be caught through ice holes in the lake until mid-October, and meat was likely stored in caches for later consumption (Knuth 1967).

Other Independence I sites have been reported for the North Devon Lowlands region of the High Arctic (Helmer 1991b; McCartney 1989), although the faunal remains were virtually unidentifiable.

At Port Refuge on Devon Island, the Cold and Upper Beaches components have yielded a more complete picture of the faunal resources utilized during this period (McGhee 1979). Seal remains comprise over 90% of the Cold component assemblage based on NISP and MNI counts. Virtually all seal elements were represented, suggesting whole animals were brought back to the sites for further processing. Very few cut marks were noted, with the exception of nicks near some of the articular ends. The Upper Beaches assemblage was much smaller due to the scarcity of midden deposits and limited excavation (McGhee 1979). The list of NISP's and MNI's indicate that this component was occupied for a shorter time period with a primary emphasis on waterfowl, and secondarily arctic fox.

3.3 Faunal Remains from the Saqqaq Complex

The Saqqaq complex is considered to be a regional cultural expression of the initial stages of the Arctic Small Tool tradition, which developed in West Greenland. Recent research indicates a near contemporaneity between Independence I and Saqqaq, however the relationship between these two cultural manifestations in the High Arctic remains unclear (Schledermann, 1990).

Faunal remains from the site of Itivnera, located on the inner part of Pisissafik fjord, were analyzed by U. Møhl (1972). The bone material was dominated by reindeer or caribou (*Rangifer tarandus*), which comprised over 95% of the identified pieces in the assemblage. His analysis "indicates that whole animals or parts of them were brought back to the settlement" (U. Møhl 1972:7). He also noted technical differences between the Danish/Norse and the Saqqaq in their means of marrow extraction. The Saqqaq people tended to chop off the ends of the long bones, allowing the diaphysis to act like a tube from which the marrow could be removed (U. Møhl 1972:13). This differed from the typical longitudinal splitting of deer limb bones at Danish Stone Age sites and reindeer at Greenlandic Norse encampments.

The site of Qaja on Jakobshavn fjord also yielded a large number of well preserved bone remains attributed to the Saqqaq complex (J. Møhl 1986). These remains along with excavations at Qeqertarsuaq (Meldgaard and Grønnow 1986, cited in Schledermann 1990) have both noted skeletal dog material. The eighteen dog bones recovered from Qaja represent a six month old dog, as well as one or possibly two adults. To cut down on shipping costs to Copenhagen, only diagnostic seal bones were sent for analysis (mandibles, auditory bullae, humeri and ulnae), along with all other mammal and bird bone. The remaining 44,786 seal bones were left at the site. The inhabitants were clearly adapted to sea mammal hunting, particularly small seals (92% of collected assemblage), but also exploited a variety of birds. Further evidence for extensive seal hunting, is supported by the heavy saturation of the Saqqaq assemblage with oil, and the breakage of seal long bones in an effort to extract marrow.

Schledermann (1990) has identified two sites in the Bache Peninsula Region of Ellesmere Island which seem to have artifacts similar in style to Saqqaq remains in Greenland. The inhabitants of these sites focused primarily on seals (both large and small), with a lesser emphasis on muskox and various species of birds.

3.4 Pre-Dorset Faunal Remains

Archaeological information increases substantially during the Pre-Dorset period, although faunal reports continue to be meager. According to Maxwell (1985) the range of fauna exploited by the Pre-Dorset people is widely varied depending on the region of occupation. He also defines a 'core area' in the vicinity of Baffin Island, Hudson Strait, Foxe Basin and Labrador for the development of Pre-Dorset and Dorset, since the diversity and persistent quantity of animals in this region is such that food could be acquired with reasonable amounts of labour (Maxwell 1985:81).

Faunal analyses from three sites on the Bache Peninsula "...indicate no particular departure in subsistence practices from earlier ASTt occupations with sea mammal hunting continuing to provide the primary food source for the population" (Schledermann 1990:119). This interpretation is based on a list of species identified for the sites in this region. A similar pattern was also noted at the Pre-Dorset settlement of Seahorse Gully, near Churchill Manitoba, with the remains being dominated by ringed seal along with migratory birds (Meyer 1977).

Research at the Lagoon site on Banks Island provides a much more extensive examination of Pre-Dorset faunal remains. Arnold (1980, 1981) presents both NISP and MNI counts for the 850 identifiable pieces of bone. An early summer occupation of the site is demonstrated by the presence of medullary bone in at least four goose long bones. Since at least 40% of the ringed seal were immature when killed, Arnold (1980, 1981) speculates that it may reflect lead ice hunting, likely during late spring or early fall (when open water leads are more common). Much of the muskoxen remains were smashed into small pieces, probably to facilitate grease extraction. The other interesting aspect of this assemblage is the discovery of a possible pack dog represented by three vertebrae from the lower back with flattened spinous processes and severe osteophytoses (Arnold 1979).

The location of cut marks on muskoxen remains was used as a means of reconstructing methods of carcass reduction. Differential element representation in the assemblage was also examined in order to explore possible butchering practices and taphonomic processes. For example the lower than expected small seal axial and flipper elements may indicate butchering outside the confines of the site (Arnold 1981:109).

Over 7000 identifiable faunal specimens, dominated by small seal, were recovered from the Early Pre-Dorset occupation of the Icebreaker Beach complex of the North Devon Lowlands (Helmer 1991b; McCartney 1989; McCartney and Helmer 1989). Analysis of the faunal material revealed no variation in species composition between features. Following the work of Spiess (1976) and Bourque, Morris and Spiess (1978), seal tooth thin sections were examined in order to determine the active period of hunting from the sites on Devon Island. This technique was first used on ringed seals in the Eastern Arctic by wildlife biologists studying their behavior (Smith 1973). A comparative collection of archaeological teeth, and teeth of known age, from various areas in the Arctic, was accumulated by S. Presley of the Archaeological Survey of Canada. Presley (1987, cited in McCartney 1989) prepared and read the dental thin sections for this project, and was able to determine the year and month of death to within one month on either side. Based on his results, hunting appears to have continued virtually throughout the year, with the most active period occurring in August and November. Features may have been occupied at different seasons of the year and more than once (Helmer 1991b).

Similar results from a Middle Pre-Dorset settlement at the Twin Ponds complex

(Helmer 1991b; McCartney 1989), attests to the dependence on small seals during various seasons of the year, with little or no between site and feature variation. This study of the zooarchaeological remains on Devon Island appears to be the only faunal study, from the period of the ASTt, which has attempted to use weathering characteristics "in an attempt to gain some quantitative control over the likely rates of bone loss affecting assemblages" (McCartney 1989). Unfortunately, application of ordinal weathering stages appears in this case to have yielded ambiguous results.

Independence II (divided into Late Pre-Dorset/Transitional/Early Dorset stages by Schledermann [1990], has been included for convenience with the Pre-Dorset faunal material) sites at Port Refuge, Devon Island, were dominated by ringed seal (McGhee 1981). Following the aging criteria established by Cox and Spiess (1980) during their research on Dorset and Thule sites on the central Labrador coast, McGhee (1981) examined the degree of fusion of seal humeri. He found that the occupants of the Lower Beach site were likely hunting at the ice edge throughout the year, due to the low proportion of adult humeri, rather than at the winter breathing holes. Sectioning of the seal teeth was carried out by Presley of the A.S.C., who concluded the hunts occurred primarily in the spring and summer. Statistical analysis of the lengths of seal long bones indicated that the seals at the Lower Beach component were somewhat larger than those from the Independence I Cold site at Port Refuge. He suggests that these differences may be due to changes in the local climate and ice conditions between Independence I and II in this region (McGhee 1981:32).

3.5 Dorset Faunal Remains

The geographic distribution of Dorset cultural material is similar to that of the Pre-Dorset. Faunal reports from this period are considerably more extensive, owing in large part to better preservation of organic material.

Mary-Rousselliere (1976) compared the percentage of faunal remains found at several sites on Navy Board Inlet, Northern Baffin Island from Early, Middle and Late Dorset, as well as Early and Late Thule. Based on the relative frequencies of species present in this region, there appears to be an increase in the pursuit of small seals during the Middle Dorset as opposed to a more generalized terrestrial and marine adaptation by the Early and Late Dorset. The contrast between Dorset and Thule is marked by an increased exploitation of whale by the Thule culture. Seasonality at these sites was only tentatively assigned.

Early Dorset occupation of the Crozier Strait region was extensively studied by Helmer (1981) on Karluk Island, and Markham Point, Bathurst Island, in the Central High Arctic. Small seal and musk-ox dominated these assemblages. The relative occurrence of skeletal elements was calculated for those species considered to be of greatest economic importance based on bone counts and MNI determinations. The results indicated that butchering units for musk-ox were preferentially selected and returned to the camp, whereas, there was an almost equal representation of bone elements for seals. An examination of cut marks and bone fracture patterns was not studied extensively, however, Helmer (1981) mentions that the ungulate remains were likely broken for marrow extraction. There were no indications of occupation during the long winter months, but this may have been due to small sample size, or they may have spent this time out on the sea ice (Helmer 1981:258).

From this same time period on the Bache Peninsula, of Ellesmere Island, Schledermann (1990) reports similar bone frequency counts from three sites. He speculates that the "schlepp effect" (Daly 1969) may factor into the low frequency of walrus remains at the Shelf site relative to other sites in the area, suggesting a summer/fall occupation with the majority of the walrus bones being left in the vicinity of the kill. However, this interpretation is based exclusively on the relative number of specimens.

Faunal remains from the Middle Dorset occupations of the Eastern Arctic seem to have been more extensively analyzed. I believe this is due more to the interests of the researchers, rather than a larger quantity or quality of bone material.

The faunal remains from the Middle Dorset period Nanook site from the Lake Harbour region of Southern Baffin Island, were examined intensively by Arundale (1976). Some of the material was analyzed in the field using notes and sketches, and in some cases with Inuit assistance, due to "logistical limitations" (Arundale 1976:214). Elements which could not be identified with certainty, along with all avian remains were analysed in the laboratory. The results of this study indicated differential transport to the middens; small seal remains tended to be more complete with larger animals disarticulated elsewhere (e.g. caribou were only partially transported from the kill). Shallow knife marks were rarely found on the bone, with virtually all cuts located on the pelvic-femoral joint. All of the ungulate remains, down to the phalanx, were cracked for marrow. This analysis provides one of the first complete lists of bird remains from a Dorset midden (Arundale 1976). As well, it examines the completeness of elements in order to study the economic or natural factors which may have influenced the site composition, taking into account biases due to recovery and identification techniques.

Extensive seasonality studies using dental annuli, were performed at sites along the Northern Labrador coast (Cox and Spiess 1980; Jordon 1980; Spiess 1976, Spiess 1978). Studies by Spiess (1978) on Koliktalik 1, House 1 demonstrated the primary use of small seals, examined population demographics using epiphyseal union (e.g. fused, unfused) determined element frequencies, and estimated the total meat and blubber content for the minimum number of individuals of the various taxa. He further relates this meat information to the minimum amount of protein needed *per diem*, based on modern analogy and ethnographic meat consumption, in order to calculate average meat intake (Spiess 1978). However, this extrapolation, albeit an interesting scenario, seems rather speculative.

The faunal remains recovered from the Northern Labrador Middle Dorset site of Avayalik revealed a heavy reliance on walrus and small seal, with very little use of bearded seal, fox, polar bear, caribou and small whale (Jordon 1980). Numerous species of bird were also recovered, including the extinct great auk. Results from tooth sectioning data suggest an occupation beginning around March and extending throughout the open-water period in late summer (Jordon 1980:618).

Another Middle Dorset site, Akulialuk, along the Northern coast of Labrador was also excavated during Torngat Project surveys (Cox and Spiess 1980). The Akulialuk midden was "essentially a solid mass of bird bones, with an occasional seal bone interspersed here and there" (Cox and Spiess 1980:662). The high number of pelagic birds and a number of juvenile ducks indicate a summer site occupation.

Traces of Dorset culture were recorded at the West Greenlandic site of Aasivissuit, an area used for caribou hunting up to historic times. Only six caribou bones were recovered from the ca. 200 B.C. Dorset level, but it does provide early evidence of resource utilization at an inland occupation (Grønnow et al. 1983; Grønnow 1986).

Other studies from the Dorset period have examined the spatial and stratigraphic distribution of faunal remains (Julien 1980). Multiple occupation of a Middle to Late Dorset site located in Diana Bay in Arctic Quebec, was indicated by the distribution of bone material. Both caribou and small seal comprised a large proportion of the assemblage, with a season of habitation ranging from spring to early winter. A cycle of annual resource exploitation and seasonal occupation at Diana Bay was observed through spatial analysis of the preserved and decomposed traces of bone (Julien 1980).

Faunal remains from eight Late Dorset sites in the region of the Bache Peninsula, reveal varying amounts of bone recovered (Scheldermann 1990). Small seals, birds and at some sites arctic fox, tend to be the dominant species exploited. Several fish bones were also discovered at a number of sites, which seems to be a rare find in the High Arctic.

Helmer's (1981) investigation of the Crozier Strait region also included three Late Dorset sites. One of these sites yielded a large assemblage composed of over 90% small seal remains which appear to have been dragged back to the site in their entirety for butchering, since there were relatively equal proportions of each bone element. Fox bones outnumbered all other taxa by 65-85% at the second Late Dorset site, followed closely by small seal. Economically, the arctic fox may have played a significant role as a source of fur. The occupants of the third site seemed to focus their attention on both small and bearded seals, as well as a variety of birds. Preferred meat packages of bearded seal, rather than complete carcasses, appear to have been carried to the site. According to Helmer (1981:260), this group of Late Dorset hunters likely adjusted its economic strategy seasonally.

The Late Dorset Shorty site on Southern Baffin Island, yielded nearly 500 animal bones, although not one piece of worked organic material was found (Maxwell 1985:234). The vast majority of remains were of ringed seal, with a considerable number being neonates or yearlings, suggesting the specialized capture of young seals. As well, seasonality was suggested to be late spring/summer based on the remains of duck. However, the ability to cache food may bias the estimation of site seasonality.

CHAPTER 4

4.1 The *Tasiarulik* Site (QjJx-10)

The Late Dorset site of *Tasiarulik* is located along the southeastern shore of Little Cornwallis Island and is comprised of 116 discrete cultural features, which include sub-rectangular semi-subterranean house depressions, tent rings, external slab hearths and hearth rows, caches, lithic scatters, middens and ambiguous feature types which likely served several functions over time. These features are dispersed along a NE/SW trending long narrow beach ridge, spanning approximately 500 metres in length, but only about 40 metres in width (Figure 4.1). The shoreline is roughly 100 to 200 metres to the east of the site, separated from the beach ridge by a series of tidal pools. Two shallow meltwater ponds lay to the west of the site. "Behind the ponds the topography rises up in a series of isostatically raised beaches to a maximum elevation of ca. 70 masl" (Helmer et. al. 1993:5). The beach is comprised of angular limestone and dolomite gravel, rarely interrupted by moss, lichen and tiny flowers.

4.2 Field Methodology during the 1992 Season

Three weeks prior to leaving for the 1992 archaeological field season on Little Cornwallis Island, several modifications were made in the procedure for recovering information pertaining to the faunal remains due to the previously mentioned permitting

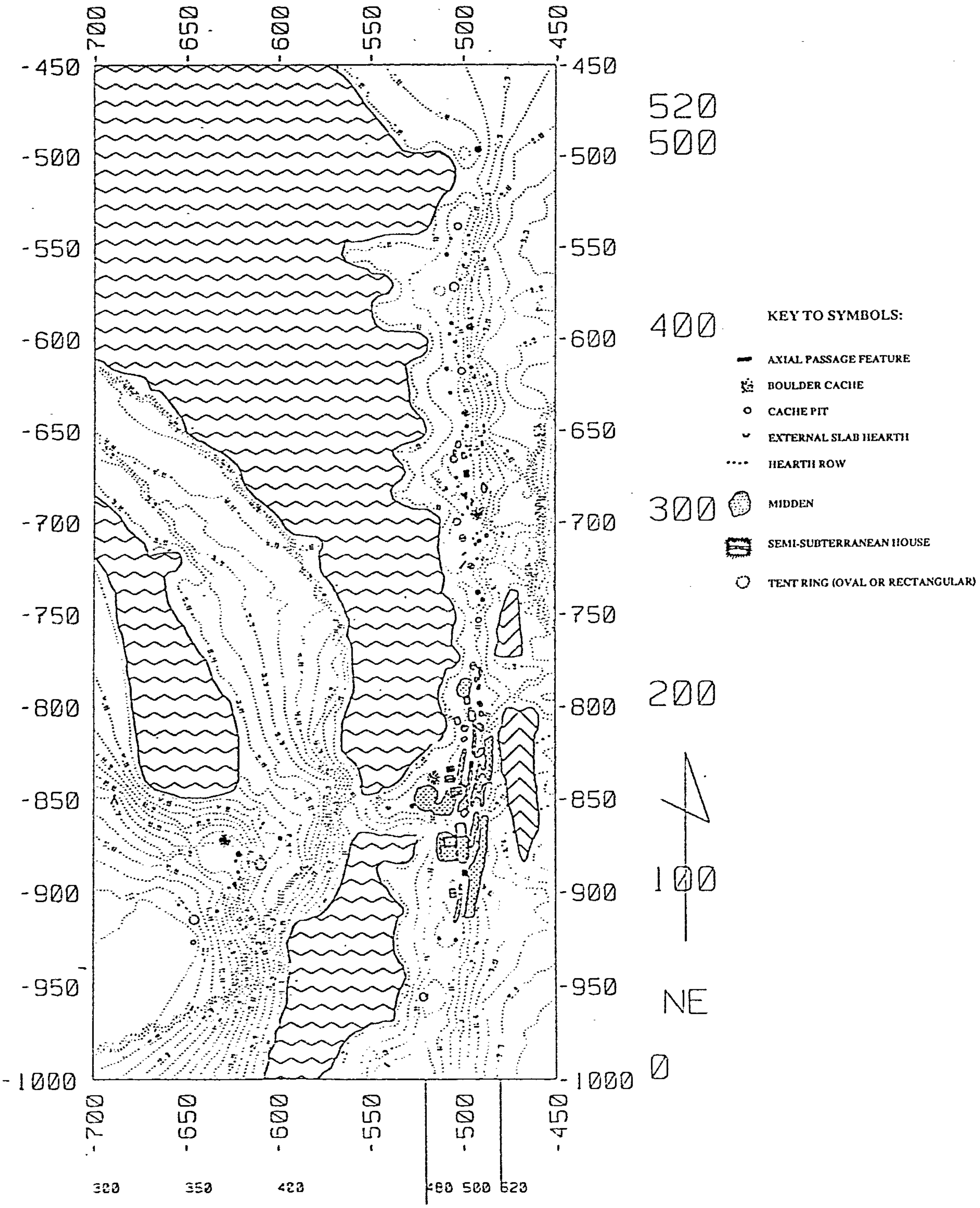


Figure 4.1 - The site of Tasiarulik (QjJx-10)

difficulties. The identification of faunal remains in the field is not unusual for Arctic projects (i.e. McCullough 1989; Møhl 1986; Schledermann 1975; Staab 1979; Will 1985). For the most part, previous archaeological research projects were hindered by the weight and quantity of bone, which would have been costly to ship to an identification laboratory, rather than the lack of permission to collect. Due to our inability to excavate, the surface faunal remains at QjJx-10 were mapped, identified and catalogued *in situ.*

Dorset, Pre-Dorset and Independence sites in the polar desert region of the High Arctic are probably best suited to this type of surface analysis due to the limited vegetative growth on the cultural features. The short growing season, coupled with low precipitation, retards soil development on virtually the entire site, with the exception of a slight 5 to 10 cm organic cover on middens and the floors of cold season dwellings. Therefore, most artifacts can be found on the surface of the site or just slightly below it.

A portable comparative collection was prepared from the University of Calgary Zooarchaeological Laboratory prior to the commencement of the 1992 field season on Little Cornwallis Island. The collection included the skeletal remains of a one and a half year old ringed seal (*Phoca hispida*), which was transported from unit to unit for comparison in a plastic container. The comparative material also consisted of a ptarmigan (*Lagopus sp.*), along with scaled photographs taken of the university's collection of arctic fox (*Alopex lagopus*) and arctic hare (*Lepus arcticus*) bones[2], and scaled drawings were made of the polar bear (*Ursus maritimus*), peary caribou (*Rangifer*

---

[2] The photographs were taken by Theresa Schober, and the drawings were done by the author. The faunal remains were identified exclusively by the author and Ms. Schober during the 1992 field season.

tarandus pearyi), and muskox (*Ovibos moschatus*) skeletal material. As well, identification manuals for avian (Gilbert et al. 1985), pinniped (Kasper 1980) and general mammalian (Olsen 1990) osteological remains were included with the field comparative collection.

Surface examination did allow for a greater area of the site to be sampled, than would have been possible using conventional excavation techniques. However, coverage of 15,000+ square metres would have been unfeasible in one field season. The project directors used the map of QjJx-10 created in 1990 (Helmer 1991a) to divide the entire site into 20x20 metre blocks.

> These were sequentially numbered and a 50% sample randomly selected. Each of the selected 20x20 blocks was further subdivided into 4x4 m units of which 50% were systematically selected in a checkerboard pattern. Thus we isolated a 25% sample of the site for intensive surface examination. Additionally, to ensure inclusion of a representative sample of different feature types we decided to examine 100% of the 4x4 metre units in the central, most densely occupied, area of the site (between ca. 90m N and 220m N), which covers approximately 5000 square metres (Helmer et al. 1993:6).

Figure 4.2 illustrates the sampling strategy used at *Tasiarulik* for site examination. Surface faunal analysis was not completed on the two random 20x20 metre blocks north of the main habitation area due to inclement weather conditions and time constraints.

A faunal record form was used in the field and all of the identifiable bone was mapped. We examined 253 4x4 metre sampling units associated with 40 different features across *Tasiarulik*. In other words we identified bone material over an area of nearly 4050 square metres, from 0m North to 216 m North (although higher bone concentrations did not occur until 80-90m North). The 4x4 metre units were divided into

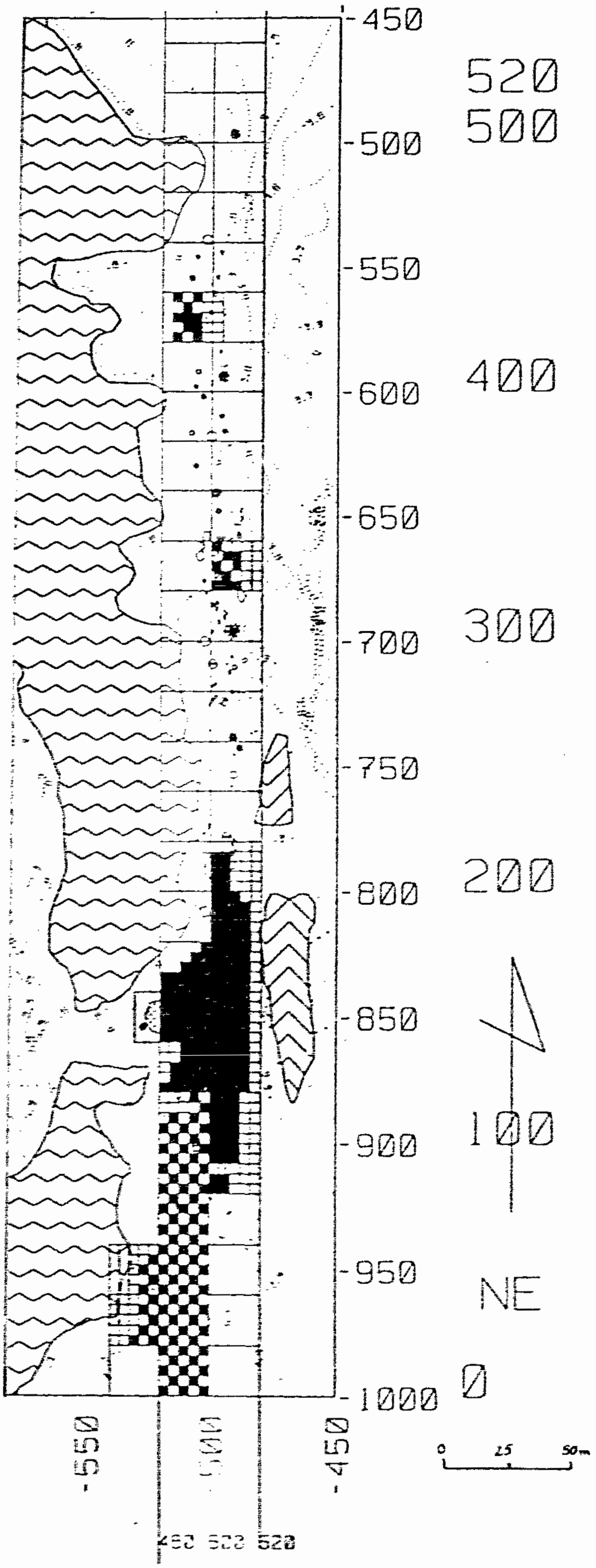


Figure 4.2 - Surface sampling units at Tasiarulik (QjJx-10)

2x2 metre quadrants for ease of recording. All faunal remains, excluding artifactual remains (i.e. bone tool or byproduct of bone tool production), were identified to the lowest possible taxonomic level based on the types of animals which inhabit this area of the Central High Arctic, and the comparative collection available. Unidentifiable fragments were counted and recorded by 2x2 metre quadrant, and associated feature (e.g. semi-subterranean house, midden, cache, tent ring, etc.). The vast majority of the unidentifiable pieces are likely the remains of sea mammals, due to the bone's spongy appearance. Unless the specimen could be assigned to a particular bone element class (e.g. long bone, vertebral, rib, axial, etc.) it was not separated into a specific taxonomic category. Long bone shaft fragments which might have been either small terrestrial mammal or bird, also remained as unidentifiable.

Since it would be difficult to reexamine a particular bone at a later date, as many variables as possible were recorded in the field. Along with recording the unit coordinates, quadrant and associated feature(s), the discrete observations made on the identifiable specimens were as follows: taxon; anatomical location; bone fusion stage (fused, unfused, or line of fusion); type, position and frequency of cut marks; upper and lower bone surface weathering/deterioration stage (after Todd 1987); presence and location of gnawing; pathological modification of the bone; breakage; burning; and any disturbance of the material (e.g. lemming or fox holes). Each identifiable specimen was also outlined to a two-point provenience within the site, and articulations, associations, or refit specimens were also noted. The bone was not weighed, and generally no measurements of the specimens were made, due in part to the constraints of identifying in the field.

4.3 Field Methodology during the 1993 Season

During the summer of 1993, we were granted permission to excavate the site of *Tasiarulik.* The MSAR project elected to return to the same site, in order to evaluate the results of the surface examination by comparing it to a more conventional excavation oriented sampling strategy. The research design involved the excavation of two to three examples of each major feature type pending weather and time constraints. This included 1) semi-subterranean house depressions, 2) tent ring formations, and 3) midden deposits. Utilizing the results from the surface examination, the directors selected features which they believed would yield a representative sample of the site. Metal stakes with flagging marking the large 20x20 metre blocks remained in the ground from the previous season, enabling the grid to be easily reestablished.

Excavation strategies focused on the individual feature. The sampling units were 1x1 metre squares subdivided into quadrants (Figure 4.3). We excavated three semi-subterranean house depressions (SSH Features 74, 91 and 59) and a midden directly associated with one of the houses (MDN Feature 57, associated with SSH 59). One true tent ring (TR Feature 30) and associated midden deposit (MDN Feature 31) were excavated, along with two features which have tentatively been described as multiple tent rings and associated midden debris (TR MDN Features 79 and 90). Three long linear midden deposits with no significant feature rocks in association were also

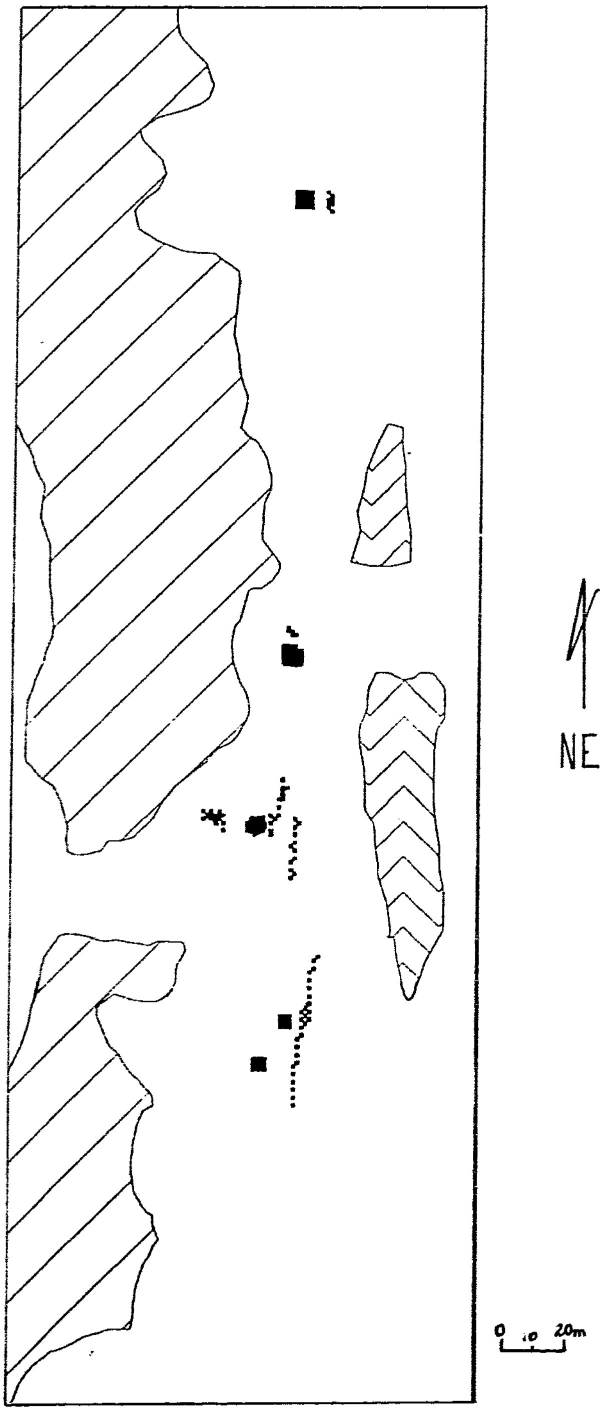


Figure 4.3 - Excavated sampling units at Tasiarulik (QjJx-10)

excavated (MDN Features 70, 78, and 84). A 100% sample was excavated within the area of the house and definable tent ring features themselves. For the house depressions this included the surrounding berm. The feature rocks and artifact concentrations defined the extent of tent ring features 30 and 90, which, like most tent rings, were nearly devoid of any vegetation. Feature 79, on the other hand, had a much thicker vegetative cover and was more ambiguously defined. Approximately 75% of the feature was sampled within the central concentration of feature rocks. Between 25 and 50% of the midden deposits were sampled typically in a checkerboard fashion (Figure 4.3). Checkerboarding the middens also served to decrease erosion of the features.

Excavation procedure involved trowel and tweezer, and the matrix was screened through a ¼ inch mesh. Although the artifacts tended to be dwarfed by the beach gravel matrix, screening did recover a significant amount of material, particularly pieces which adhered to the moss covering. It should be noted that screening is rarely used in the arctic. The faunal material was bagged by unit and quadrant. Surface bone was bagged separately from subsurface bone. Seal mandibles and maxillae with intact canines were isolated for future dental annuli studies, and articulated or associated bone clusters were also tagged separately. Vertical provenience was typically not recorded since most features were very shallow (5-10 cm). Bones from subsurface depressions or possible cache 'pits' were bagged together regardless of whether the pit cross-cut the archaeologically constructed quadrants. Units which fell within surface examined 4x4's were compared with a printout of the 1992 field identifications, and checked off as they were collected. Problems involved with this procedure will be discussed in the next chapter.

In total 187 units were excavated over the course of the field season. This constituted 183½ square metres of surface coverage, since a few of the units were only 50x100 cm. All of the units were backfilled at the end of the season.

CHAPTER 5

5.1 Identification and Quantification

Faunal remains (and lithic debitage) have often been left in the field by Arctic archaeologists and not collected for laboratory analysis. Much of the non-artifactual bone material in the past was ignored, but more recently field identifications have been made in order to reduce shipping costs without losing the type of information which can be recovered from the analysis of faunal remains. In particular, it would be impractical to remove the vast quantity of bowhead whale bone associated with Thule sites. During one High Arctic project McCullough (1989) left behind cetacean (whale) bone, along with a portion of one season's assemblage to reduce costs. However, she states that "without reference specimens, the field identifications were much less precise than the laboratory identifications... (which was)... reflected in the greater percentage of unidentified mammalian elements" recovered from houses excavated during that particular season (McCullough 1989:261).

Specimens identified during the 1992 field season at QjJx-10 were often assigned to more general taxonomic categories due to the inability to compare the bones to a laboratory comparative collection. This restricted the classification of bird remains to some degree. Faunal remains recovered during 1993 excavations were identified using the zooarchaeological collections at Simon Fraser University and the University of Calgary. Arctic bird material is rather limited in these collections, and resulted in many of the bird bone identifications remaining at the family level. Marine mammal remains were compared with similar sized northern Pacific species contained in Simon Fraser's collection along with an immature ringed seal from the University of Calgary. Identifications were also made with the assistance of numerous illustrated guides (e.g. Gilbert 1990; Gilbert et al. 1985; Kasper 1980; Olsen 1990).

A problem which arises with the identification of a faunal assemblage is that some animals are more easily identified to the level of species based on their distinctive skeletal morphology, while other species are virtually indistinguishable osteologically (Driver 1992:41). This leads to particular species being over represented by virtue of their skeletal biology. One of the advantages of identifying faunal remains from a High Arctic context is low species diversity, resulting in a limited range of animals from which a bone could originate.

Discrimination between the two species of small seal found in the Central High Arctic was not undertaken during the course of this analysis. Few criteria exist with which to separate the osteological remains of ringed and harp seals, since the majority of the skeletal elements are not morphologically distinct. "Although faunal reports in which such distinctions have been made exist (Cox and Spiess 1980), many other analysts consider that few, if any, diagnostic criteria display a sufficiently narrow range of intra-specific variation" (McCartney 1989:113). My comparative collection was too limited to enable identification of *Phoca* to the level of species with any degree of certainty. It is most likely that the vast majority of the *Phoca* remains are ringed seals given the short open water season in which harp seals are available, in contrast to the year round availability of ringed seals. The hunting and butchering of small seals is fairly similar among modern Inuit people (Graburn 1969). Thus, archaeological examination of the element distribution and butchering patterns of *Phoca* as a grouping should be viable given their similar structure.

Bearded seal and walrus remains are considerably larger than the smaller Phocid seals and were separated based on morphological and size differences, using the comparative collection and references (Gilbert 1990; H. Savage 1994, pers. comm.). Whale remains were not differentiated past the level of order Cetacea because virtually all of the specimens were axial or rib fragments. Bowhead, narwhal or beluga probably all contributed to the assemblage. Architectural and worked whale bone was likely scavenged from bowhead whale remains. Element frequency and diversity was extremely low which tends to suggest that the whale was not actively hunted. There is also no clear evidence during the Late Dorset of whaling tools or large umiaks for navigation in open water (Maxwell 1985).

The category 'large terrestrial mammal' includes caribou, muskox and polar bear (Although polar bears are considered to have a marine habitat, osteologically they are terrestrial). Specimens which were thought to be either muskox or caribou were classified as order Artiodactyla. 'Small terrestrial mammal' refers to Arctic fox and Arctic hare remains which could not be differentiated. Lemming bones are very distinct and would not be included in this category. There were no wolf or dog specimens from either the 1992 or 1993 assemblages. Bird remains were identified to as low a taxonomic category as possible based on the species which occur in the Central High Arctic and the comparative collections available. Indeterminate bird bones remained as class Aves, such as ribs, vertebrae, phalanges, etc. Cranial fish bones were exclusively Arctic char, while post-cranial remains were not assigned to a species category and lumped into class Osteichthyes.

Assumptions about the possible range of species which could be represented in the faunal assemblage must be made before identifications can be undertaken. As mentioned previously, in the Central High Arctic this range is limited allowing for identifications to the level of species which would not have been possible in other regions. Zooarchaeological analysis which involves "identification by association" has been highly criticized (Driver 1992). Keeping this in mind I did choose to separate pinniped rib and vertebral fragments which are not very species specific to *Phoca sp.*, bearded seal, and walrus whenever possible based primarily on gross size differences because there were no other taxa with which to mistake the bones. If the piece was too small or marginal in size the specimen was placed in a broader category of either a large Pinniped (walrus/bearded seal) or subfamily Phocinae (bearded/ringed/harp seal). Unidentifiable specimens were those bone or tooth fragments which could not be confidently assigned to any of the above mentioned categories. Many of the small spongy fragments were likely sea mammal remains, but I chose to err on the side of caution and not lump them into an 'unidentifiable mammal' category. Small thin walled shaft fragments without any distinctive characteristics which could be either bird or small terrestrial mammal were similarly left as unidentifiable.

Quantification methods used by zooarchaeologists have come under critical examination (e.g. Grayson 1984; Ringrose 1993; Marshal and Pilgram 1993). The main quantification units encountered in zooarchaeology are NISP and MNI. The basic counting or observational unit is NISP, which refers to the number of identified specimens per taxon. The taxon could be a species, genus, family or a higher taxonomic category. MNI is a derived unit of measure generally defined as the minimum number of individual animals needed to account for a particular set of faunal remains which may or may not take into account age, sex or size variation (Lyman 1994a:38). A specimen refers to "a bone or tooth, or fragment thereof...while an element is a single complete bone or tooth in the skeleton of an animal" (Grayson 1984:16, following Shotwell 1955,1958). In the text of this report I often use the term "bones", " bone assemblage" or "faunal assemblage" and these terms indicate bone or tooth fragments which are not tools or the debitage resulting from tool manufacture (for a discussion of the bone artifacts see Helmer et al. 1993).

Criticisms have been made regarding the use of NISP and MNI. I will address some of the issues surrounding these quantification methods with reference to the comparison of two bone assemblages at QjJx-10. These techniques are measures of certain characteristics of an archaeological or fossil assemblage, and errors associated with NISP and MNI are typically in the expectations of what can be done with them rather than the calculations themselves (Ringrose 1993).

There are numerous problems associated with NISP such as preservational biases between elements and between species, as well as differential butchery (i.e. some animals may reach a site whole or certain species may be smashed for grease extraction).

Problems also arise because of differences in the number of bones between species, biases in the identification of skeletal remains, and most importantly the interdependence of the counting units (Grayson 1984; Ringrose 1993). This last criticism stems from the fact that some of the specimens may have derived from the same animal, which makes statistical treatment of the data unsuitable. In particular, the level of statistical significance will be overestimated during the calculation of inferential statistics (Grayson 1984; Marshall and Pilgram 1994).

The method of MNI calculation often varies from analyst to analyst, and it is often not explicitly stated how the numbers were derived. Estimates of the minimum number can generally be done only on species, whereas it is more difficult to calculate MNI's on the order level. MNI's should remove the problems of bone interdependence because the objective is to avoid counting the same animal twice and may be less affected by differences in the number of elements identified for each taxon (Ringrose 1993). However, Grayson (1984) has demonstrated that NISP and MNI are not independent of each other, and in fact one can predict the MNI from the NISP. This measure is also highly correlated with sample size, in other words NISP (Grayson 1984), such that the error increases as the sample size increases. MNI's have often been used to estimate the relative importance of a species to the human diet by multiplying it by an average meat weight. Comparison with the results of stable isotope analysis indicate that MNI is further from the expected values than calculations using NISP (Driver 1993).

It is widely assumed that NISP is inferior to MNI as a unit of measure if an assemblage is highly fragmented. Marshal and Pilgram (1994) suggest that MNI is a more biased measure of relative element frequencies than NISP. They also found that MNI is more sensitive to difficulties in the identification of body parts. MNI will also tend to overemphasize the importance of the least abundant or rare species, and underemphasize the more plentiful species. The greatest disadvantage to the use of MNI is "that the numerical values of minimum numbers of individuals vary with the way in which faunal material from a given site is divided into... smaller aggregates...[and] changes in abundance will probably occur differently across taxa" (Grayson 1984:29). Because these numbers can vary not only in the method of calculation, but also in how the bones are grouped together, comparison of MNI values between sites would be difficult.

As stated previously, the use of NISP as a counting method is not without its problems, particularly the interdependence of the counting units. However, NISP is simple to use, and is a quantitative method which is not fraught with the problems of aggregation associated with MNI. In other words, no matter how you divide up your sample you will always end up with the same totals for the site. This factor is the primary reason that MNI's were not used to compare the 1992 and 1993 faunal assemblages from *Tasiarulik.* The surface assemblage is particularly inappropriate for MNI calculations because it cross-cuts numerous features over the site which were likely deposited during different occupations. If each of the forty features in which bone was identified were treated as a separate aggregates the MNI calculations would be radically different from an MNI of the assemblage as a whole. Difficulties would also be encountered in the calculation of MNI for features which were likely reused at different times and for different functions. For example, Feature 79 appears to have been used initially as a tent ring but later functioned as a midden. A descriptive comparison of the two assemblages using NISP was felt to be the most viable method of analysis. As for the use of MNE's (minimum number of elements) or MAU's (minimum animal units), they would be governed by the same aggregation problems as MNI.

During the summer of 1993 problems arose when we attempted to match the surface material from our excavation units with the 1992 faunal catalogue. These included incorrect field measurements (human error and slight grid inconsistencies between seasons) and identifications of some of the specimens, along with the inability to account for 'unidentifiable' bone since it was counted by 2x2 metre quadrant. I have chosen to treat these two assemblages as different samples of the same site for comparative purposes. Overlap between the two assemblages is small since we only sampled nine features in 1993 which were examined during the previous season. This constituted an overlap of approximately 2% of the 1993 sample.

NISP frequencies of the specimens from the 1992 surface examination are presented in Tables 5.1-5.7. Features were combined together into "lithic scatters", "tent rings", "tent ring/midden" combinations, "semi-subterranean houses", "middens" and bone "not associated with a feature" in order to examine the relative bone frequencies found in these major feature types. Appendix A contains the actual bone counts for over forty individual features and feature combinations examined during the 1992 season.

Table 5.1
QjJx-10 Surface Assemblage, NISP Counts

Taxon	Frequency	%Identifiable
family Anatidae (goose/duck)	20	0.81
class Aves (unidentified bird)	8	0.32
Lepus arcticus (arctic hare)	13	0.52
Dicrostonyx torquatus (collared lemming)	10	0.40
order Cetacea (whale)	27	1.09
Alopex lagopus (arctic fox)	63	2.54
small terrestrial mammal (hare/fox)	20	0.81
Ursus maritimus (polar bear)	13	0.52
Odobenus rosmarus (walrus)	321	12.93
Erignathus barbatus (bearded seal)	564	22.72
large Pinniped (walrus/bearded seal)	75	3.02
Phoca sp. (ringed/harp seal)	1216	48.99
subfamily Phocinae (bearded/ringed/harp seal)	54	2.18
Rangifer tarandus (caribou)	41	1.62
order Artiodactyla (caribou/muskox)	13	0.52
large terrestrial mammal (polar bear/caribou/muskox)	24	0.97
Subtotal	2482	100.00
Unidentified	984	
Total	**3466**	

Table 5.2
Surface Bone, Lithic Scatter Features, NISP Counts

Taxon	Frequency	%Identifiable
Phoca sp. (ringed/harp seal)	1	50.00
large terrestrial mammal (polar bear/caribou/muskox)	1	50.00
Subtotal	2	100.00
Unidentified	2	
Total	**4**	

Table 5.3
Surface Bone, Tent Ring Features, NISP Counts

Taxon	Frequency	%Identifiable
Dicrostonyx torquatus (collared lemming)	3	37.50
order Cetacea (whale)	1	12.50
Odobenus rosmarus (walrus)	1	12.50
Phoca sp. (ringed/harp seal)	2	25.00
large terrestrial mammal (polar bear/caribou/muskox)	1	12.50
Subtotal	8	100.00
Unidentified	8	
Total	**16**	

Table 5.4
Surface Bone, Tent Ring/Midden Features, NISP Counts

Taxon	Frequency	%Identifiable
Lepus arcticus (arctic hare)	2	1.53
Dicrostonyx torquatus (collared lemming)	1	0.76
order Cetacea (whale)	4	3.05
Alopex lagopus (arctic fox)	9	6.87
small terrestrial mammal (hare/fox)	2	1.53
Ursus maritimus (polar bear)	2	1.53
Odobenus rosmarus (walrus)	13	9.92
Erignathus barbatus (bearded seal)	27	20.61
large Pinniped (walrus/bearded seal)	2	1.53
Phoca sp. (ringed/harp seal)	65	49.62
subfamily Phocinae (bearded/ringed/harp seal)	3	2.29
Rangifer tarandus (caribou)	1	0.76
Subtotal	131	100.00
Unidentified	60	
Total	**191**	

Table 5.5
Surface Bone, Semi-subterranean House Features, NISP Counts

Taxon	Frequency	%Identifiable
Lepus arcticus (arctic hare)	1	0.72
order Cetacea (whale)	5	3.62
Alopex lagopus (arctic hare)	3	2.17
small terrestrial mammal (hare/fox)	1	0.72
Ursus maritimus (polar bear)	2	1.45
Odobenus rosmarus (walrus)	12	8.70
Erignathus barbatus (bearded seal)	24	17.39
large Pinniped (walrus/beared seal)	4	2.90
Phoca sp. (ringed/harp seal)	82	59.42
Rangifer tarandus (caribou)	1	0.72
order Artiodactyla (caribou/muskox)	3	2.17
Subtotal	138	100.00
Unidentified	58	
Total	**196**	

Table 5.6
Surface Bone, Midden Features, NISP Counts

Taxon	Frequency	%Identifiable
familyAnatidae (goose/duck)	20	0.95
class Aves (unidentified bird)	8	0.38
Lepus arcticus (arctic hare)	8	0.38
Dicrostonyx torquatus (collared lemming)	5	0.24
order Cetacea (whale)	15	0.71
Alopex lagopus (arctic fox)	49	2.32
small terrestrial mammal (hare/fox)	17	0.81
Ursus maritimus (polar bear)	9	0.43
Odobenus rosmarus (walrus)	274	12.99
Erignathus barbatus (bearded seal)	493	23.38
large Pinniped (walrus/bearded seal)	68	3.22
Phoca sp. (ringed/harp seal)	1034	49.03
subfamily Phocinae (bearded/ringed/harp)	49	2.32
Rangifer tarandus (caribou)	34	1.61
order Artiodactyla (caribou/muskox)	9	0.43
large terrestrial mammal (polar bear/caribou/muskox)	17	0.81
Subtotal	2109	100.00
Unidentified	776	
Total	**2885**	

Table 5.7
Surface Bone Not Associated with a Feature, NISP Counts

Taxon	Frequency	%Identifiable
Lepus arcticus (arctic hare)	2	2.13
Dicrostonyx torquatus (collared lemming)	1	1.06
order Cetacea (whale)	2	2.13
Alopex lagopus (arctic fox)	2	2.13
Odobenus rosmarus (walrus)	21	22.34
Erignathus barbatus (bearded seal)	20	21.28
large Pinniped (walrus/bearded seal)	1	1.06
Phoca sp. (ringed/harp seal)	32	34.04
subfamily Phocinae (bearded/ringed/harp seal)	2	2.13
Rangifer tarandus (caribou)	5	5.32
order Artiodactyla (caribou/muskox)	1	1.06
large terrestrial mammal (polar bear/caribou/muskox)	5	5.32
Subtotal	94	100.00
Unidentified	80	
Total	**174**	

The faunal material from the surface of the site appears to indicate a large (90%) dependence on pinniped resources, and what would seem to indicate only slight use of terrestrial or avian species. Within the order Pinnipedia, small seals are the most abundant followed by bearded seals, then walrus. Bone which was not associated with a feature type (Table 5.7) indicates a less dramatic separation between the small and large pinnipeds. These bones were likely disturbed from their original context or were deposited at a later time period and probably do not accurately reflect the frequency of species found at the site. Low species diversity in the avian remains was a due to a poor field comparative collection. Very few Arctic fox remains were noted on the surface of the site as well.

Non-artifactual bone material which was excavated during the 1993 excavation at QjJx10 is presented in Tables 5.8 through 5.19. The 'shell' fragments were found exclusively subsurface and likely constitute part of the beach gravel matrix rather than a cultural accumulation.

Table 5.8
QjJx-10 Excavated Assemblage, NISP Counts

Taxon	Frequency	%Identifiable
Salvelinus alpinus (arctic char)	5	0.10
class Osteichthyes (unidentified fish)	10	0.20
Gavia sp. (loon)	1	0.02
subfamilyAnserinae (brant/snow goose)	72	1.41
subfamily Aythyinae (old squaw/eider)	97	1.90
family Anatidae (duck/goose)	201	3.93
Lagopus sp. (ptarmigan)	4	0.08
family Laridae (jaeger/gull/tern)	42	0.82
Nyctea scandiaca (snowy owl)	2	0.04
family Scolopacidae (sandpiper)	1	0.02
family Fringillidae (bunting/longspur)	10	0.20
class Aves (unidentified bird)	218	4.26
Lepus arcticus (arctic hare)	3	0.06
Dicrostonyx torquatus (collared lemming)	59	1.15
order Cetacea (whale)	13	0.25
Alopex lagopus (arctic fox)	883	17.27
small terrestrial mammal (hare/fox)	26	0.51
Ursus maritimus (polar bear)	10	0.20
Odobenus rosmarus (walrus)	131	2.56
Erignathus barbatus (bearded seal)	332	6.49
large Pinniped (walrus/bearded seal)	82	1.60
Phoca sp. (ringed/harp seal)	2850	55.70
subfamily Phocinae (bearded/ringed/harp seal)	25	0.49
Rangifer tarandus (caribou)	22	0.43
Ovibos moschatus (muskox)	5	0.10
order Artiodactyla (caribou/muskox)	1	0.02
large terrestrial mammal (polar bear/caribou/muskox)	12	0.23
Subtotal	5117	100.00
Shell	341	
Unidentified vertebrate	3216	
Total	**8674**	

Table 5.9
Semi-subterranean House Feature 59, NISP Counts

Taxon	Frequency	%Identifiable
subfamily Anserinae (brant/snow goose)	1	1.96
subfamily Aythyinae (old squaw/eider)	6	11.77
family Laridae (jaeger/gull/tern)	1	1.96
class Aves (unidentified bird)	2	3.92
Dicrostonyx torquatus (collared lemming)	1	1.96
Alopex lagopus (arctic fox)	4	7.84
Odobenus rosmarus (walrus)	6	11.77
Erignathus barbatus (bearded seal)	3	5.88
large Pinniped (walrus/bearded seal)	3	5.88
Phoca sp. (ringed/harp seal)	14	27.45
subfamily Phocinae (bearded/ringed/harp seal)	2	3.92
Rangifer tarandus (caribou)	7	13.73
Ovibos moschatus (muskox)	1	1.96
Subtotal	51	100.00
Shell	2	
Unidentified vertebrate	54	
Total	**107**	

Table 5.10
Semi-subterranean House Feature 74, NISP Counts

Taxon	Frequency	%Identifiable
subfamily Aythyinae (old squaw/eider)	2	2.56
family Laridae (jaeger/gull/tern)	1	1.28
Nyctea scandiaca (snowy owl)	1	1.28
class Aves (unidentified bird)	1	1.28
Dicrostonyx torquatus (collared lemming)	31	39.74
order Cetacea (whale)	5	6.41
Alopex lagopus (arctic fox)	1	1.28
Ursus maritimus (polar bear)	1	1.28
Erignathus barbatus (bearded seal)	4	5.13
large Pinniped (walrus/bearded seal)	3	3.85
Phoca sp. (ringed/harp seal)	28	35.90
Subtotal	78	100.00
Shell	4	
Unidentified vertebrate	48	
Total	**130**	

Table 5.11
Semi-subterranean House Feature 91, NISP Counts

Taxon	Frequency	%Identifiable
class Osteichtyes (unidentified fish)	1	1.96
Dicrostonyx torquatus (collared lemming)	6	11.77
order Cetacea (whale)	3	5.88
Alopex lagopus (arctic fox)	1	1.96
Phoca sp. (ringed/harp seal)	38	74.54
subfamily Phocinae (bearded/ringed/harp seal)	1	1.96
Ovibos moschatus (muskox)	1	1.96
Subtotal	51	100.00
Unidentified	43	
Total	**94**	

Table 5.12
Tent Ring Feature 30, NISP Counts

Taxon	Frequency	%Identifiable
subfamilyAnserinae (brant/snow goose)	5	4.13
subfamily Aythyinae (old squaw/eider)	10	8.26
family Anatidae (duck/goose)	51	42.15
family Laridae (jaeger/gull/tern)	3	2.48
Fringillidae (bunting/longspur)	5	4.13
class Aves (unidentified bird)	36	29.75
Dicrostonyx torquatus (collared lemming)	1	0.85
Odobenus rosmarus (walrus)	1	0.85
Erignathus barbatus (bearded seal)	1	0.85
Phoca sp. (ringed/harp seal)	5	4.13
Rangifer tarandus (caribou)	1	0.85
order Artiodactyla (caribou/muskox)	1	0.85
large terrestrial mammal (polar bear/caribou/muskox)	1	0.85
Subtotal	121	100.00
Shell	309	
Unidentified vertebrate	438	
Total	**868**	

Table 5.13a
Tent Ring / Midden Feature 79, NISP Counts

Taxon	Frequency	%Identifiable
class Osteichthyes (unidentified fish)	1	0.11
subfamily Anserinae (brant/snow goose)	2	0.22
subfamily Aythyinae (old squaw/eider)	1	0.11
family Anatidae (duck/goose)	16	1.76
family Laridae (jaeger/gull/tern)	7	0.51
family Fringillidae (bunting/longspur)	1	0.11
class Aves (unidentified bird)	6	0.66
order Cetacea (whale)	1	0.11
Alopex lagopus (arctic fox)	392	43.08
Small terrestrial mammal (hare/fox)	2	0.22
Ursus maritimus (polar bear)	2	0.22
Odobenus rosmarus (walrus)	9	0.66
Erignathus barbatus (bearded seal)	114	12.53
large Pinniped (walrus/bearded seal)	12	1.32
Phoca sp. (ringed/harp seal)	340	37.36
subfamily Phocinae (bearded/ringed/harp seal)	3	0.33
Rangifer tarandus (caribou)	1	0.11
Subtotal	910	100.00
Shell	6	
Unidentified vertebrate	455	
Total	**1371**	

Table 5.13b
Tent Ring / Midden Feature 79, "Cache Pit Depression", NISP Counts

Taxon	Frequency	%Identifiable
Alopex lagopus (arctic fox)	2	18.18
Odobenus rosmarus (walrus)	1	9.09
Erignathus barbatus (bearded seal)	5	45.45
Phoca sp. (ringed/harp seal)	3	27.27
Total	**11**	**100.00**

Table 5.14
Tent Ring/Midden (?) Feature 90, NISP Counts

Taxon	Frequency	%Identifiable
class Osteichthyes (uidentified fish)	2	2.56
Lepus arcticus (arctic hare)	2	2.56
Dicrostonyx torquatus (collared lemming)	5	6.41
Alopex lagopus (arctic fox)	1	1.28
Small terrestrial mammal (hare/fox)	4	5.13
Odobenus rosmarus (walrus)	1	1.28
Erignathus barbatus (bearded seal)	1	1.28
Phoca sp. (ringed/harp seal)	59	75.64
subfamily Phocinae (bearded/ringed/harp seal)	2	2.56
Ovibos moschatus (muskox)	1	1.28
Subtotal	78	100.00
Shell	3	
Unidentifiable	48	
Total	**129**	

Table 5.15
Midden Feature 31 (Associated with Tent Ring Feature 30), NISP Counts

Taxon	Frequency	%Identifiable
Gavia sp. (loon)	1	0.23
subfamily Anserinae (brant/snow goose)	52	12.18
subfamily Aythyinae (old squaw/eider)	59	13.82
family Anatidae (duck/goose)	117	27.40
family Laridae (jaeger/gull/tern)	8	1.87
family Fringillidae (bunting/longspur)	2	0.47
class Aves (unidentified bird)	136	31.85
order Cetacea (whale)	1	0.23
Odobenus rosmarus (walrus)	6	1.41
Erignathus barbatus (bearded seal)	7	1.64
large Pinniped (walrus/bearded seal)	4	0.94
Phoca sp. (ringed/harp seal)	28	6.56
subfamily Phocinae (bearded/ringed/harp seal)	2	0.27
Rangifer tarandus (caribou)	2	0.47
Large terrestrial mammal (polar bear/caribou/muskox)	2	0.47
Subtotal	427	100.00
Shell	2	
Unidentified vertebrate	315	
Total	**744**	

Table 5.16
Midden Feature 57 (Associated with House Feature 59), NISP Counts

Taxon	Frequency	%Identifiable
subfamily Aythyinae (old squaw/eider)	7	6.48
family Laridae (jaeger/gull/tern)	1	0.93
class Aves (unidentified bird)	5	4.63
Alopex lagopus (arctic fox)	6	5.55
Small terrestrial mammal (hare/fox)	2	1.85
Ursus maritimus (polar bear)	1	0.93
Odobenus rosmarus (walrus)	2	1.85
Erignathus barbatus (bearded seal)	6	5.55
large Pinniped (walrus/bearded seal)	3	2.77
Phoca sp. (ringed/harp seal)	67	62.04
Rangifer tarandus (caribou)	3	2.77
Large terrestrial mammal (polar bear/caribou/muskox)	5	4.63
Subtotal	108	100.00
Unidentifiable	46	
Total	**154**	

Table 5.17a
Midden Feature 70, NISP Counts

Taxon	Frequency	%Identifiable
Salvelinus alpinus (arctic char)	2	0.50
subfamily Anserinae (brant/snow goose)	2	0.50
family Anatidae (duck/goose)	5	1.26
family Laridae (jaeger/gull/tern)	1	0.25
Dicrostonyx torquatus (collared lemming)	2	0.50
order Cetacea (whale)	1	0.25
Alopex lagopus (arctic fox)	125	31.49
Odobenus rosmarus (walrus)	10	2.52
Erignathus barbatus (bearded seal)	72	18.14
large Pinniped (walrus/bearded seal)	13	3.27
Phoca sp. (ringed/harp seal)	150	37.78
subfamily Phocinae (bearded/ringed/harp seal)	8	2.02
Rangifer tarandus (caribou)	5	1.01
Ovibos moschatus (muskox)	2	0.50
Subtotal	398	100.00
Shell	3	
Unidentified vertebrate	229	
Total	**630**	

Table 5.17b
Midden Feature 70, "Cache Pit Depression", NISP Counts

Taxon	Frequency	%Identifiable
Salvelinus alpinus (arctic char)	1	4.55
class Osteicthyes (unidentified fish)	6	27.27
class Aves (unidentifed bird)	1	4.55
Odobenus rosmarus (walrus)	2	9.09
Erignathus barbatus (bearded seal)	2	9.09
large Pinniped (walrus/bearded seal)	1	4.55
Phoca sp. (ringed/harp seal)	8	36.36
Subtotal	21	100.00
Unidentified	2	
Total	**23**	

Table 5.18
Midden Feature 78, NISP Counts

Taxon	Frequency	%Identifiable
Salvelinus alpinus (arctic char)	2	0.20
subfamily Anserinae (brant/snow goose)	7	0.71
family Anatidae (duck/goose)	11	1.11
subfamily Aythyinae (old squaw/eider)	11	1.11
Lagopus sp. (ptarmigan)	2	0.20
family Laridae (jaeger/gull/tern)	11	1.11
Nyctea scandiaca (snowy owl)	1	0.10
family Fringillidae (bunting/longspur)	2	0.20
class Aves (unidentified birds)	18	1.82
Lepus arcticus (arctic hare)	1	0.10
Dicrostonyx torquatus (collared lemming)	8	0.81
order Cetacea (whale)	1	0.10
Alopex lagopus (arctic fox)	307	31.01
Small terrestrial mammal (hare/fox)	1	0.10
Odobenus rosmarus (walrus)	49	4.95
Erignathus barbatus (bearded seal)	64	6.46
large Pinniped (walrus/bearded seal)	28	2.83
Phoca sp. (ringed/harp seal)	461	46.57
subfamily Phocinae (bearded/ringed/harp seal)	1	0.10
Rangifer tarandus (caribou)	2	0.20
Large terrestrial mammal (polar bear/caribou/muskox)	2	0.20
Subtotal	990	
Shell	12	
Unidentified vertebrate	708	
Total	**1710**	

Table 5.19
Midden Feature 84, NISP Counts

Taxon	Frequency	%Identifiable
subfamily Anserinae (brant/snow goose)	3	0.16
subfamily Aythyinae (old squaw/eider)	1	0.05
family Anatidae (duck/goose)	1	0.05
Lagopus sp. (ptarmigan)	2	0.11
family Laridae (jaeger/gull/tern)	9	0.48
family Scolopacidae (sandpiper)	1	0.05
class Aves (unidentified bird)	13	0.69
Dicrostonyx torquatus (collared lemming)	5	0.28
order Cetacea (whale)	1	0.05
Alopex lagopus (arctic fox)	44	2.35
Small terrestrial mammal (hare/fox)	17	0.91
Ursus maritimus (polar bear)	6	0.32
Odobenus rosmarus (walrus)	44	2.35
Erignathus barbatus (bearded seal)	53	2.82
large Pinniped (walrus/bearded seal)	15	0.80
Phoca sp. (ringed/harp seal)	1647	88.04
subfamily Phocinae (bearded/ringed/harp seal)	6	0.32
Rangifer tarandus (caribou)	1	0.05
Large terrestrial mammal (polar bear/caribou/muskox)	2	0.11
Subtotal	1871	100.00
Unidentified	829	
Total	**2700**	

Examination of the faunal remains from *Tasiarulik* will not include an assessment of the season(s) of occupation. However, the extremely high frequency of avian remains from features 30 and 31 cannot be overlooked. Nearly 90% of the identifiable fauna from tent ring 30 (Table 5.12) and the associated midden 31 (Table 5.15) is comprised of bird bone. These features were almost certainly occupied during the summer season based on the extreme numbers of bird bone and the immature walrus mandible found in the midden. Migratory birds are typically found in this region from early June to September and it is highly likely (although meat caching could have occured) that the remains from these features were deposited at this time. The Dorset people likely took advantage of the nesting areas around the meltwater ponds. Features 30 and 31 are located at the north end of the site and were not surface examined during the 1992 season.

A heavy reliance on bird was not found to be the case in the other tent ring/ midden features. No bird bone was found in feature 90 (Table 5.14). Very few bones were actually recovered, and the overall preservation of this feature was poor. Less than 3% of the bone from feature 79 (Table 5.13a and 5.13b) was avian. Instead this feature was dominated by arctic fox. Feature 79 is thought to have been reused. The numerous large feature rocks indicate that it may have functioned originally as a tent ring or possibly a cache, and was later used as a midden deposit. The depression in feature 79 (Table 5.13b), which has been tentatively described as a "pit" or "cache", yielded quite an interesting bone accumulation. In particular the arctic fox is represented by two nearly complete skulls, and three of the five bearded seal bones were identified as complete tibia/fibula. These fused tibia/fibula were found in very close association and derive from at least two individuals. A "cache" pit with a more defined edge was also discovered in feature 70 (Table 5.17). Like the depression in feature 79 the bone was well preserved, and included several fragile fish bones and an immature bearded seal scapula with several long thin cut marks on the interior surface.

One of the most significant differences between the surface and the excavated assemblages is the dramatic increase in the relative amount of small terrestrial mammal, bird and fish remains. Figures 5.1 and 5.2 indicate the differences in species abundance graphically. Lemming bones were not included since they are likely intrusive (bones

Figure 5.1
Relative frequency of animal species from the surface faunal assemblage at QjJx-10

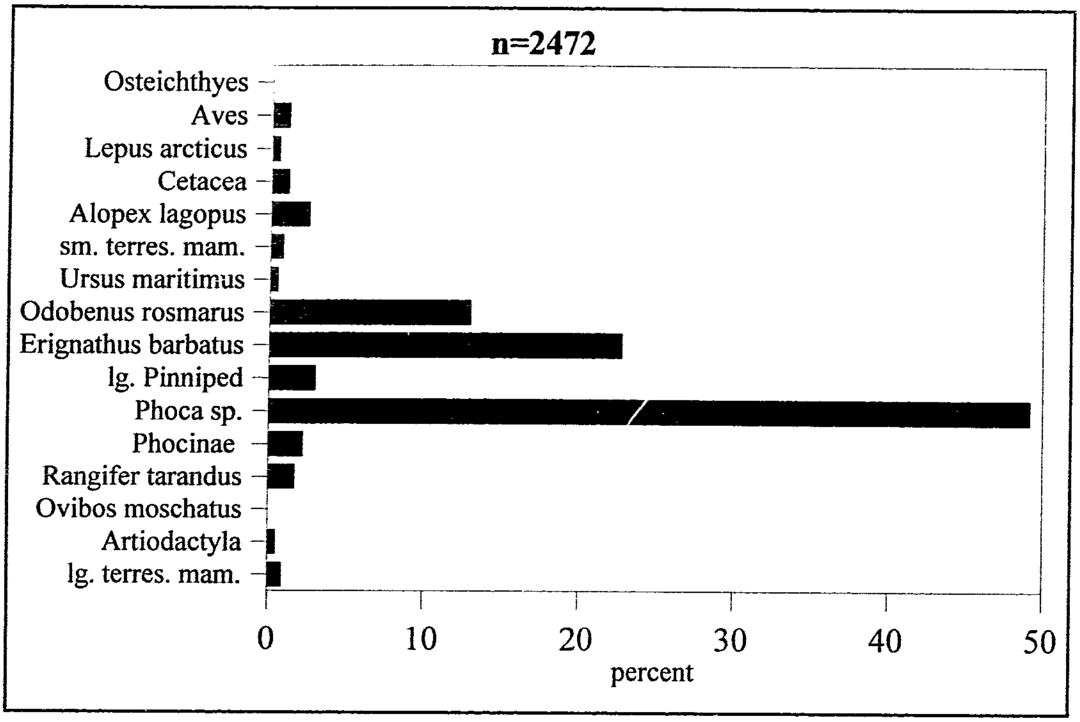
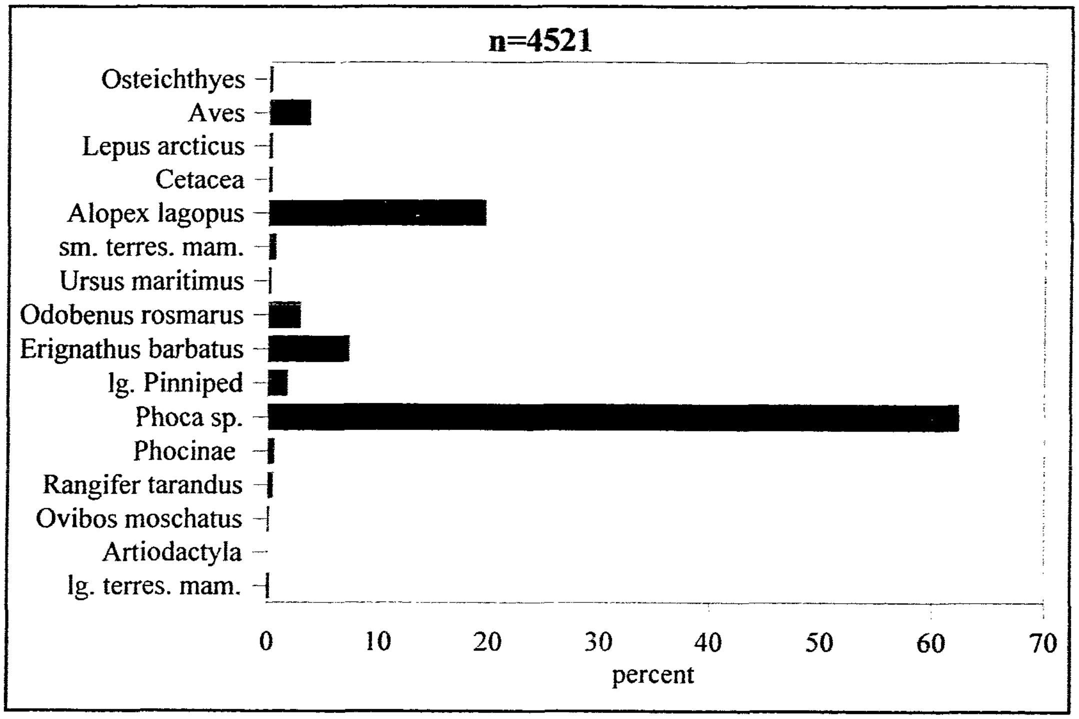


Figure 5.2
Relative frequency of animal species from the excavated faunal assemblage at QjJx-10 (not including features 30 and 31)



often found in clusters, articulated or associated) and were not utilized for food or raw material by the past occupants. Features 30 and 31 were not included in Figure 5.2 because they were not field examined during the 1992 season and because they represent an extreme seasonal assemblage atypical of the 1993 assemblage as a whole.

An increase in the frequency of smaller species in the excavated remains is particularly evident in the relative number of arctic fox from 2.5% to 19.5%. Just over 24% of the 1993 assemblage is made up of fox, hare, bird and fish. Large sea mammal remains, such as bearded seal and walrus, are not as well represented in the excavated sample, while small seals are much more abundant. These differences seem to indicate that the smaller bones tend to be more easily obscured by a thin vegetative cover. As well, the density of the small animal remains is such that they will not as easily withstand exposure and are less likley to be preserved on the surface over a long period of time.

Avifauna in the 1993 sample is much more diverse, due in large part to better preservation, but the difference can also be attributed to my access to a comparative bird collection. Fish bones are extremely delicate and it is therefore not surprising that they would not be preserved on the surface. Artiodactyl remains are better represented on the surface, which is due mainly to their size. Several muskox bones were recovered during excavation, including part of a mandible and the central portion of a horn core. Field identifications appear to have the effect of masking the rarer species due to vegetative cover or taphonomic processes. As well, the identifier is often forced to lump fragmented bones into a higher taxonomic category due to the lack of a more comprehensive comparative collection.

The proportion of pinniped remains in the 1993 assemblage more closely resembles their natural distribution in the wild. It seems more reasonable to presume that there is a bias toward larger pinnipeds in the surface assemblage rather than a shift by the Late Dorset people to more active walrus and bearded seal hunting at this site.

5.2 Body Part Frequency

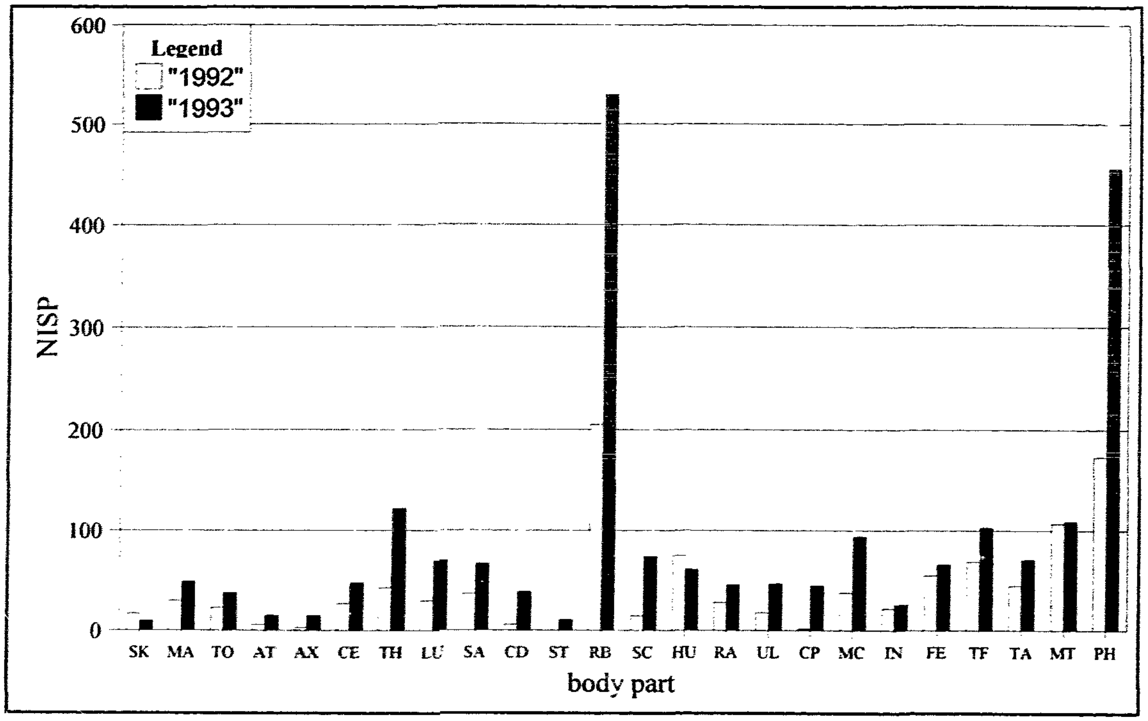
Analysis of the frequency of various body parts was undertaken in order to examine differences in the composition of the two faunal assemblages from QjJx-10. Only four of the species represented at the site could be utilized for this comparison because they were found in sufficient numbers across the site to enable an examination of the relative numbers of skeletal parts. NISP counts were used for this analysis in order to compare the raw frequencies along with an examination of the percent NISP compared with the expected values for the various species. The calculation of the percent NISP involved dividing the element frequency for a particular body part by the total NISP for that species. The total NISP for this analysis is the total number of specimens for the skeletal elements examined. It does not include loose teeth, sesamoids (including the patella), longbone shafts, non-specific vertebral fragments, or non-specific metapodial fragments. The total NISP counts for all element categories for small seals, bearded seals, walrus and Arctic fox can be found in Appendix B. These relative body part frequencies were compared with the expected frequency if an entire carcass was deposited and preserved (see Appendix C).

Small Seals

The NISP frequencies per body part are presented in Figure 5.3. This graph shows a fairly close correlation between the 1992 and 1993 assemblages in the representation of various body parts across the site taking into account the overall higher frequency of the small seal bones in the 1993 sample. Figure 5.4 expresses the body part frequencies in terms of the percent of the total NISP for the respective samples and compares these observed NISP values with expected values for seals. The graph shows a fairly good correlation between the archaeological samples and the expected frequency of skeletal parts given a complete seal. The results seem to indicate that small seals were typically brought back to the site as an entire carcass and butchered. This is consistent with ethnographic studies (Balikci 1970; Graburn 1969; Whitridge n.d., cited in Lyman et al. 1992) as well as other archaeological faunal analyses (Murray 1992) from the Dorset period. An area where primary butchery and deposition has occured should result in observed NISP values which are similar to the expected NISP (Lyman 1984).

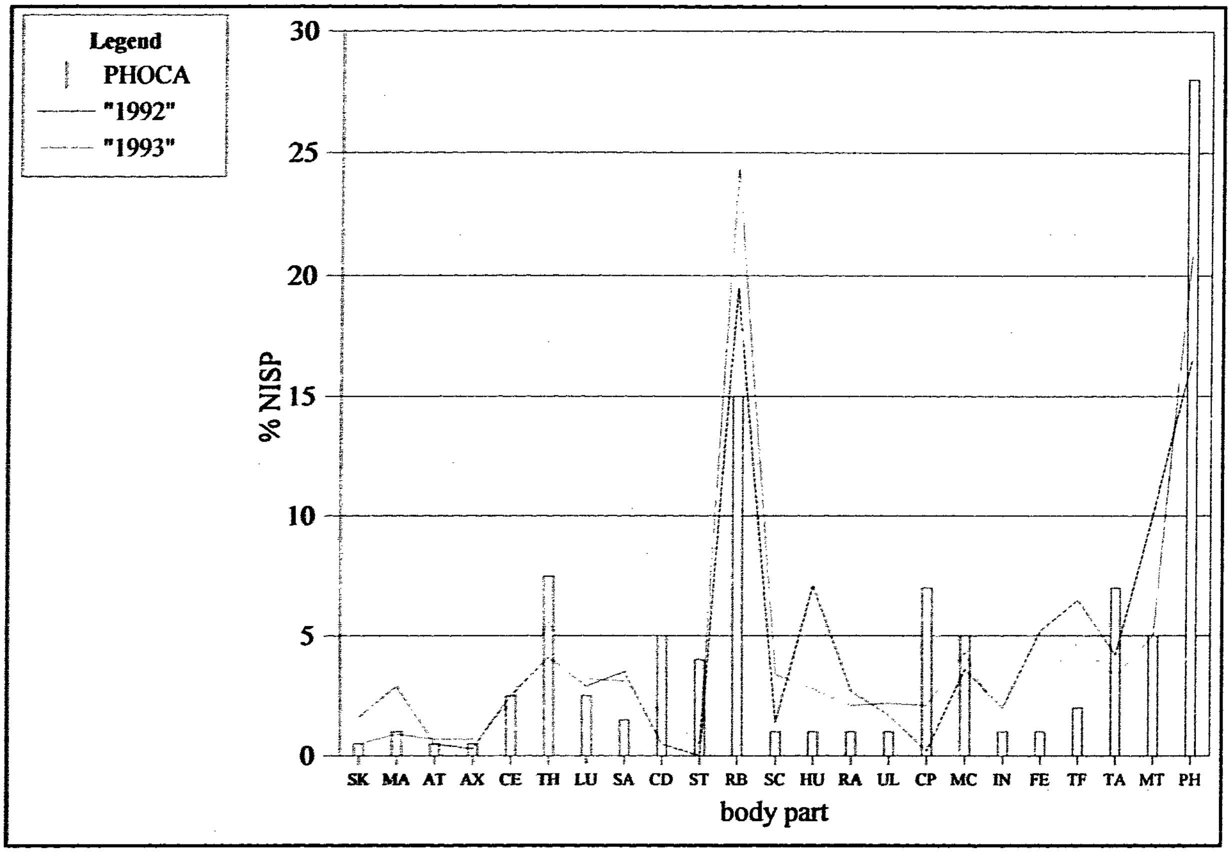
Both assemblages seem to show low frequencies of caudal vertebrae and sternal segments. The sternum is very porous and would be highly subject to density mediated destruction, such as weathering and the action of carnivores. Caudal vertebral, although dense, are small and could easily have been removed by carnivores and lost from the assemblages. This removal of small bones by carnivores may also account for the low frequency of carpals. It has also been pointed out that small seal carpals bear a striking similarity to small stones and may have overlooked (Balkwill and Rick 1994). Carpal frequencies are particularly low on the surface of the site where they would have been

Figure 5.3
Phoca sp. body part frequencies expressed as NISP



Element Codes: **SKull, MAndible, TOoth, ATlas, AXis, CErvical, THoracic, LUmbar, SAcrum, CauDal, STernum, RiB, SCapula, HUmerus, RAdius, ULna, CarPal, MetaCarpal, INnominate, FEmur, Tibia/Fibula (TIbia, FIbula), TArsal, MetaTarsal, PHalanx**

Figure 5.4
Phoca sp. body part frequencies expressed as % NISP



easily obscured by even a slight lichen covering. Humeri appear to be more abundant on the surface of the site and it may be that they are more visible due to their overall bulk and tend to protrude from the vegetation. The density of phocid seal humeri is relatively low, particularly the proximal end (Chambers 1992, cited in Lyman 1994b) which should indicate that it would be a less well preserved bone in a surface assemblage. There is no appreciable difference in the recovery of proximal ends compared with distal in the 1992 sample, indicating that the high frequency is not due to an overabundance of the distal humerus.

In order to measure the degree of fragmention of the bone assemblages I examined the proportion of whole bones to the total NISP (see Lyman 1994c), and found that the 1993 sample appeared to be less fragmented overall (47.7% of the total NISP were whole) than the 1992 assemblage (38.4% of the total NISP were whole). Figure 5.5 compares this ratio of complete bones to total NISP by body part. The pattern of destruction is relatively similar between the two samples, although vertebrae are much more highly fragmented on the surface of the site. Caudal vertebrae, carpals and tarsals are typically complete due to the compact nature of the bones, while thinner bones such as crania and ribs are highly fragmented. A similar pattern of small seal bone destruction was found in the Pre-Dorset faunal assemblages examined by McCartney (1989).

Bearded Seals

Comparison of the raw body part frequencies between the two assemblages (Figure 5.6) indicates a similar distribution. The 1992 sample is more abundant, but as

Figure 5.5
Frequency of complete skeletal elements for *Phoca sp.*

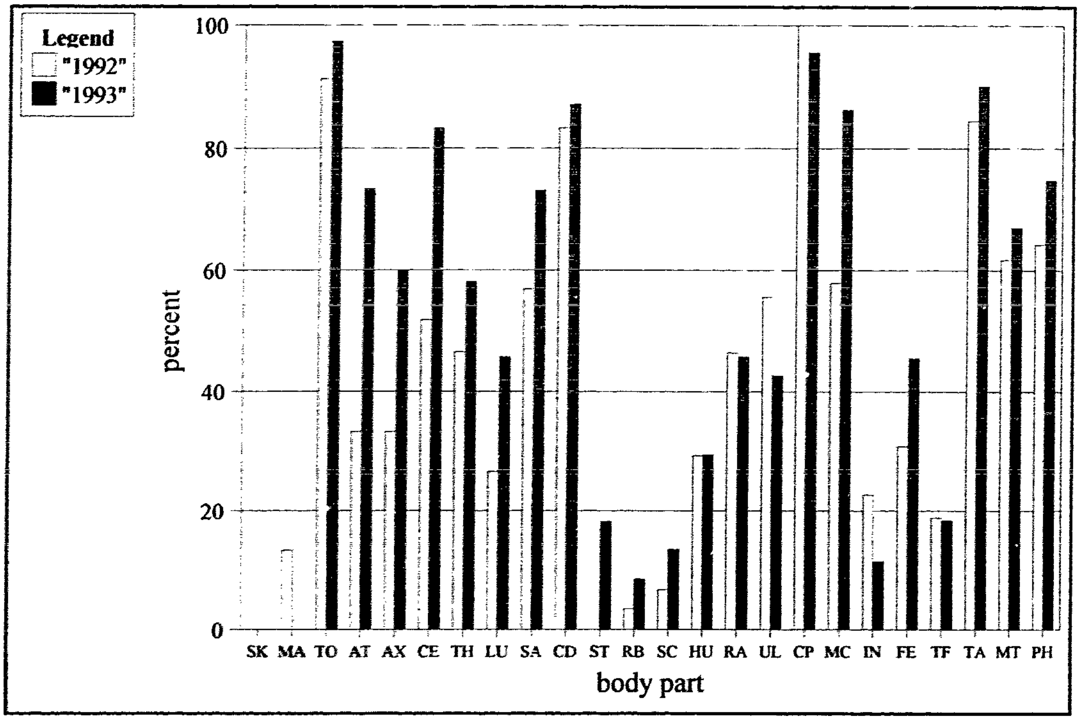
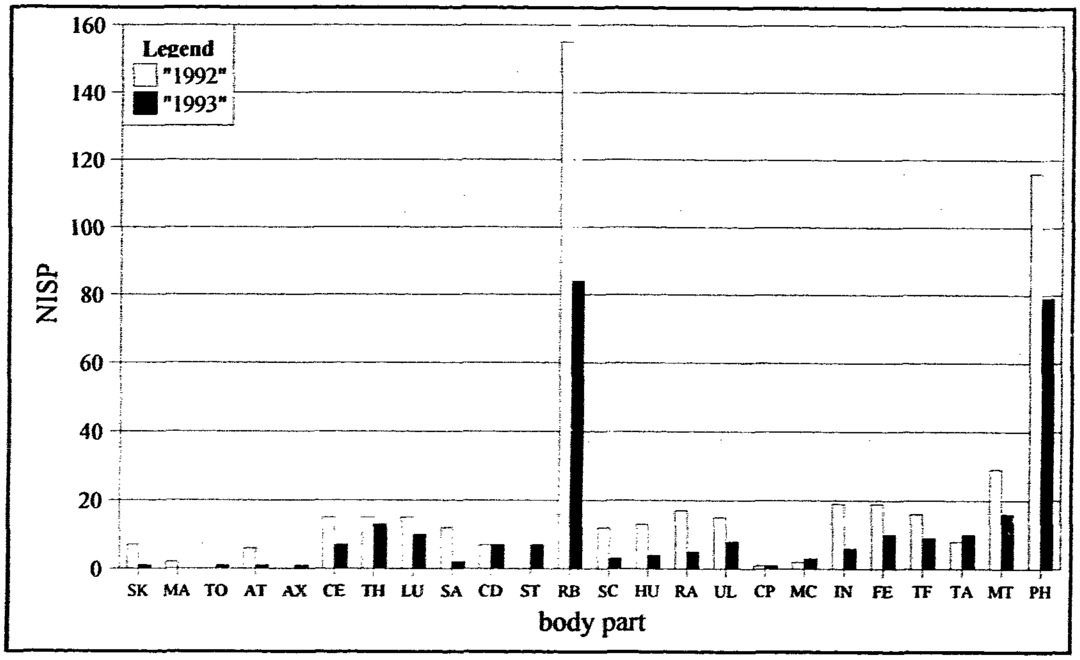


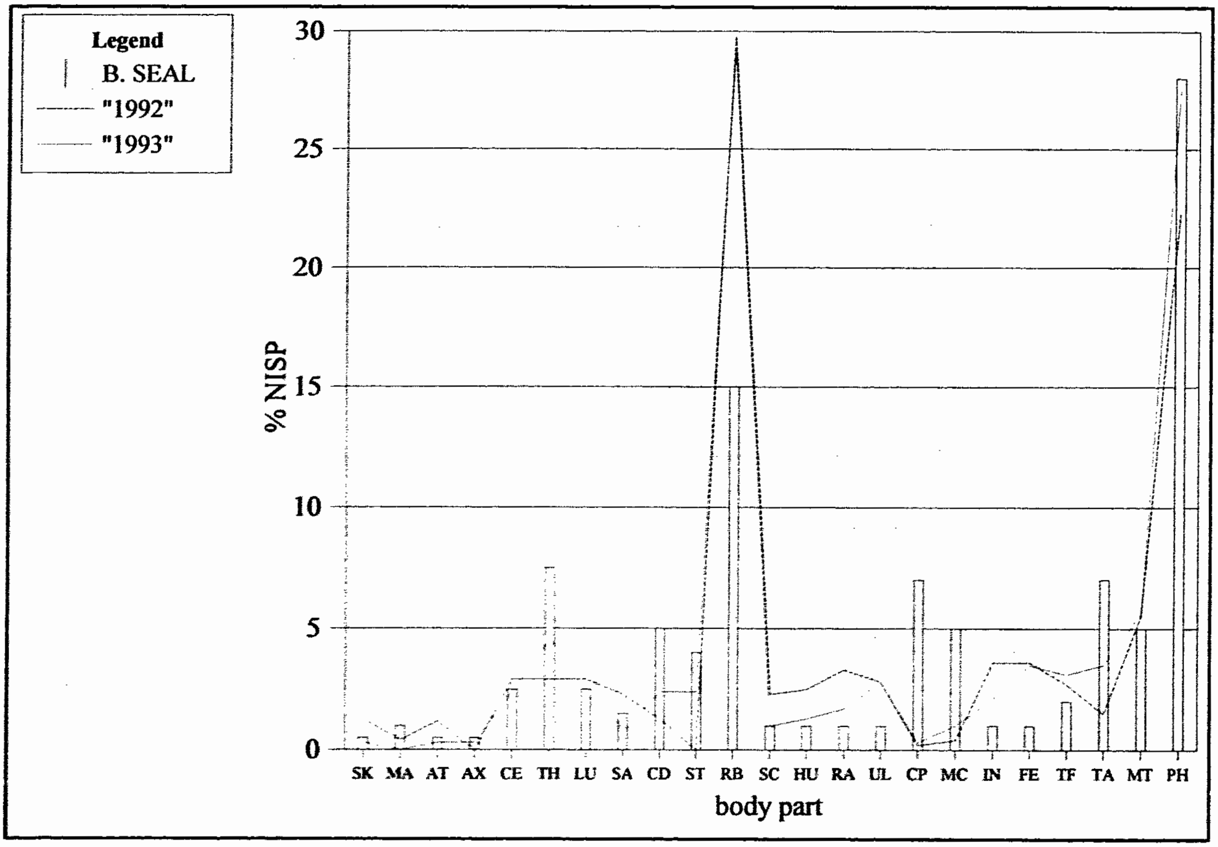
Figure 5.6
Bearded seal body part frequencies expressed as NISP



discussed previously, this is mainly the result of an increased incidence of exposure due to the size of the species. Thoracic vertebrae tend to be slightly underrepresented in both faunal assemblages. It possible that these vertebrae were separated and discarded during initial butchering of the seal (McCartney and Helmer 1989; Lyman et al. 1992). Front flippers in both assemblages are not as commonly recorded and may have been removed by carnivores. This pattern was also found in the Ruin Island (McCullough 1989) assemblage and the Phillip's Garden East remains (Balkwill n.d., cited in Balkwill and Rick 1994). McCullough (1989) refers to the use of front flippers in sealskin floats, which would have limited their deposition at the site. Metatarsals, in contrast, are not underrepresented and tarsals are found slightly less than expected. Similar to the small seals the sternum and caudals do not occur as frequently. Figure 5.7 indicates that bearded seals were not extensively butchered at the kill site and returned to *Tasiarulik* as a complete carcass since the observed and expected values are roughly similar. Ethnographic accounts suggest that the organs (particularly the heart) of these large seals may have been consumed at the kill by the hunter(s), but very little of the skeletal portion of the animal was culled prior to transport (Balikci 1970; Graburn 1969).

Over 50% of the bones from the excavated assemblage from QjJx-10 were complete (53.1% of the total NISP were whole), while the 1992 fauna seems to exhibit more fragmentation (38.5% of the total NISP were whole). Much of the surface fragmention is associated with severe vertebral and rib destruction.

Figure 5.7
Bearded seal body part frequencies expressed as % $\overline{\text{NISP}}$



Walrus

Figure 5.8 indicates the total NISP for each walrus body part is higher in the 1992 assemblage. This is likely the result of the general overabundance of larger species on the surface. Skulls in particular were highly visible on the surface of the site due their robusticity. The degree of fragmentation of walrus remains is fairly similar between the 1993 (34.7% of the total NISP are whole) and the 1992 surface remains (28.1% of the total NISP were whole).

Comparison of the observed and expected NISP (Figure 5.9) indicates that differential transport of certain body parts may have occured. Not surprisingly the walrus skull is well represented in the assemblages, which would likely have been considered the most prized element because of the valuable raw material available from the ivory tusks. The mandible, atlas and axis vertebrae more closely resemble the expected frequency. It is likely that the skull would have been removed and more preferentially transported back to the site. More numerous fragments of the skull may have arrived at the site through scavenging ivory from beached walrus remains.

The size and shape of the walrus make it more susceptible to the "schlepp effect" (Daly 1969). Modern ethnographic accounts of walrus butchering suggest that the body parts most often left at the kill were rib cages because they tended to consume a large amount of boat space, although the meat from this area was almost always removed prior to discarding the bones (Freeman 1974/75). It would be difficult to use this analogy for the Dorset occupants because it is not known whether boats were used for transport. Rib cages may possess a high volume but they are relatively low in weight so may have been

Figure 5.8
Walrus body part frequencies expressed as NISP

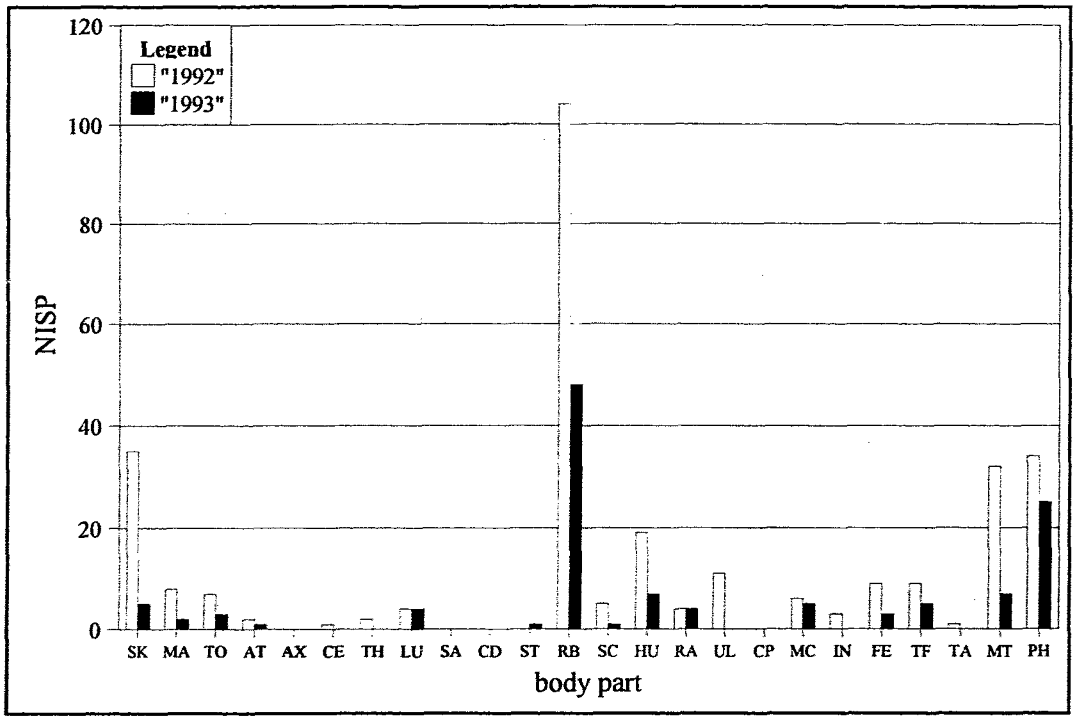
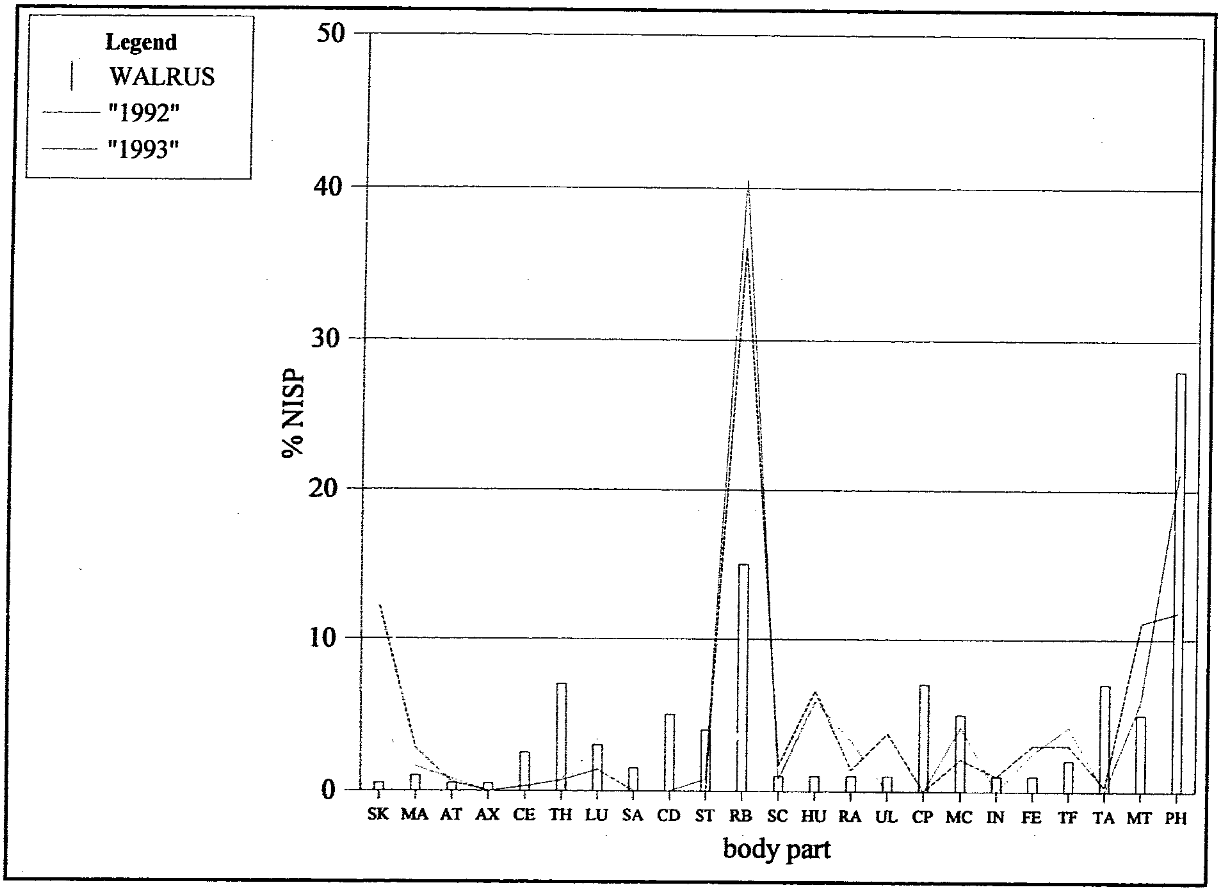


Figure 5.9
Walrus body part frequencies expressed as % NISP



transported after initial butchering. Rib fragments were found in large numbers which indicates that meat attached to ribs was typically transported to the site. The number of thoracic vertebrae are much lower than expected and may have been removed during primary butchering. Caudal vertebrae and the sternum follow the same low frequency pattern as the seals and were likely subject to same destructive processes. A broken or weathered piece of sternum would also be excedingly difficult to identify to element. Carpals and tarsals were likely removed from the site by carnivores and not discarded during butchering since metapodials tend to follow the expected pattern. The humerus may have been differentially transported to the site because of the large amount of associated meat.

Arctic Fox

Comparison of the Arctic fox remains between the surface and excavated assemblages is rather difficult because the 1992 sample is very small (N=63). Bones from small animals were rarely recorded on the surface of the site because they would have been highly subject to destruction and tended to be easily obscured by vegetation (see Figure 5.10). A slightly higher proportion of complete fox bones was also recovered during the 1993 excavation (44.4% of the total NISP are whole) than were recorded in 1992 (35.9% of the total NISP were whole), possibly indicating a higher degree of surface destruction.

The extreme peaks in the 1992 sample as seen in Figure 5.11 are the result of small sample size. Foxes were likely deposited whole at the site. Given their small size

Figure 5.10
Arctic fox body part frequencies expressed as NISP

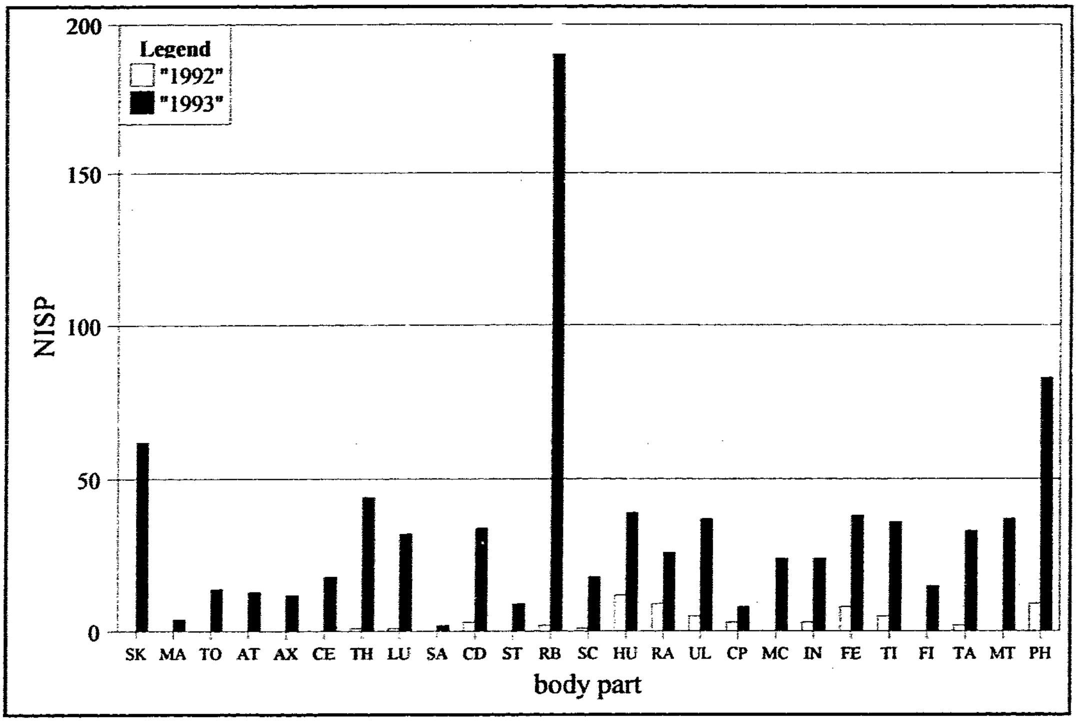
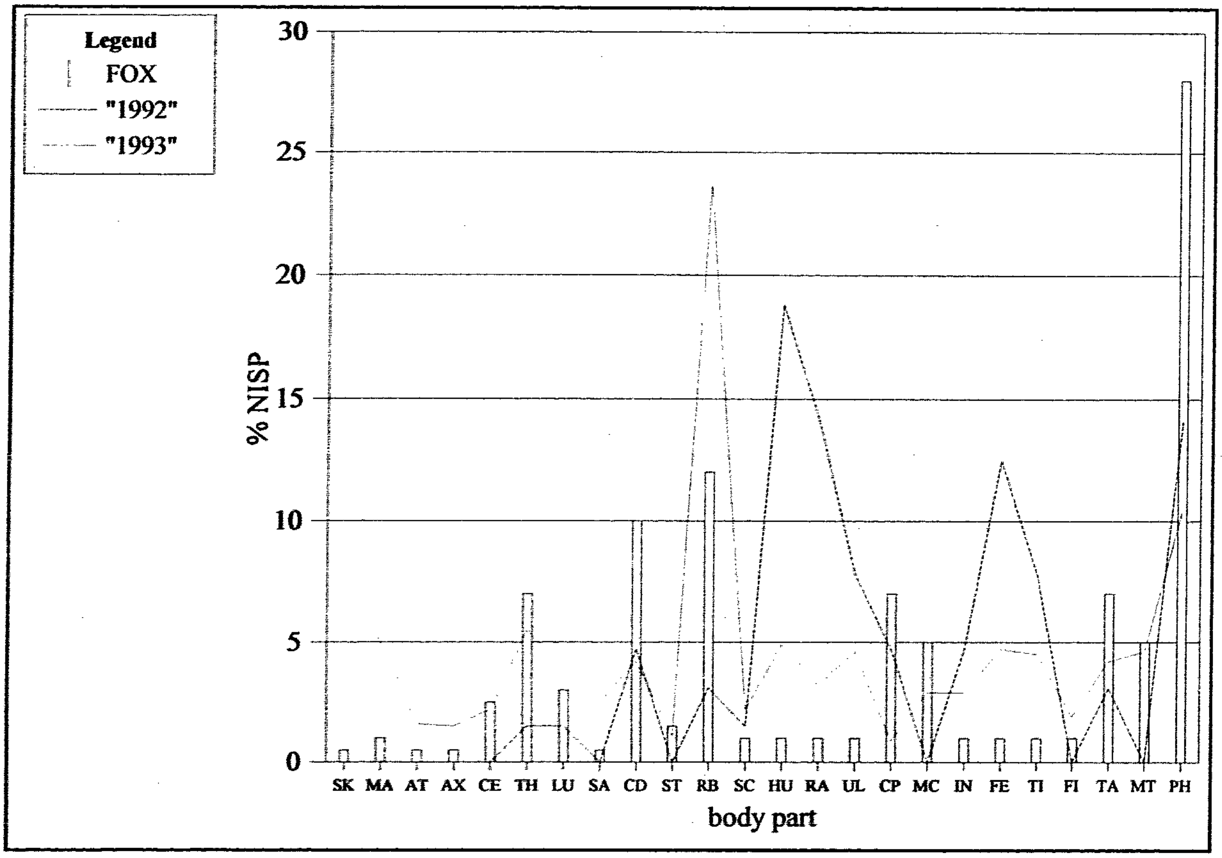


Figure 5.11
Arctic fox body part frequencies expressed as % NISP



they could easily be transported entirely. Skulls were highly fragmented which likely accounts, in part, for their high frequency in the 1993 collection. Two nearly complete skulls were found at the bottom of pit in feature 79 and may have been protected from destruction by burial in the depression. Figure 5.10 demonstrates the high frequency of phalanges in the excavated faunal assemblage, however, this graph masks the fact that first and second phalanges far outweigh the number of third phalanges recovered by 50 and 31 specimens, to 6 respectively. The general size and density of these bones are relatively similar. It is plausible that the lack of third phalanges could be the result of skinning methods which may have involved leaving the claws attached, and disposing of these bones elsewhere. Fox paws tended to be less frequently recovered during excavation. They may have been removed by other foxes during scavenging, or it is also possible that these bones were overlooked during excavation and not recovered during the screening process.

5.3 Bone Weathering and Deterioration

The study of the weathering and deterioration of bone over time has become a useful indicator of one aspect of the taphonomic record. In order to gain some insight into the taphonomic processes which have acted on the faunal remains at *Tasiarulik*, weathering stages were recorded for the non-artifactual bone material.

The faunal remains at QjJx-10 were evaluated following the work of Todd (1987), and a weathering/deterioration stage was assigned for both the upper and lower bone surfaces (Table 5.20). Compact bone deterioration stages were developed to record attributes at a Wyoming bison kill/butchery site (Todd 1987), and provided a compliment to cortical bone weathering stages developed in southern Kenya (Behrensmeyer 1978). Todd (1987) used these weathering stages to document the state of preservation, which includes both pre-burial weathering and post-depositional deterioration, rather than a measure of the length of time in solar years that a bone had remained on the surface prior to burial (Behrensmeyer 1978). Although the environments in which these stages were developed are considerably different from the High Arctic, the use of these stages did provide a basic means of evaluating the relative preservation of the faunal assemblage.

Table 5.20
Weathering/Deterioration Stages for Large (Terrestrial) Mammals

Stage	Compact Bone (Todd 1987)[a]	Cortical Bone (Behrensmeyer 1978)[b]
1	Unweathered, articular surface intact with no surface cracking	Unweathered (bone still moist)
2	Articular surfaces intact with some surface cracking	Limited surface weathering; some longitudinal cracking
3	Articular surfaces exhibit some deterioration, but more than 50% of the surface remains	Light surface flaking, deeper cracking
4	Intact articular surfaces restricted to a few "islands"; less than 50% of articular	Patches of fibrous bone with moderate flaking and cracking
5	No articular surface area remains intact	Deep cracking and extensive surface flaking
6	Bone severely deteriorated; large areas of fibrous bone exposed	Bone falling apart

[a] Stages coded for by Todd (1987). [b]Stages 1-6 modified by Todd (1987) following Behrensmeyer (1978), but 0 has been changed to stage 1, 1 to stage 2, etc. Stage 0 is reserved by Todd for modern death assemblages. Table and descriptions from Todd et al. (1987:64, Table 3.3)

Obviously problems did arise in the use of weathering stages designed for large terrestrial mammals when assessment of the predominantly marine mammal assemblage was undertaken. The appendicular and axial skeleton of a marine mammal is dense, filled with trabecular or cancellous bone. Unlike terrestrial mammals, no marrow cavity is present in the limb bones of aquatic mammals. Dense bone may have evolved as an adaptation to an aquatic environment, enabling them to remain submerged for extended periods (Wall 1983). This difference in bone structure required a modification to the weathering stages.

Sea mammal bone does not tend to develop the characteristic longitudinal cracking observed on terrestrial mammals. The bone surface of axial and long bones typically chips, flakes and peels like old paint. During the first field season, we were forced to modify the descriptions applied to the weathering stages. These modifications are as follows: Stage 1, unweathered (non-archaeological); Stage 2, very limited surface weathering with a slight crazed appearance; Stage 3, bone surface is cracked, with chipping and flaking of the outer bone layer; Stage 4, outer bone layer is peeling away and patches of cancellous bone appear; Stage 5, large areas of cancellous bone are exposed and the surface is severely cracked with extensive flaking of the bone surface; Stage 6, bone is severely deteriorated and the cortical layer is virtually absent, cancellous bone is exposed over nearly the entire surface. These descriptions emphasize the fact that weathering stages are not mutually exclusive categories, but rather they are arbitrary divisions and operate on a continuous spectrum (Behrensmeyer 1978:152-153).

Only specimens which could be identified to a taxonomic and element category were assigned a weathering/deterioration stage. Weathering stages were not ascribed to antler, horn, horn core, ivory, foetal bone, unfused surfaces, bone interior (i.e. the interior aspect of a crania), or unidentifiable specimens. Flat surfaces of axial bones, or shafts of limb bones, were used to assess the weathering stage rather than edges or areas which were physically damaged (Behrensmeyer 1978:152). Both the most severely weathered and the least weathered surfaces of the bones were recorded in order to gauge the relative stability of the bone (Todd et al. 1987).

Examination of the data indicates that the bone lying on the surface of the site appears to have remained quite stable in its position over time due to the marked difference in the weathering/deterioration stages on the opposite surfaces of various elements (Tables 5.21 and 5.22). "Had the bone been subjected to repeated movement, the weathering should have been more uniform across the entire cortical surface" (Todd et al. 1987:68). A comparison of surface bone weathering between feature types (midden MDN, semi-subterranean house SSH, tent ring TR, tent ring midden composite TR MDN, and bone not associated with a feature N/A) reveals no remarkable differences in weathering, with the exception of bone which was not directly associated with any feature.

Non-feature bones tend to be more heavily weathered on both the upper and lower surfaces. The exposed surfaces fell more often into stages 5 and 6, as opposed to the feature bone which was typically recorded as 4 or 5. Similarly, the unexposed surfaces of non-feature bone were more poorly preserved than bone which was found directly associated with a feature. It appears that even though the surface bone at QjJx-10 was not covered by vegetation, an association with plant material may have given some protection to the bone. Various explorers have commented on the differential preservation of bone material from the Canadian High Arctic, noting the lichen covered deteriorated exposed surface, and the well preserved reverse side with visible knife marks (Greely 1886, cited in Sutcliffe 1990). The area of the bone in contact with the ground may remain at the freezing point virtually year-round, while bone surfaces which are exposed and baked by the sun will typically become more desiccated (Sutcliffe 1990:168). Faunal remains not associated with a feature appear to have been much less stable in their position over time, since the weathering stages for the exposed and unexposed surfaces are relatively similar. These bones were found on bare beach gravel and should have distinct differences between the exposed and unexposed surfaces (Sutcliffe 1990), but because they have likely been moved, the underside of the bone is not as frequently found in the higher stages of preservation (i.e. Stages 2 and 3).

A marked difference can be seen in the weathering of the 1992 surface assemblage when compared with the 1993 excavated assemblage. The unexposed side of the surface bone (Table 5.22) tends to be much more poorly preserved than the excavated bones (Table 5.23 and 5.24). Bones buried within the deeper midden deposits were subject to leaching by plant material which causes deterioration of the outer table of bone. This was particularly evident in Feature 84 where the vast majority of bones were very "root etched". This destruction was not nearly as severe as surface weathering in the same midden deposit. Etching of the bone surface by various plants may not have caused the same degree of destruction to the bone as a whole, but these markings likely marred the visibility of fine cut marks or other modifications. Bone on the surface of the site exhibited more extreme differences in its minimum and maximum weathering stages than bone recovered from a subsurface context

Table 5.21
Weathering/Deterioration Stages, 1992 Surface Assemblage: Exposed Surface (Upper)

Stage	MDN		SSH		TR		TR MDN		N/A		Total	
	#	%	#	%	#	%	#	%	#	%	#	%
2	6	0.32	0	0	0	0	0	0	0	0	6	0.27
3	36	2.09	3	2.50	3	33.33	4	3.33	1	1.28	50	2.28
4	209	11.22	16	13.33	2	22.22	13	10.33	4	5.12	244	11.15
5	1133	60.85	88	73.33	4	44.44	79	65.83	47	60.25	1351	61.72
6	375	20.14	13	10.83	0	0	24	20.00	26	33.33	538	24.58
Total	1862	100.00	120	100.00	9	100.00	120	100.00	78	100.00	2189	100.00

Table 5.22
Weathering/Deterioration Stages, 1992 Surface Assemblage: Unexposed Surface (Lower)

Stage	MDN		SSH		TR		TR MDN		N/A		Total	
	#	%	#	%	#	%	#	%	#	%	#	%
2	155	8.24	7	5.88	0	0	4	3.25	2	2.50	95	4.29
3	388	20.90	33	27.73	3	33.33	35	28.45	4	5.00	463	20.90
4	840	44.63	44	36.97	4	44.44	53	43.10	32	40.00	974	43.97
5	499	26.51	30	25.21	0	0	26	21.14	36	45.00	595	26.86
6	73	3.88	5	4.20	2	22.22	5	4.07	6	7.50	90	4.06
Total	1882	100.00	119	100.00	9	100.00	123	100.00	80	100.00	2215	100.00

Table 5.23
Weathering/Deterioration Stages, 1993 Excavated Assemblage: Upper

Stage	MDN		SSH		TR		TR MDN		Total		Surface [a]	
	#	%	#	%	#	%	#	%	#	%	#	%
2	680	24.86	44	35.48	34	49.30	293	35.69	1051	28.03	5	2.12
3	1279	46.76	40	32.26	23	33.33	389	47.38	1731	46.17	24	10.17
4	523	19.12	26	20.96	6	8.69	98	11.94	653	17.42	57	24.15
5	211	7.17	9	7.26	4	5.80	30	3.65	254	6.78	94	39.83
6	42	1.54	5	4.03	2	2.90	11	1.34	60	1.60	56	23.73
Total	2735	100.00	124	100.00	69	100.00	821	100.00	3749	100.00	236	100.00

[a] The surface bone from the excavated assemblage (all features) is presented separately to avoid overlap with the 1992 field examination.

Table 5.24
Weathering/Deterioration Stages, 1993 Excavated Assemblage: Lower

Stage	MDN		SSH		TR		TR MDN		Total		Surface[a]	
	#	%	#	%	#	%	#	%	#	%	#	%
2	1175	43.99	49	40.16	36	51.43	443	55.38	1703	46.49	37	16.15
3	1237	46.31	42	34.43	28	40.00	318	39.75	1625	44.36	95	41.48
4	227	8.50	26	21.31	5	7.14	37	4.62	295	8.05	70	30.56
5	30	1.12	4	3.28	1	1.43	2	0.25	37	1.01	23	10.04
6	2	0.07	1	0.82	0	0	0	0	3	0.08	4	1.75
Total	2671	100.00	122	100.00	70	100.00	800	100.00	3663	100.00	229	100.00

[a] The surface bone from the excavated assemblage (all features) is presented separately to avoid overlap with the 1992 field examination.

Weathering studies can provide important information on the taphonomy of a site. However, as pointed out by Lyman and Fox weathering stages are not necessarily a reflection of the *rate* at which bone passes from one stage to the next because "they are not structured to do so...[since] many taphonomic factors are involved in the formation of an assemblage of weathered bone" (1989:293). The use of weathering stages at this High Arctic site was to provide means of examining the relative state of bone preservation in various contexts. A study by Sutcliffe (1990) on the rate of decay in the Canadian High Arctic reveals that there is no accurate means of gauging how long bone material has remained on the surface. As well, microenvironmental conditions such as variable vegetation cover can drastically alter the appearance of bone only a short distance apart (Behrensmeyer 1978, 1991; Lyman and Fox 1989). Bone at *Tasiarulik* could be found in a variety of microenvironmental zones, such as on dry beach gravel, covered by a layer of moss, submerged within a freshwater pond, embedded in the permafrost, or covered by a snow bank. It is these "localized conditions" which govern the rate of bone weathering rather than the general characteristic of the environment (Behrensmeyer 1978).

Table 5.25
Weathering Stage Frequencies for Small Seals, Bearded Seals and Walrus

Taxa	Weathering Stage (% per stage)				
	2	3	4	5	6
1992 (upper)					
Phoca sp.	0.2	2.1	9.5	65.8	22.4
Bearded Seal	0	0.4	7.2	60.5	32.0
Walrus	0	0.4	3.2	64.8	31.7
1992 (lower)					
Phoca sp.	5.2	21.7	45.3	24.4	3.4
Bearded Seal	1.9	17.5	44.7	30.7	5.2
Walrus	1.8	12.5	45.6	35.6	4.6
1993 (upper)					
Phoca sp.	19.7	46.6	20.8	9.9	3.0
Bearded Seal	10.3	32.3	29.2	22.3	5.8
Walrus	6.6	29.8	36.4	21.5	5.8
1993 (lower)					
Phoca sp.	41.8	46.2	10.1	1.7	0.1
Bearded Seal	34.3	44.5	17.7	3.2	0.4
Walrus	18.1	55.2	22.2	4.3	0

Differences in the construction of the various taxa will also influence how a bone weathers (Gifford 1981). An examination of weathering stages for the three main sea mammals represented at QjJx-10 (Table 5.25) seems to indicate that small seal remains are not weathered to the same degree as the larger seals and walrus. These taxa were chosen for examination because they are represented in sufficient numbers in both assemblages and their bone composition is similar. It is possible that the size of the bone correlates to how long it will remain exposed before it will become covered/buried by vegetation. As discussed in the previous section there is an over abundance of walrus and bearded seal bones in the surface assemblage owing to the fact that they tend to protrude from the vegetated features. Therefore, these larger marine mammals will likely remain exposed to weathering processes for a longer period than the smaller seals which will tend to become covered over relatively quickly.

5.4 Gnawing Marks

The frequency of chewed bones in the assemblages at *Tasiarulik* take into account modification which derives from several possible sources; rodent, fox, wolf/dog, caribou and polar bear. Only those specimens which displayed clearly defined tooth marks were considered to have been gnawed. Bones which had ragged edges or marks which were very poorly defined were not included in the "gnawed" category. There was no clear evidence of either caribou or wolf/dog chewing of the bone material. Polar bear gnawing was recorded on only five bones, exclusively from the 1992 surface examination. These canine punctate bite marks were limited to large marine species (2 cetacean, 1 large marine mammal, 2 walrus). Polar bears are rarely found on land, but could have easily taken advantage of midden debris accumulating in the vicinity of the human occupation. Bone from smaller species would likely have been consumed entirely, or ignored in favour of the larger meatier animals. Bones with exclusively rodent marks comprised only 12% (52 bones) of the gnawed bones recorded in the 1992 examination, while rodent gnawing in association with small carnivore chewing made up 5% (23 bones). Only 2% (3 bones) of the gnawed material from the 1993 excavation exhibited any rodent marks, and these were found on bones which were also fox gnawed.

Typical carnivore behaviour involves destruction from the end of the bone inward in order to access the marrow (Gifford 1981). However, most studies of carnivore gnawing have focused on larger carnivores, such as dogs , wolves or hyaenas (e.g. Binford 1981). Carnivore modification of the QjJx-10 assemblage appears to have been almost exclusively the result of Arctic foxes. These animals are about the size of a small terrier, and the size of their jaws precludes them from crushing larger bone material. A study of faunal remains from sites in South Africa (Cruz-Uribe and Klein 1994) revealed a higher frequency of chewing on seal bones over bovid bones. They believe that these differences stem from the structure of marine mammal bone which offers "digestible organic matter [that] tends to be perfused throughout seal bones rather than concentrated in a discrete marrow cavity" (Cruz-Uribe and Klein 1994:40). Due to this difference in composition, carnivore gnawing should not tend to be restricted to the bone ends.

The results of the "chewing" analysis, presented in Table 5.26, show that nearly 17% of bones, identifiable to a taxon and element category, were modified by gnaw marks in the surface assemblages. In contrast, just over 2% of the subsurface bone exhibit visible chew marks. This difference is quite dramatic and seems to indicate that foxes may return to scavenge old bone long after a vegetative layer has covered up much of the assemblage. During the 1993 field season, Arctic foxes were observed dragging around and gnawing on the front limb of a small seal which was completely skeletonized, bleached white and held together by dried tendons. They managed to remove most of the phalanges, and continuously redeposited the limb in various locations around our camp. It is possible that small bone elements could easily have been removed from QjJx-10 or redeposited well after the Dorset occupants abandoned the site. This rather high activity by foxes on surface collections may have also contributed to a bias toward the preservation of larger species on the surface, since they could not as easily have been consumed or transported away from the site. It is likely that the Dorset people could easily trap the foxes for their pelts and exhaust the island population quickly over a winter season. It may have taken a considerable length of time for the foxes to replace themselves on the island and begin to scavenge the debris left by the occupants, which by this point may have become covered, at least partially, by vegetation.

The Arctic fox, as discussed in Chapter 2, will scavenge anything, including other members of their own species. All of the recognizable chew marks on fox bones were produced by other foxes. Scoring and punctate marks were primarily limited to the shaft of the bones (76% of carnivore chewed fox bones), although marks were also found on canine teeth. Marks on the teeth were likely the result of consuming the crania for brain and nasal tissue. The mid shaft region was also the area which showed the vast majority of recognizable carnivore gnaw marks on the seals (73% of small and bearded seal bones), walrus (70%), as well as artiodactyl (60%) remains. The remaining marks were concentrated on the ends of the bone, however, nearly 30% of the remaining marks on the ungulate remains were found on antler or horn core pieces. In areas where both seals and ungulates were exploited it has been documented that seal remains tend to be much more complete and exhibit a higher frequency of chewing (Cruz-Uribe and Klein 1994; Lyman 1991, 1992). However, the frequency of caribou and muskox remains at QjJx-10 is so slight that comparisons of this sort would be highly speculative.

Cruz-Uribe and Klein (1994) postulate that chew marks will be much less conspicuous when bone preservation is poor. However, it appears that the higher incidence of chew marks at QjJx-10 is correlated with the poorly preserved bones. If poor preservation affects the frequency/visibility of chew marks, it is likely that the incidence of gnawing on the surface assemblage at QjJx-10 was even higher than recorded archaeologically.

Table 5.26
QjJx-10 Frequency of chewed bones in the 1992 and 1993 bone assemblages

Taxon	1992			1993					
	surf.	chewed	%	surf.	chewed	%	sub.	chewed	%
Salvelinus alpinus (arctic char)	0	0	0	0	0	0	5	0	0
class Osteichthyes (uniden. fish)	0	0	0	0	0	0	10	0	0
Gavia sp. (loon)	0	0	0	0	0	0	1	0	0
subfamily Anserinae (brant/goose)	0	0	0	3	0	0	69	0	0
subfamily Aythyinae (duck)	0	0	0	3	0	0	94	0	0
family Anatidae (duck/goose)	20	3	15.0	7	0	0	194	1	0.5
Lagopus sp. (ptarmigan)	0	0	0	0	0	0	4	0	0
family Laridae (jaeger/gull/tern)	0	0	0	0	0	0	42	0	0
Nyctea scandia (snowy owl)	0	0	0	0	0	0	0	0	0
family Scolopacidae (sandpiper)	0	0	0	0	0	0	1	0	0
family Fringillidae (bunting/longspur)	0	0	0	0	0	0	10	0	0
class Aves (unidentified bird)	8	0	0	0	0	0	128	0	0
Lepus arcticus (arctic hare)	13	5	38.5	1	0	0	2	0	0
Dicrostonyx torquatus (lemming)	10	0	0	0	0	0	59	0	0
order Cetacea (whale)	27	3	11.1	4	2	50.0	9	0	0
Alopex lagopus (arctic fox)	63	23	36.5	24	5	20.8	859	19	2.2
Sm. terrestrial mammal (hare/fox)	20	1	5.0	0	0	0	26	0	0
Ursus maritimus (polar bear)	13	5	38.5	0	0	0	10	1	10.0
Odobenus rosmarus (walrus)	321	85	26.5	23	6	26.1	108	18	16.7
Erignathus barbatus (bearded seal)	564	136	24.1	63	18	28.6	269	17	6.3
Phoca sp. (ringed/harp seal)	1216	103	8.5	111	12	10.8	2739	45	1.6
large Pinniped (walrus/bearded seal)	75	9	12.0	16	0	0	82	1	1.2
subfamily Phocinae (seals)	54	7	13.0	1	0	0	24	3	12.5
Rangifer tarandus (caribou)	41	20	48.8	3	1	33.3	19	5	26.3
Ovibos moschatus (muskox)	0	0	0	0	0	0	5	1	20.0
order Artiodactyla (caribou/muskox)	13	4	30.8	1	0	0	0	0	0
Large terrestrial mammal	24	11	45.8	2	0	0	10	1	10.0
Subtotal	2482	415	16.7	262	44	16.8	4855	113	2.3
Unidentified	984	10	1.0	117	0	0	3099	1	0.03
Total	**3466**	**425**	**12.3**	**379**	**44**	**11.6**	**7954**	**114**	**1.4**

5.5.1 Cultural Modification: Cut Marks

All of the bones from the site of QjJx-10 were examined for the presence of cut marks. Several attributes were recorded for each bone which exhibited cut marks. The type of mark was indicated as either a fine, medium or heavy striae, a chopping mark, or an impact scar. The number of cut marks, along with the location of the cut marks on the specimen were described.

Numerous difficulties can arise in the attempt to reconstruct patterns of butchery from the examination of cut marks on an archaeological assemblage. Macroscopically visible cut marks on bones associated with a stone tool technology are typically rare (Lyman 1987). This may be due to several factors, such as the skill of the butcher, the conservation of stone tools (avoiding frequent contact with the bone), and the possibility that contact may have been so slight as to leave only microscopically visible marks (Cruz-Uribe and Klien 1994:42). It has also been suggested by Kooyman (1984) that the infrequent occurrence of cut marks on a prehistoric assemblage may be a poor indicator of a general butchering strategy, more likely indicating the use of an occasional alternative pattern.

Only macroscopically visible cut marks were recorded during this anlaysis. Since very few cut marks were actually recorded on either bone assemblage from QjJx-10, I was able to check if the marked bones from the 1992 examination were collected during the following season's excavation. Of the 30 specimens with visible cut marks in the 1993 assemblage, 8 were collected from the surface of the excavation units and were also recorded in the previous season.

It appears that the incidence of cut marks is higher on the surface of the site rather than the subsurface (Table 5.27). Surface cut marks were typically recorded on the underside of the bone which was much less weathered than the exposed side. Subsurface bones tended to be better preserved overall than the unexposed side of the surface bones, which should indicate that the bone from the excavated assemblage would have a higher incidence of macroscopically visible cut marks. The most likely explanation is the overabundance of large bones on the surface of the site. Walrus and bearded seal bones display a much higher frequency of cut bone compared with the small seals in both the surface and subsurface assemblages. Presumably the large marine mammals underwent more extensive reduction prior to their transport back to camp. Cut marks are much heavier and thicker on the large sea mammal bones presumably because greater effort would have been needed to remove the meat and cut the large muscles. Lyman (1991, 1992) also noted a significantly higher incidence of cut marks on large Steller's sea lions on the Oregon coast compared with harbour seals. Larger bones will protrude from the archaeological features and tend to be recorded in a surface evaluation more frequently than smaller bones. They are also less likely to be removed by carnivores and will remain identifiable even when highly weathered. Thus, this higher incidence of cut marks on the surface is more likely the result of visibility of large bones rather than any other factor.

The vast majority of the cut bones were found on pinniped remains, closely reflecting the overall faunal assemblage. In the surface assemblage nearly 90% of the identifiable bones were pinniped, and 81% of cut bones were from the order Pinnipedia. The excavated assemblage was comprised of 67% pinniped bones, and 76% of cut bones were found on this order. Very few artiodactyl remains were recovered in either assmblage although a relatively high proportion of these bones were cut when compared with the sea mammals. All of the worked bone or bone artifacts (typically antler) were analysed separately (see LeMoine in Helmer et al. 1993).

Table 5.27
QjJx-10 Frequency of cut bone in the 1992 and 1993 bone assemblages

Taxon		1992			1993	
	Total bones	Total cut	Percent cut	Total bones	Total cut	Percent cut
Salvelinus alpinus (arctic char)	0	0	0	5	0	0
class Osteichthyes (unidentified fish)	0	0	0	10	0	0
Gavia sp. (loon)	0	0	0	1	0	0
subfamilyAnserinae (brant/snow goose)	0	0	0	72	0	0
subfamily Aythyinae (old squaw/eider)	0	0	0	97	0	0
family Anatidae (duck/goose)	20	0	0	201	0	0
Lagopus sp. (ptarmigan)	0	0	0	4	0	0
family Laridae (jaeger/gull/tern)	0	0	0	42	0	0
Nyctea scandiaca (snowy owl)	0	0	0	2	0	0
family Scolopacidae (sandpiper)	0	0	0	1	0	0
family Fringillidae (bunting/longspur)	0	0	0	10	0	0
class Aves (unidentified bird)	8	0	0	218	0	0
Lepus arcticus (arctic hare)	13	1	7.7	3	0	0
Dicrostonyx torquatus (lemming)	10	0	0	59	0	0
order Cetacea (whale)	27	0	0	13	0	0
Alopex lagopus (arctic fox)	63	4	6.3	883	3(2)*	0.7
small terrestrial mammal (hare/fox)	20	0	0	26	0	0
Ursus maritimus (polar bear)	13	0	0	10	0	0
Odobenus rosmarus (walrus)	321	21	6.5	131	2	1.5
Erignathus barbatus (bearded seal)	564	19	3.3	332	5(5)	3.0
large Pinniped (walrus/bearded seal)	75	1	1.3	82	1	1.1
Phoca sp. (ringed/harp seal)	1216	26	2.1	2850	9(1)	0.4
subfamily Phocinae (seals)	54	2	3.7	25	0	0
Rangifer tarandus (caribou)	41	7	17.1	22	1	4.5
Ovibos moschatus (muskox)	0	0	0	5	0	0
order Artiodactyla (caribou/muskox)	24	0	0	1	0	0
large terrestrial mammal	24	4	0	12	0	0
Total	**2482**	**85**	**3.4**	**5117**	**22(8)**	**0.5**

* The bracketed numbers indicate the number of bones which were recovered on the surface of the excavated assemblage and were also recorded during the 1992 surface evaluation.

It has been observed that cut marks were more frequent on bone assemblages where chewing was absent or rare (Cruz-Uribe and Klein 1994). However, it appears that the high frequency of chewing on the surface assemblage has not seriously effected the visibilty of cut marks. Arctic foxes are quite small and the damage to bones which they did not transport away from the site was likely not significant enough to obscure the cuts.

Table 5.28
Number of cut small seal, bearded seal, and walrus bones per skeletal part

	Sm. Seal				Lg. Seal				Walrus			
	1992		1993		1992		1993		1992		1993	
	Total bones	Total cut	Total bones	Total cut	Total bones	Total cut	Total bones	Total cut	Total bones	Total cut	Total bone	Total cut
skull	17	0	10	0	7	0	1	0	35	2	5	0
mandible	30	0	49	0	2	0	0	0	8	0	2	0
cervical	36	0	78	0	21	1	9	0	3	0	1	0
thoracic	43	0	122	0	15	0	13	0	2	0	0	0
lumbar	30	0	70	0	15	0	10	0	4	0	4	0
sacrum	37	0	67	0	12	0	2	0	0	0	0	0
caudal	6	0	39	0	7	0	7	0	0	0	0	0
sternum	0	0	11	0	0	0	7	0	0	0	1	0
rib	20	2	529	1	155	7	84	1(3)*	104	11	48	0
scapula	15	3	74	2	12	0	3	1	5	0	1	0
humerus	25	7	61	3(1)	13	0	4	1	19	0	7	0
raduis	28	1	46	0	17	2	5	0	4	1	4	0
ulna	18	0	47	1	15	2	8	0	11	1	0	0
carpal	2	0	45	0	1	0	1	0	0	0	0	0
metacarpal	38	0	94	0	2	0	2	1	0	0	0	0
innominate	22	0	26	1	19	0	6	0	3	1	0	0
femur	55	6	66	1	19	2	10	1	9	2	3	1
tib. + fib.	69	3	103	0	16	1	9	1	9	0	5	0
tarsal	45	0	71	0	8	1	10	(1)	1	0	0	0
metatarsal	107	2	109	0	29	2	16	(1)	32	0	7	0
phalanx	173	1	455	0	116	1	79	0	34	1	25	1
metapodial	13	0	11	0	8	0	3	0	18	1	4	0
baculum	2	1	1	0	1	0	0	0	1	1	0	0
Total	**829**	**26**	**2184**	**9(1)**	**510**	**19**	**280**	**5(5)**	**302**	**21**	**117**	**3**

* The bracketed bones indicate the number which were surface collected from the 1993 excavation units, and were also recorded in 1992.

Table 5.29
Number of cut caribou and fox bones per skeletal part

	Caribou				Fox			
	1992		1993		1992		1993	
	Total bones	Total cut	Total bones	Total cut	Total bones	Total cut	Total bones	Total cut
antler	5	0	6	0	0	0	0	0
skull	0	0	0	0	0	0	62	1
mandible	1	0	0	0	0	0	4	0
cervical	0	0	0	0	0	0	43	0
thoracic	1	0	0	0	1	0	44	0
lumbar	0	0	0	0	1	0	32	0
sacrum	0	0	0	0	0	0	2	0
caudal	0	0	0	0	3	1	34	0
sternum	0	0	0	0	0	0	9	0
rib	11	1	3	0	2	0	190	0
scapula	0	0	1	0	1	0	18	0
humerus	7	3	1	0	12	0	39	0
radius	0	0	0	0	9	1	26	0(1)*
ulna	0	0	0	0	5	0	37	0
carpal	0	0	1	0	3	0	8	0
metacarpal	0	0	1	1	0	0	24	0
innominate	1	1	5	0	3	0	24	0
femur	2	0	0	0	8	1	38	0
tibia	3	1	1	0	5	1	36	2(1)
fibula	0	0	0	0	0	0	15	0
tarsal	0	0	0	0	2	0	33	0
metatarsal	0	0	2	0	0	0	37	0
phalanx	1	0	1	0	9	0	83	0
long bone (ind.)	9	1	0	0	0	0	0	0
Total	**41**	**7**	**22**	**1**	**64**	**4**	**838**	**3(2)**

* The bracketed bones indicate the number which were surface collected from the 1993 excavation units, and were also recorded in 1992.

The majority of cut marks were found along the shaft of the long bones or ribs, which seems to indicate that the occupants of the site made contact with the bone surface while scraping along the shaft to remove the meat. Cuts on small seals were often found on the large limb bones such as the humerus, femur and tibia/fibula. The pectoral joint of pinnipeds (scapula and humerus) is heavily muscled and may account for the higher incidence of cut marks. Lyman (1991, 1992) following the work of Binford (1978,

1981) classified butchery marks on pinniped remains from Oregon into the general categories of dismemberment (disarticulation), filleting (removal of meat from bones), and skinning. He found that filleting marks outnumbered disarticulation marks on harbour seal bones, while the reverse occured on the sea lion bones. Table 5.30 shows the number of cutting incidents for each butchery category. The bones which were recorded during both the 1992 and 1993 analyses were only included once. Some bones displayed several types of marks on one specimen and each of these occurances were included. A bone could have multiple striae at one instance of force, but for this analysis a cluster of striae is counted as *one* instance (Lyman 1987).

It appears that for all the pinniped specimens in this sample filleting outweighs dismemberment, which seems to indicate a focus on the removal of meat rather than a focus on the dismemberment of the animal prior to transport. Skinning marks occur infrequently since very few bones in seals and walruses are close to the skin's surface. Typically skinning marks should only be expected on cranial and flipper elements. The sample size available is too small to enable a discussion of a general pattern of butchering.

Multiple striae were found on the parietal region of a fox cranium (Table 5.31). The cluster of marks were angled upward toward the top of the cranium and represent cuts made when the skin was scraped off the skull near the ear. The other skinning mark was found on a caudal vertebrae, however, this may have also been the result of removing the tail from the fox. Most of the remaining marks were found on the shaft of long bones and likely resulted from meat scraping, but it is also possible that some of the cuts may resulted from skinning since the distal shaft of the tibia and radius can be quite close to the skins surface. The extremely small sample size and the fact that a fox, once skinned, could easily be processed without any cuts leads one to suspect that these marks occured as an occasional variant in the typical butchery pattern (see Kooyman 1984).

Table 5.30
Frequencies of butchery-mark classes by skeletal portion for pinnipeds (1992 and 1993 combined)

	Dismemberment			Filleting			Skinning		
	sm. seal	lg. seal	walrus	sm seal	lg. seal	walrus	sm. seal	lg. seal	walrus
Cranial	0	0	1	0	0	0	0	0	2
Post-cranial axial	5	3	2	5	9	13	0	0	0
Forelimb	2	2	0	11	5	1	0	0	0
Hindlimb	4	1	1	5	4	6	0	0	0
Flippers	0	3	0	0	0	0	2	3	3
Total	**11**	**9**	**4**	**21**	**18**	**20**	**2**	**3**	**5**

A caribou humerus was found on the surface of the site and displayed marks associated with marrow extraction. The distal humerus and distal shaft was refit from three pieces, all of which showed evidence of impact scarring. Typical spiral fracturing was found on the shaft fragments. It appears that the humerus was cracked toward the end of the bone in order to facilitate marrow extraction. Filleting marks were also noted on the caribou humerus. Cuts were noted on the pubis bone which were likely produced when the animal was initially cut along the ventral surface to remove the skin.

Table 5.31
Frequencies of butchery-mark classes by skeletal portion for terrestrial mammals (1992 and 1993 combined)

	Dismemberment		Filleting		Skinning	
	caribou	fox	caribou	fox	caribou	fox
Cranial	0	0	0	0	0	1
Post-cranial axial	0	0	1	0	2	1
Forelimb	0	0	4	1	1	0
Hindlimb	0	2	1	4	0	0
Total	0	2	6	5	3	2

* 3 impact scars were noted on three pieces of a humerus (anterior shaft, posterior shaft, distal end with 1/4 shaft) which was refit; likely the result of marrow extraction.

5.5.2 Cultural Modification: Burning

Other cultural modification to the two assemblages was in the form of scorched bone. It is quite uncommon to find any form of burning on an assemblage of bone from the arctic. Fuel was primarily used as a source of heat and light. During the 1992 surface assessment only 11 (0.003%) bones with slight scorching were recorded. This consisted of one bearded seal, one polar bear, one large terrestrial mammal and three small seal bones, along with three unidentifiable fragments. The 1993 assemblage included only 6 (0.0007%) unidentifiable burned fragments. These bones likely attained their slightly scorched appearance through inadvertent contact with hot lamp oil, rather than any intentional cooking of the meat. However, there is not much evidence, at the site of *Tasiarulik* that bone was utilized directly as a source of fuel.

5.6 Patterns of Spatial Distribution and Density

The analysis of the spatial distribution of bone within a site has often been proposed as a means of identifying "activity areas". Although the "degree of skeletal dismemberment and the distribution of bones can be appropriate units of analysis in ethnoarchaeological cases, their direct applicability to archaeological problems is questionable" (Todd 1987:112). Much of difficulty in the archaeological definition of activity areas stems from the previously mentioned taphonomic processes which may have considerably altered the original placement of the faunal remains. An examination of the distribution of bone material across QjJx-10 will only be used in an attempt to reveal broad patterns of spatial density.

Figure 5.12 illustrates the pattern of surface bone distribution within the main habitation features at QjJx-10. Unidentifiable bone was not included on this map because it was only counted by 2x2 metre quadrant. According to Behrensmeyer (1991) excavation is the only way to document the original spatial density and arrangement of bones at a site. Examination of only the surface of *Tasiarulik* will tend to mask bone concentrations covered up by vegetation and highlight faunal remains which lack vegetative covering. This may lead to a false impression of which areas of the site have high bone spatial densities. For example, feature 84 is long linear midden covered with a thick vegetative covering (located along the eastern edge of the site from approximately 80m to 140m North, and spans a width of about 5m). We recorded a total of 288 bones over an area of nearly 300 square metres. In contrast, feature 60 is a sparsely vegetated

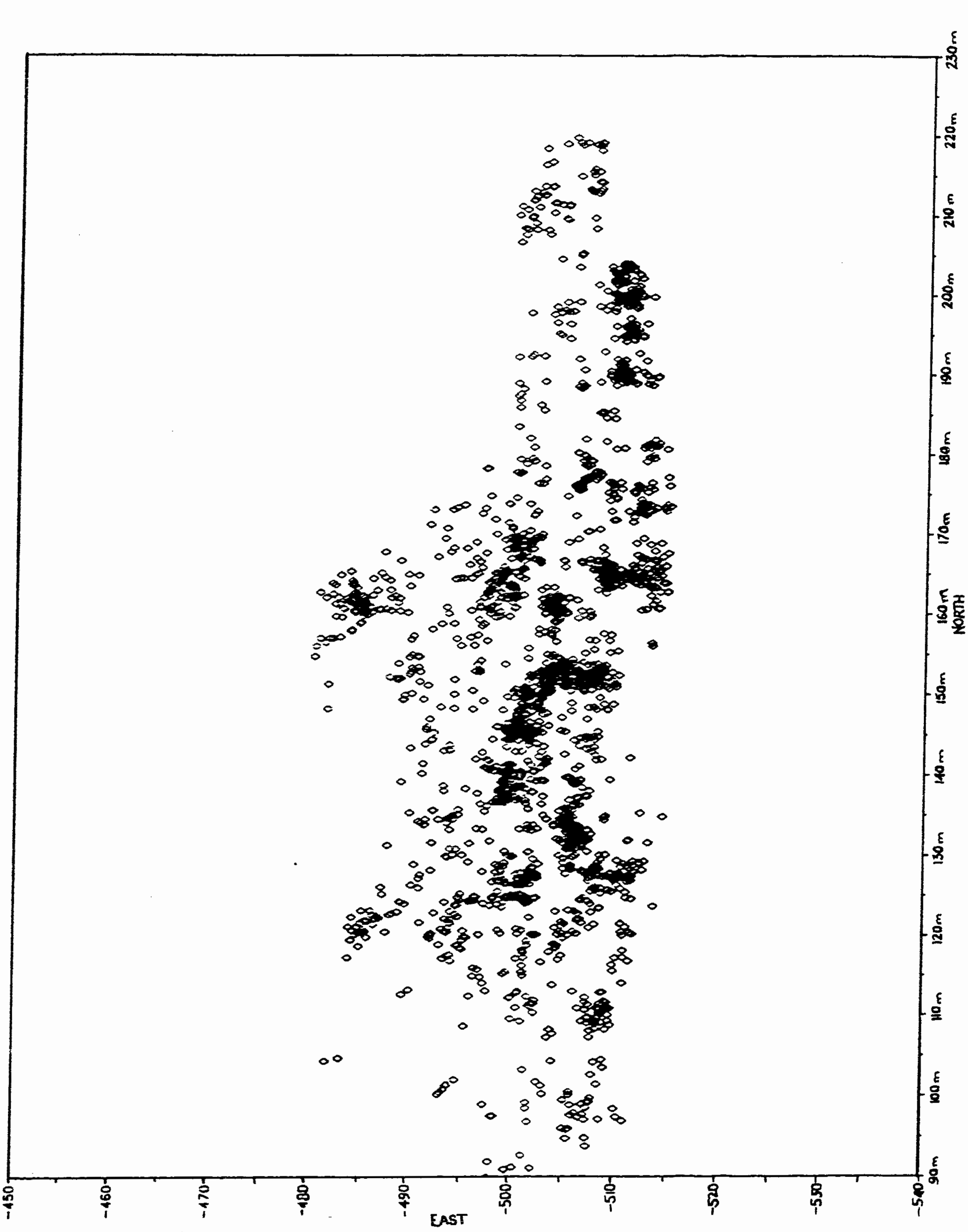


Figure 5.12 - Distribution of surface bone across the main habitation area of QjJx-10

midden deposit (located along the eastern edge of the beach ridge from 196m to 204m North, with a width of nearly 6m) in which we recorded 255 bones within 48 square metres. This indicates a surface bone spatial density of less than 1 bone per m^2 for feature 84, compared with just over 5 bones per m^2 for feature 60.

Table 5.32 displays the spatial density of bone within each feature, surface and subsurface (not including shell). The ratio of surface bone per square metre to subsurface indicates that the amount of bone on the surface of a feature should not be used to predict the amount of subsurface bone since the ratio appears to be highly variable. A low correlation between the density of bone on the surface and subsurface in feature 84 is likely due to the very thick vegetation which has covered virtually all of the faunal material. In contrast features 70 and 90 were less grown over and the correlation between the surface and subsurface is much closer. (However, the sample size for feature 90 is quite low and this may also be the reason for the tight correlation). The size of the bones in the features will also preclude them from being exposed on the surface of the site. Small bird bones were recovered in extremely high numbers in features 30 and 31 and these bones were typically found under a small gravel layer in the tent ring (30) or covered by only a thin moss mat in the midden (31).

Figure 5.12 illustrates the relationship of the 11 features at QjJx-10, and Figures 5.13 through 5.19 show the number of bones collected in each unit (not including shell), and include the location of the feature rocks. A possible 'activity area' may be indicated by the high bone concentrations in house feature 59, which were located along the axial mid-passage. The greatest number (n=26) were recovered from the unit where a large hearth stain was also discovered.

Table 5.32
Bone spatial densities from the 1993 excavated sample

Feature	Metres^2	Surface	bone/m^2	Subsurface	bone/m^2	ratio (surf.bone/m^2: sub.bone/m^2)
30*	25	15	0.6	542	21.7	1:35
31*	8	14	1.8	711	88.8	1:49
57	5	2	0.4	152	30.4	1:51
59	25	6	0.2	99	4.0	1:20
70	15	63	4.2	588	39.2	1:9
74	22.5	4	0.2	122	5.4	1:27
78	13	114	8.7	1584	121.8	1:14
79	15	75	5.0	1301	86.7	1:17
84	27	22	0.8	2680	99.2	1:124
90	12	31	2.6	95	7.9	1:3
91	16	6	0.4	88	5.5	1:14
Total	**183.5**	**352**	**1.9**	**7962**	**43.3**	**1:23**

* surface bone outside excavated features not included

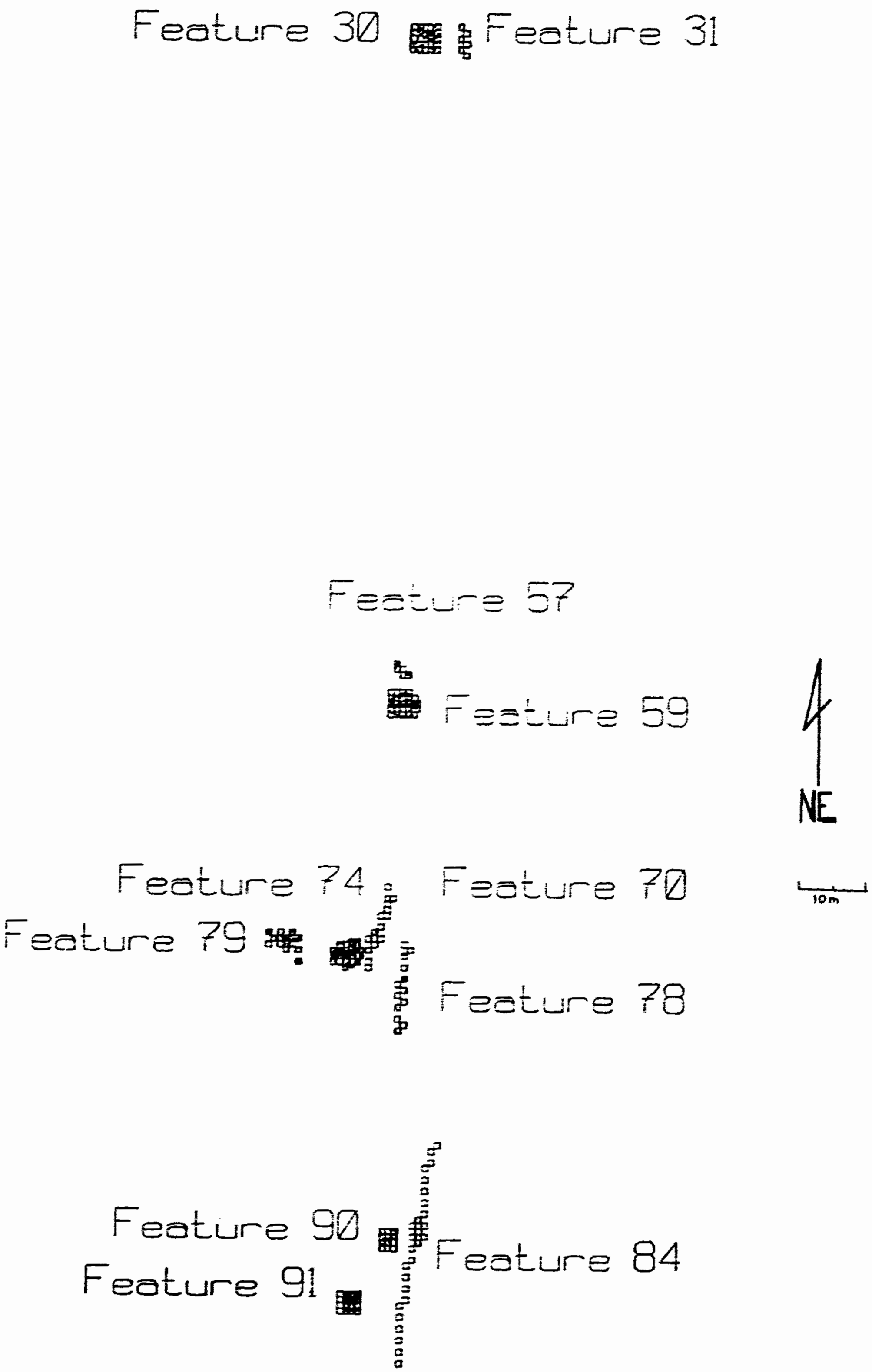
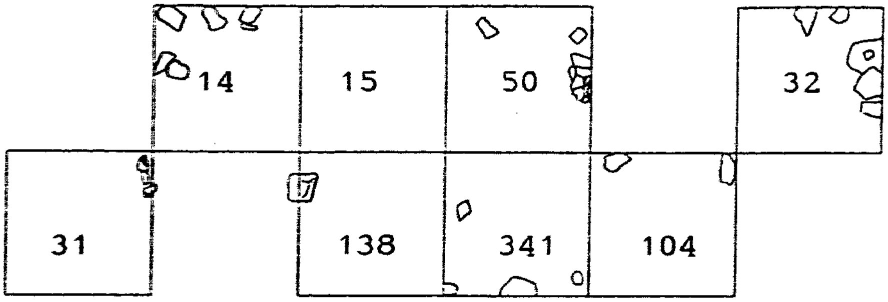
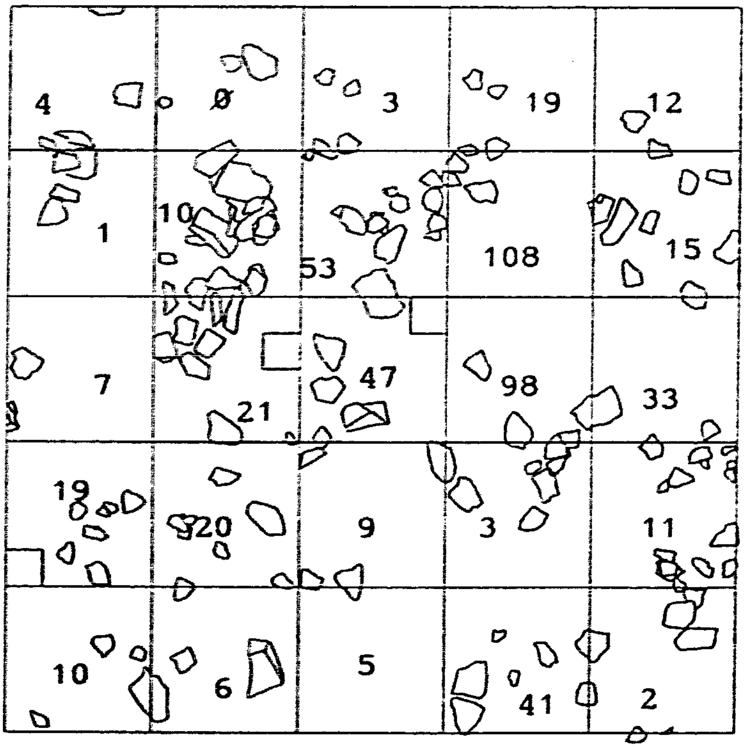


Figure 5.13 - Relationship between 1993 excavated features at QjJx-10

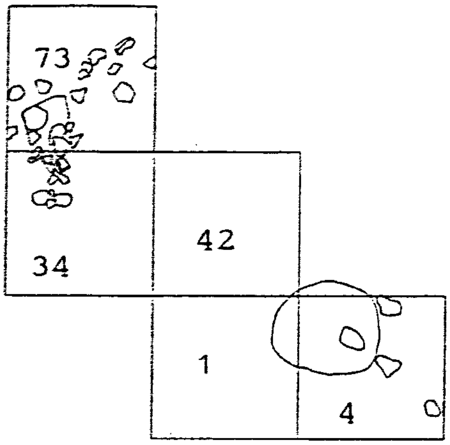


Feature 31

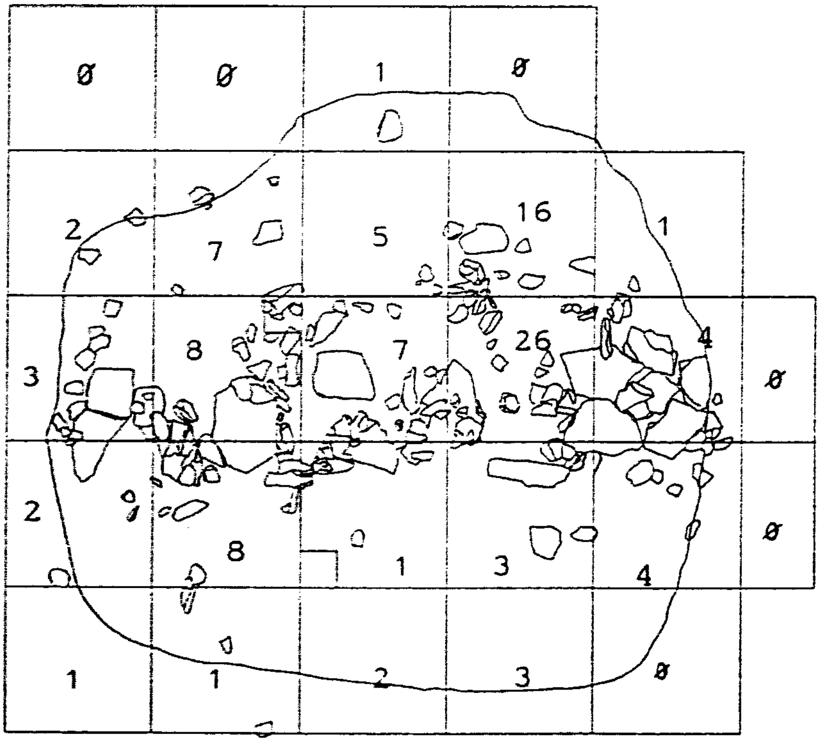


Feature 30

Figure 5.14 - Distribution of bone fragments (NISP per metre unit)
Features 30 (TR) and 31 (MDN)



Feature 57



Feature 59

Figure 5.15 - Distribution of bone fragments (NISP per metre unit)

Features 59 (TR) and 57 (MDN)

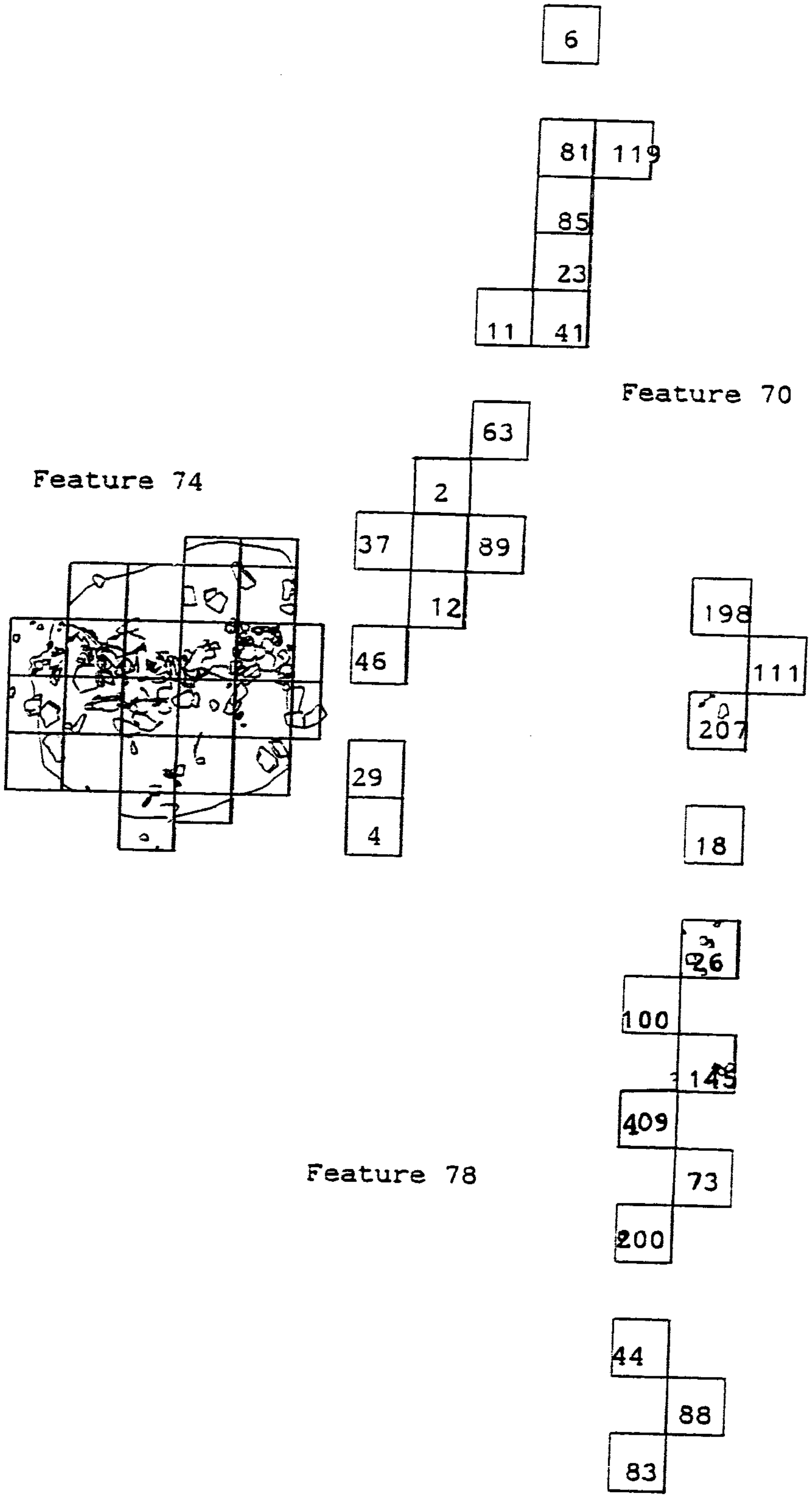


Figure 5.16 - Distribution of bone fragments (NISP per metre unit)
Features 70 (MDN) and 78 (MDN)

Feature 74

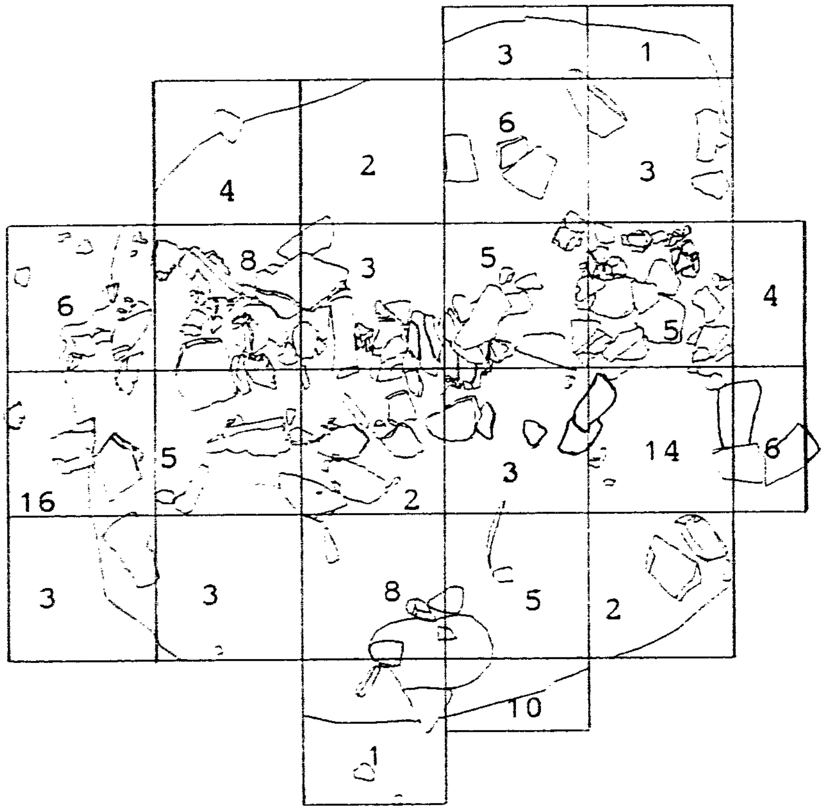


Figure 5.17 - Distribution of bone fragments (NISP per metre unit)

Feature 74 (SSH)

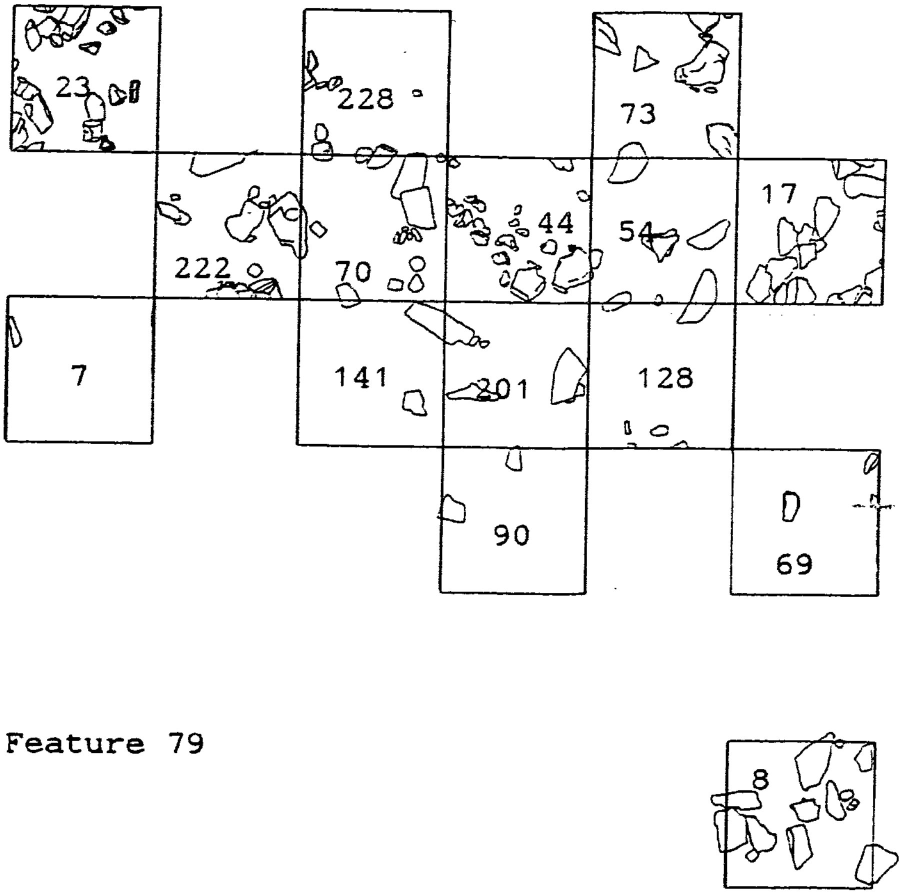


Figure 5.18 - Distribution of bone fragments (NISP per metre unit)
Feature 79 (TR MDN)

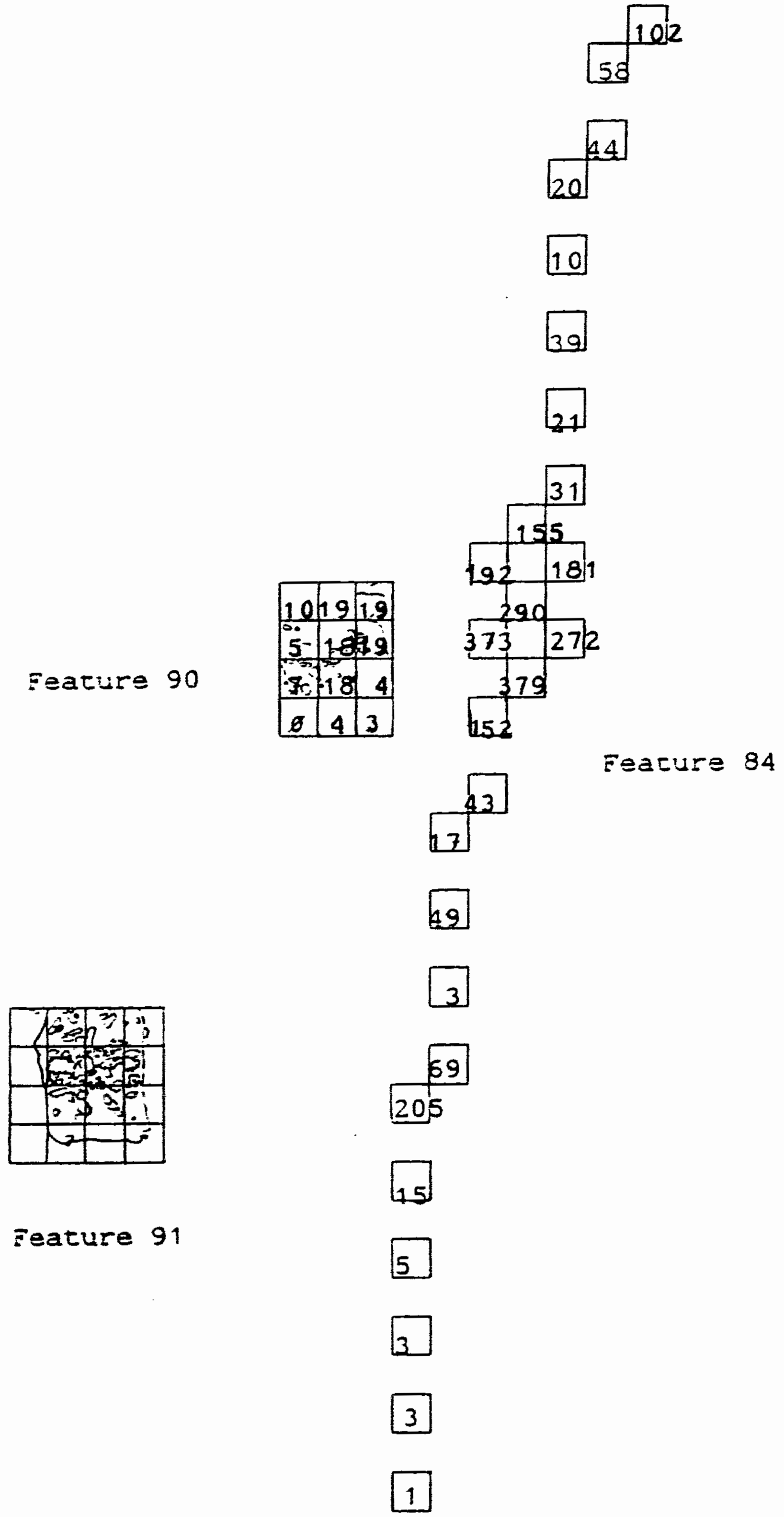


Figure 5.19 - Distribution of bone fragments (NISP per metre unit)
Features 90 (TR MDN) and 84 (MDN)

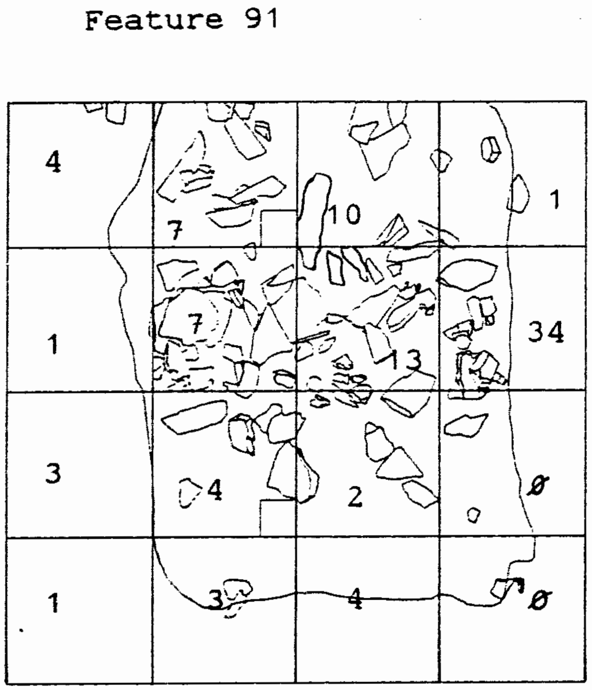


Figure 5.20 - Distribution of bone fragments (NISP per metre unit)
Feature 91 (SSH)

CHAPTER 6

6.1 Summary and Conclusions

> The most important thing is the animals - where they stay, and the best places to catch them.
> It is not the land, it is the animals.
> (Iquallaq, cited in Brody 1976:203).

This thesis involved the analysis of faunal remains from the multi-component Late Dorset site of *Tasiarulik* on Little Cornwallis Island in the Canadian Central High Arctic. Archaeological investigation of this site involved two seasons of field work (1992 and 1993). A strictly surface examination of the faunal remains, with identification and analysis completed in the field, was employed during the first season. The following summer a sample of three major feature types (semi-subterranean house depression, tent ring, and midden) were excavated. Faunal remains were collected from eleven different features and subsequently analyzed in a laboratory. These two seasons of field work offered the chance to examine the type of information which can be obtained from the identification of faunal remains on the surface of a High Arctic site compared with traditional excavation sampling strategies.

It would appear from the analysis of the faunal remains from *Tasiarulik* that surface examination may not be a viable means of collecting data on the subsistence strategies of past High Arctic occupants. However, the surface material can give insight into taphonomic processes which have acted on the faunal assemblage. This was the first time field analysis of non-excavated material from a High Arctic ASTt site was undertaken in a systematic fashion. Often sampling strategies involve a judgmental decision as to which feature to excavate, typically governed by where artifacts or architectural remains can be found. QjJx-10, however, was randomly sampled horizontally over a large area of the site. This surface evaluation cross-cut a large number of features which would not normally have been examined using conventional excavation techniques. It should not be ruled out that part of the reason for the high incidence of large sea mammal remains in the surface assemblage could be related to the random and 100% sampling strategy. Features with large pinniped remains exposed on the surface may not have been chosen in a judgmental sampling strategy that, for example, focused on gathering architectural information.

The composition of the surface faunal assemblage is relatively similar across the site. All of the feature types (middens, tent-rings, houses and tent-ring/midden features) are dominated by approximately 80% pinniped remains. Small seals are closely followed in number by bearded seals and walrus. Other species occur much less frequently on the surface of the site. Small mammalian, bird and fish remains appear to have been covered by the vegetative growth on the organically rich features or fell between the spaces in the beach gravel. Taphonomic processes such as the action of carnivores and differential bone destruction have also placed biases on the surface faunal sample from QjJx-10 by under representing the smaller species.

The various features excavated at *Tasiarulik* appear to demonstrate a range of subsistence patterns. Small seals tend to be the primary resource, with some features (i.e. midden 84) comprised of nearly 90% *Phoca* remains. Approximately 70% of the bone material from features 78 (midden) and 79 (tent ring/midden) was evenly split between small seal or fox, with other sea mammal, terrestrial mammal and bird remains constituting the remainder of the assemblage. In contrast to the other features, tent ring 30 and the associated midden 31 were dominated almost exclusively by bird bones. Three broad patterns of subsistence appear to be reflected in the faunal remains excavated at QjJx-10, which likely indicates different seasons of habitation, and possibly the reoccupation or reuse of certain features.

Faunal remains from three Late Dorset sites on Karluk Island (located between Little Cornwallis and Bathurst Island) also indicate seasonal shifts in species exploitation (Helmer 1981). The primary focus of subsistence at QjLd-17 was small seals. Arctic fox, followed fairly closely by small seals, comprised the QjLd-25 assemblages and a more general pattern of hunting was found at QiLf-25, which was made up of bearded seals, fox, *Phoca sp.* and a variety of birds.

Analysis of seal body part frequencies at QjJx-10 indicates that the observed NISP closely followed the expected NISP of a complete carcass. It appears that the past occupants tended to transport the entire seal carcass back to the site for butchering. This pattern was found for bearded and small seals, and was also recognized in both the surface and excavated faunal assemblages. The spongier, less dense vertebral elements were not as well represented on the surface of the site due to differential destruction resulting from weathering processes, non-human transport and human processing.

Differences were observed between the surface and excavated samples in walrus and fox body part frequencies. Walrus crania tended to be over represented on the surface of the site which is likely due to the bulk of the element which would make it less likely to become completely overgrown with vegetation. The analysis of fox body parts on the surface of the site was hampered by small sample size. These small elements were easily obscured by vegetation and would have been highly susceptible to carnivore action. The excavated assemblage indicates that entire skeletons were deposited. Variance tends to occur with those body parts which would have been most susceptible to differential destruction such as ribs and crania.

Examination of weathering stages demonstrates the severe deterioration and poor preservation of the surface assemblage, particularly on the exposed side of the bone. Large pinnipeds, due to their size, will tend to remain exposed on the surface of the site for a longer period of time. Because of this they appear to be more weathered than small seal bones which would have been more rapidly covered over by vegetation. Analysis of the incidence of chew marks on the bone also indicates that the surface assemblage was subject to a higher degree of non-human movement and destruction than the subsurface.

Cut marks were rarely observed which is typical of faunal assemblages associated with stone technologies. This is a reflection of both the degree of preservation of the outer bone table and the butchering skill of the past inhabitants. (A relatively high incidence of native copper and meteoric iron was found at the Late Dorset sites on Little Cornwallis, including formed blades, but its use in butchering has not yet been fully explored). The majority of cut marks seem to have resulted from filleting or scraping the bone shafts to remove meat. Terrestrial bone was rarely found, however, one caribou bone did show clear evidence of being cracked for marrow.

The spatial density of bone across the site was highly varied. This analysis suggests that the spatial density of bone on the surface of the site is a poor indicator of the subsurface bone spatial density (per square metre). Vegetation tends to mask areas of high bone concentration, and small bones can also be hidden by thin layers of gravel and not recorded on the surface of the site.

McCartney (1989) has characterized the High Arctic environment as an area of low ecological diversity and high instability. This appears to be reflected in the faunal remains in the sense that a range of species were exploited for raw material and food resources depending on their seasonal and regional availability.

The analysis of the faunal remains from both the surface and subsurface of *Tasiarulik* has allowed for a better understanding of the taphonomic processes acting on a High Arctic assemblage. The permitting difficulties experienced during the 1992 field season could likely be encountered in the future for other archaeologists. Surface analysis has been shown to be a useful means of exploring a large area of a site which could not be otherwise sampled by conventional excavation techniques. Comparison with the results obtained from excavation have enabled a better understanding of the problems and biases of surface analysis. However, it has also demonstrated the benefits of not excavating (destroying) these non-renewable archaeological resources. Without an examination of the surface remains of *Tasiarulik* an exploration of the taphonomic processes which have created and altered this site over time could not have been undertaken. Excavated remains are necessary if an attempt to reconstruct the subsistence patterns of the past occupants is the goal. The more severe preservational biases must be accounted for when utilizing surface remains as an indicator of past diet and raw material use. These two methods of analysis appear to complement each other as a means of accessing different types of information about the taphonomic and cultural processes which have created this multi-component site.

REFERENCES CITED

Arnold, C.D.

1979 Possible Evidence of Domestic Dog in a Paleoeskimo Context. *Arctic* 32(3):263-265.

1980 A Paleoeskimo Occupation on Southern Banks Island, N.W.T. *Arctic* 33(3):400-426.

1981 The Lagoon site (OjRl-3): Implications for Paleoeskimo Interactions. *Archaeological Survey of Canada, Mercury Series*, No. 107, National Museums of Canada, Ottawa.

Arundale, W.H.

1976 *The Archaeology of the Nanook Site: An Explanatory Approach, Volume I.* Unpublished Ph.D. dissertation, Department of Anthropology, Michigan State University.

Balkwill, D.M. and A.M. Rick

1994 Siglit Subsistence: Preliminary Report on Faunal Remains From a Large Midden at the Gupuk Site (NiTs-1), Mackenzie Delta, N.W.T. In *Bridges Across Time: The NOGAP Archaeology Project*, edited by J.-L. Pilon, pp. 95-116. Canadian Archaeological Association Occassional Paper No. 2.

Balikci, A.

1970 *The Netsilik Eskimo*. The American Museum of Natural History, Natural History Press, Garden City, New York.

Banfield, A.W.F.

1974 *The Mammals of Canada*. University of Toronto Press, Toronto.

Behrensmeyer, A.K.

1978 Taphonomic and Ecologic Information from Bone Weathering. *Paleobiology* 4(2):150-162.

1990 Terrestrial Vertebrate Accumulations. In *Taphonomy:Releasing the Data Locked in the Fossil Record,* edited by P.A. Allison and D.E.G. Briggs, pp. 291-335. Plenum Press, New York.

Binford, L.R.

1978 *Nunamiut Ethnoarchaeology*. Academic Press, New York.

Binford, L.R.
1981 *Bones: Ancient Men and Modern Myths.* Academic Press, New York.

Bourque, B.J., K. Morris and A. Spiess
1978 Determining the Season of Death of Mammal Teeth from Archaeological Sites: A New Sectioning Technique. *Science* 199:530-531.

Burns, J.J.
1981 Bearded Seal -- *Erignathus barbatus.* In *Handbook of MarineMammals, Volume 2: Seals*, edited by S.H. Ridgway and R.J. Harrison, pp. 145-170. Academic Press, London.

Brodie, P.F.
1989 The White Whale -- *Delphinapterus leucas* (Pallas, 1776). In *Handbook of Marine Mammals, Volume 4: River Dolphins and the Larger Toothed Whales*, edited by S.H. Ridgway and R.J. Harrison, pp. 119-144. Academic Press, London.

Brody, H.
1976 Land Occupancy: Inuit Perceptions. In *Inuit Land Use and Occupancy Project, Volume One: Land Use and Occupancy*, edited by M.M.R. Freeman, pp. 185-242. Department of Indian and Northern Affairs, Ottawa.

Cox, S.L. and A. Spiess
1980 Dorset Settlement and Subsistence in Northern Labrador. *Arctic* 33(3):659-669.

Cruz-Uribe, K. and R.G. Klein
1994 Chew Marks and Cut Mark on Animal Bones from the Kasteelberg B and Dune Field Midden Later Stone Age Sites, Western Cape Province, South Africa. *Journal of Arcaheological Science* 21:35-49.

Daly, P.
1969 Approaches to Faunal Analysis in Archaeology. *American Antiquity* 34:146-153.

Dumond, D.E.
1987 *The Eskimos and Aleuts,* revised edition. Thames and Hudson Ltd., London.

Driver, J.C.
1992 Identification, Classification and Zooarchaeology. *Circaea* 9(1):35-47.

Driver, J.C.
1993 Zooarchaeology in British Columbia. *B.C. Studies* 99:77-105.

Eschricht, D.F. and J. Reinhart
1866 On the Greenland Right Whale (*Balaena mysticetus*, Linn.), with especial reference to its geographical distribution and migrations in times past and present, and to its external and internal characteristics. (Transl. from Danish publ. of 1861). In *Recent Memoirs on the Cetacea by Professors Eschricht, Reinhart and Lilljeborg*, edited by W.H. Flower, pp. 1-150. The Ray Society, London.

Fay, F.H.
1981 Walrus -- *Odobenus rosmarus*. In *Handbook of Marine Mammals, Volume 1: The Walrus, Sea Lions, Fur Seals and Sea Otter*, edited by S.H. Ridgway and R.J. Harrison, pp. 1-24. Academic Press, London.

Freeman, M.M.R.
1974/75 An Analysis of Walrus Hunting and Utilization: Southampton Island, N.W.T. 1970. *Folk* 16-17:147-158.

Frost, K.J. and L.F. Lowry
1981 Ringed, Baikal and Caspian Seals -- *Phoca hispida, Phoca sibirica* and *Phoca caspica*. In *Handbook of Marine Mammals, Volume 2: Seals*, edited by S.H. Ridgway and R.J. Harrison, pp. 29-53. Academic Press, London.

Gifford, D.P.
1981 Taphonomy and Paleoecology: A Critical Review of Archaeology's Sister Disciplines. In *Advances in Archaeological Method and Theory*, edited by M.B. Schiffer, 4:365-438. Academic Press, New York.

Gilbert, B.M.
1990 *Mammalian Osteology*. Missouri Archaeological Society, Columbia.

Gilbert, B.M., L.D. Martin and H.G. Savage
1985 *Avian Osteology*. B. Miles Gilbert, Publisher, Flagstaff, Arizona.

Godfrey, W.E.
1979 *The Birds of Canada*. National Museums of Canada, Ottawa.

Graburn, N.H.H.
1969 *Eskimos without Igloos: Social and Economic Development in Sugluk*. Little Brown and Co., Boston.

Graves, J. and E. Hall
1985 *Arctic Animals*. Department of Renewable Resources, Government of the Northwest Territories, Yellowknife, N.W.T.

Grayson, D.K.
1984 *Quantitative Zooarchaeology: Topics in the Analysis of Archaeological Faunas*. Academic Press, Inc., Orlando.

Grønnow, B.
1986 Recent Archaeological Investigations of West Greenland Caribou Hunting. *Arctic Anthropology* 23:57-80.

Grønnow, B., M. Meldgaard, and J. Berglund Nielson
1983 Aasivissuit - The Great Summer Camp: Archaeological, Ethnographical and Zoo-Archaeological Studies of a Caribou-Hunting Site in West Greenland. *Meddelelser om Grønland*, Man and Society 5.

Hay, K.A. and A.W. Mansfield
1989 Narwal -- *Monodon monoceros* Linnaeus, 1758. In *Handbook of Marine Mammals, Volume 4: River Dolphins and the Large Toothed Whales*, edited by S.H. Ridgway and R.J. Harrison, pp. 145-176. Academic Press, London.

Helmer, J.W.
1981 *Climate Change and Dorset Culture Change in the Crozier Strait Region, N.W.T.: A Test of a Hypothesis*. Unpublished Ph.D. dissertation, Department of Archaeology, University of Calgary.

1991a Final Report of the 1990 Polaris Archaeological Research Project. Unpublished manuscript on file with the Archaeological Survey of Canada, Ottawa.

1991b The Palaeo-Eskimo Prehistory of the North Devon Lowlands. *Arctic* 44(4):301-317.

Helmer, J.W., G.M. LeMoine, and D.T. Hanna
1993 Central High Arctic Archaeology Programme (C.H.A.A.P.): Report of the 1992 Field Season of the McDougall Sound Archaeological Research Project. Unpublished manuscript on file with the Archaeological Survey of Canada, Ottawa.

Jensen, A.M.
1987 Patterns of Bearded Seal Exploitation in Greenland. *Etudes/Inuit/Studies* 11(2):91-116.

Jordon, R.H.
1980 Preliminary Results from Archaeological Investigations in Avayalik Island, Extreme Northern Labrador. *Arctic* 33(3):607-627.

Julien, M.
1980 Etude Preliminaire du Material Osseux Provenant du Site Dorsettien DIA.4 (JfEl-4) (Arctique Oriental). *Arctic* 33(3):533-555.

Kasper, J.C.
1980 Skeletal Identification of California Sea Lions and Harbour Seals for Archaeologists. *Ethnic and Technological Notes*, No. 17. San Diego Museum of Man, San Diego.

King, J.E.
1964 *Seals of the World.* Trustees of the British Museum (Natural History), London.

Knuth, E.
1967 Archaeology of the Musk-ox Way. *Contribution du Centre d'Etudes Arctiques et Finno-Scandinaves*, No. 5, Paris.

Kooyman, B.
1984 Moa Utilisation at Owens Ferry, Otago, New Zealand. *New Zealand Journal of Archaeology* 6:47-57.

Loughrey, A.G.
1959 Preliminary Investigation of the Atlantic Walrus *Odobenus rosmarus rosmarus* (Linnaeus). *Wildlife Management Bulletin*, Series 1, Number 14. Department of Northern Affairs and National Resources National Parks Branch, Canadian Wildlife Service, Ottawa.

Lyman, R.L.
1984 Bone Density and Differential Survivorship of Fossil Classes. *Journal of Anthropological Archaeology* 3:259-299.

1987 Archaeofaunas and Butchery Studies: A Taphonomic Perspective. In *Advances in Archaeological Method and Theory*, edited by M.B. Schiffer, 10:249-337. Academic Press, San Diego.

1991 *Prehistory of the Oregon Coast: The Effects of Excavation Strategies and Assemblage Size on Archaeological Inquiry.* Academic Press, Inc., San Diego.

Lyman, R.L.

1992 Prehistoric Seal and Sea Lion Butchering on the Southern Northwest Coast. *American Antiquity* 57(2):246-261.

1994a Quantitative Units and Terminology in Zooarchaeology. *American Antiquity* 59(1):36-71.

1994b *Vertebrate Taphonomy.* Cambridge University Press.

1994c Relative Abundances of Skeletal Specimens and Taphonomic Analysis of Vertebrate Remains. *Palaios* 9:288-298.

Lyman, R.L. and G.L. Fox

1989 A Critical Evaluation of Bone Weathering as an Indication of Bone Assemblage Formation. *Journal of Archaeological Science* 16:293-317.

Lyman, R.L., J.M. Savelle and P. Whitridge

1992 Derivation and Application of a Meat Utility Index for Phocid Seals. *Journal of Archaeological Science* 19:531-555.

Mansfield, A.W.

1967 Seals of Arctic and Eastern Canada. *Fisheries Research Board of Canada*, Bulletin 137, Ottawa.

Marshall, F. and T. Pilgram

1993 NISP vs. MNI in Quantification of Body-Part Representation. *American Antiquity* 58(2):261-269.

Mary-Rousseliere, O.M.I., G.

1976 The Paleoeskimo in Northern Baffinland. In *Eastern Arctic Prehistory: Paleoeskimo Problems*, edited by M.S. Maxwell. Memoirs of the Society for American Archaeology 31:40-57.

Maxwell, M.S.

1985 *Prehistory of the Eastern Arctic*. Academic Press, Orlando.

McCart, P.J. and J. Den Beste

1979 *Aquatic Resources of the Northwest Territories.* Science Advisory Board of the Northwest Territories, Yellowknife.

McCartney, A.P. and J.M. Savelle

1985 Thule Eskimo Whaling in the Central Canadian Arctic. *Arctic Anthropology* 22(2):37-58.

McCartney, P.H.
1989 *Paleoeskimo Subsistence and Settlement in the High Arctic.* Unpublished Ph.D. dissertation, Department of Archaeology, University of Calgary, Calgary.

McCartney, P.H. and J.W. Helmer
1989 Marine and Terrestrial Animals in High Arctic Paleoeskimo Economy. *Archaeozoologia* 3(1/2):143-160.

McCullough, K.M.
1989 The Ruin Islanders: Early Thule Culture Pioneers in the Eastern High Arctic. *Archaeological Survey of Canada, Mercury Series*, No. 141. Canadian Museum of Civilization, Hull.

McGhee, R.
1979 The Paleoeskimo Occupations at Port Refuge, High Arctic Canada. *Archaeological Survey of Canada, Mercury Series*, No. 92, National Museums of Canada, Ottawa.

1981 The Dorset Occupations in the Vicinity of Port Refuge, High Arctic Canada. *Archaeological Survey of Canada, Mercury Series*, No. 105, National Museums of Canada, Ottawa.

McLaren, I.A.
1958 Some Aspects of Growth and Reproduction in the Bearded Seal, *Erignathus barbatus* (Erxleben). *Journal of the Fisheries Research Board of Canada* 15(2):219-227.

Meyer, D.A.
1977 Pre-Dorset Settlements at the Seahorse Gully Site. *Archaeological Survey of Canada, Mercury Series*, No. 57, National Museums of Canada, Ottawa.

Miller, F.L., R.H. Russell, and A. Gunn
1977 Distributions, Movements and Numbers of Peary Caribou and Muskoxen on Western Queen Elizabeth Islands, Northwest Territories 1972-74. *Canadian Wildlife Service Report, Series*, No. 40, Ottawa.

Møhl, J.
1986 Dog Remains from a Paleoeskimo Settlement in West Greenland. *Arctic Anthropology* 23:81-89.

Møhl, U.
1972 Animal Bones from Itivnera, West Greenland: A Reindeer Hunting Site of the Sarqaq Culture. *Meddelelser om Grønland* 191(6).

Murray, M.S.
1992 *Beyond the Laundry List: The Analysis of Faunal Remains from a Dorset Dwelling at Phillips Garden (EeBi 1) Port au Choix, Newfoundland.* Unpublished M.A. thesis, Department of Anthropology, Memorial University of Newfoundland.

Olsen, S.J.
1990 Mammal Remains from Archaeological Sites: Part 1 - Southeastern and Southwestern United States. *Papers of the Peabody Museum of Archaeology and Ethnology*, Vol. 56, No. 1, Harvard University Press, Cambridge, Massachusetts.

Park, R.
1993 The Dorset-Thule Succession in Arctic North America: Assessing Claims for Culture Contact. *American Antiquity* 58:203-234.

Reeves, R.R. and S. Leatherwood
1985 Bowhead Whale -- *Balaena mysticetus.* In *Handbook of Marine Mammals, Volume 3: The Sirenians and Baleen Whales*, edited by S.H. Ridgeway and R.J. Harrison, pp. 305-344. Academic Press, London.

Riewe, R.
1976 Inuit Land Use in the High Canadian Arctic. In *Inuit Land Use and Occupancy Project, Volume One: Land Use and Occupancy*, edited by M.M.R. Freeman, pp. 173-182. Department of Indian and Northern Affairs, Ottawa.

Ringrose, T.J.
1993 Bone Counts and Statistics: A Critique. *Journal of Archaeological Science* 20:121-157

Ronald, K. and P.J. Healey
1981 Harp Seal -- *Phoca groenlandica.* In *Handbook of Marine Mammals, Volume 2: Seals*, edited by S.H. Ridgway and R.J. Harrison, pp. 55-88. Academic Press, London.

Savelle, J.M. and Beattie, O.B.
1983 Analysis of Dental Annuli in Muskoxen (*Ovibos moschatus*) as an Aid in the Determination of Archaeological Site Seasonality. *Canadian Journal of Anthropology* 3(1)123-129.

Schledermann, P.

1975 Thule Eskimo Prehistory of Cumberland Sound, Baffin Island, Canada. *Archaeological Survey of Canada, Mercury Series*, No. 38, National Museums of Canada, Ottawa.

1990 Crossroads to Greenland: 3000 Years of Prehistory in the Eastern High Arctic. *Komatik Series*, No. 2. The Arctic Institute of North America, Calgary.

Smith, T.G.

1973 Population Dynamics of the Ringed Seal in the Canadian Eastern Arctic. *Fisheries Research Board of Canada, Bulletin* 181, Ottawa.

Smith, T.G. and M.O. Hammill

1981 Ecology of the Ringed Seal, *Phoca hispida*, in its Fast Ice Breeding Habitat. *Canadian Journal of Zoology* 58(6):966-981.

Spiess, A.

1976 Determining Season of Death of Archaeological Fauna by Analysis of Teeth. *Arctic* 29:53-55.

1978 Zooarchaeological Evidence Bearing on the Nain Area Middle Dorset Subsistence-Settlement Cycle. *Arctic Anthropology* 15(2):48-60.

Staab, M.L.

1979 Analysis of the Faunal Material Recovered from a Thule Eskimo Site on the Island of Silumiut, N.W.T., Canada. In *Thule Eskimo Culture an Anthropological Retrospective*, edited by A.P. McCartney. Archaeological Survey of Canada, Mercury Series, No. 88:349-379. National Museums of Canada, Ottawa.

Stirling, I., R.E. Schweinsburg, W. Calvert, and H.P.L. Kiliaan

1979 Population Ecology of the Polar Bear Along the Proposed Arctic Islands Gas Pipeline Route. *Indian and Northern Affairs Publication*, No. QS-8160-024-EE-A1, Ottawa.

Sutcliffe, A.J.

1990 Rates of Decay of Mammalian Remains in the Permafrost Environment of the Canadian High Arctic. In *Canada's Missing Dimension: Science and History in the Canadian Arctic Islands*, edited by C.R. Harrington, pp. 161-186. Canadian Museum of Nature, Ottawa.

Tener, J.S.
1965 *Muskoxen in Canada: a Biological and Taxonomic Review*. Department of Northern Affairs and Natural Resources, Ottawa.

Todd, L.C.
1987 Taphonomy of the Horner II Bone Bed. In *The Horner Site: The Type Site of the Cody Cultural Complex*, edited by G.C. Frison and L.C. Todd, pp. 107-198. Academic Press, Inc., Orlando.

Todd, L.C., R.V. Witter and G.C. Frison
1987 Excavation and Documentation. In *The Horner Site: The Type Site of the Cody Cultural Complex*, edited by G.C. Frison and L.C. Todd, pp. 39-91. Academic Press, Orlando.

Wall, W.P.
1983 The Correlation between High Limb-Bone Density and Aquatic Habitats in Recent Mammals. *Journal of Paleontology* 57(2):197-207.

Will, R.T.
1985 *Ninteenth Century Copper Inuit Subsistence Practices on Banks Island, N.W.T.* Unpublished Ph.D. dissertation, Department of Anthropology, University of Alberta.

APPENDIX A

Table A.1
QjJx-10 Surface examination, features and feature types

Feature	Feature Type	Total bones
56a	Tent Ring (TR)	16
56c	Midden (MDN)	8
56c/58*	Midden (MDN) / Midden (MDN)	8
57	Linear Midden (M L)	44
58	Midden (MDN)	2
59	Semi-Subterranean House (SSH)	8
60	Midden (MDN)	255
61	Midden (MDN)	10
62	Semi-Subterranean House (SSH)	7
63b	Midden (MDN)	13
64	Midden (MDN)	64
65	Midden (MDN)	106
66	Linear Midden (M L)	67
67	Semi-Subterranean House (SSH)	2
68	Linear Midden (M L)	26
68/69	Linear Midden (M L) / Linear Midden (M L)	1
69	Linear Midden (M L)	161
70	Linear Midden (M L)	208
71	Semi-Subterranean House (SSH)	4
71/72	Semi-Subterranean House (SSH) / Midden (MDN)	2
72	Midden (MDN)	135
72/69	Midden (MDN) / Linear Midden (M L)	28
72/78	Midden (MDN) / Linear Midden (M L)	3
73	Tent Ring Midden (TR MDN)**	30
74	Semi-Subterranean House (SSH)	14
74 (berm)	Semi-Subterranean House (SSH)	3
75	Lithic Scatter (LS)	4
76a	Semi-Subterranean House (SSH)	9
76a/80a	Semi-Subterranean House (SSH) / Midden (MDN)	8
77	Midden (MDN)	401
Associated with 77	Midden (MDN)	4
77/78	Midden (MDN) / Linear Midden (M L)	92
78	Linear Midden (M L)	391
Associated with 78	Linear Midden (M L)	2
79	Tent Ring Midden (TR MDN)	133
80a	Midden (MDN)	71
Midden assoc. with 80a	Midden (MDN)	12
80b	Semi-Subterranean House (SSH)	8
81	Semi-Subterranean House (SSH)	45
Midden assoc. with 81	Semi Subterranean House Midden (SSH MDN)	22
82	Semi-Subterranean House (SSH)	25
82 (berm)	Semi-Subterranean House (SSH)	5

Table A.1 (cont.)

Feature	Feature Type	Total bones
Midden assoc. with 82	Semi-Subterranean House Midden (SSH MDN)	116
Midden between 81 and 82	Semi-Subterranean House Midden (SSH MDN)	25
82/85	Semi-Subterranean House (SSH) / Linear Midden (M L)	2
84	Linear Midden (M L)	286
Assoc. with 84	Linear Midden (M L)	2
85	Linear Midden (M L)	133
87	Semi-Subterranean House (SSH)	29
87 (berm)	Semi-Subterranean House (SSH)	22
88	Midden (MDN)	33
89	Midden (MDN)	92
Assoc. with 89	Midden (MDN)	44
90	Tent Ring Midden (TR MDN)	29
91	Semi-Subterranean House (SSH)	11
92	Linear Midden (M L)	11
Subtotal		3292
N/A	Not associated with a feature	174
Total		**3466**

*Bone found marginally within two features is indicated by a "/"
**TR MDN refers to a palimpsest of what may be multiple tent rings and associated midden debris
Note: Midden features were combined and discussed as simply "MDN" in the text of this report (MDN, M L, MDN/MDN, MDN/M L, M L/M L, SSH/MDN, SSH/M L, SSH MDN)

APPENDIX B

Table B.1
QjJx-10 Small Seal element frequencies, 1992 surface examination

Element	Feature Type						
	LS	TR	TR MDN	SSH	MDN	N/A	Total
Astragalus	0	0	2	1	8	0	11
Atlas	0	0	0	0	6	0	6
Axial	0	0	1	0	4	1	6
Axis	0	0	0	0	3	0	3
Baculum	0	0	0	0	1	1	2
Calcaneum	0	0	1	1	13	0	15
Carpals	0	0	0	0	2	0	2
Carp/Tars (ind.)	0	0	1	1	23	0	25
Caudal	0	0	0	0	6	0	6
Cervical 3-7	0	0	1	1	25	0	27
Costal Cart.	0	0	0	0	1	0	1
Cuboid	0	0	2	1	8	1	12
Cranial	0	0	0	0	17	0	17
Femur	0	0	4	3	48	0	55
Fibula	0	0	4	1	14	1	20
Humerus	0	0	3	2	68	2	75
Innominate	0	0	2	1	19	0	22
Long bone (ind.)	0	0	4	2	16	0	22
Lumbars	0	0	0	2	28	0	30
Mandible	0	0	3	1	26	0	30
Metacarpal	0	0	0	0	8	0	8
Metacarpal I	0	0	1	1	14	0	16
Metacarpal II	0	0	1	0	4	0	5
Metacarpal III	0	0	0	1	1	0	2
Metacarpal IV	0	0	0	1	3	0	4
Metacarpal V	0	0	1	1	1	0	3
Metapodial	0	0	1	0	12	0	13
Metatarsal	0	0	0	0	5	0	5
Metatarsal I	0	0	2	3	22	2	29
Metatarsal II	0	0	0	1	21	1	23
Metatarsal III	0	0	0	1	3	1	5
Metatarsal IV	0	0	2	1	16	0	19
Metatarsal V	0	0	1	6	19	0	26
Navicular	0	0	0	1	6	0	7
Patella	0	0	0	0	0	0	0
Phalanx (ind.)	0	0	2	3	33	1	39
1st Phalanx	0	0	3	4	61	2	70
2nd Phalanx	0	0	3	2	40	4	49
3rd Phalanx	0	0	1	1	12	1	15
Radius	0	1	1	1	23	2	28
Rib	0	0	8	12	178	7	205

Table B.1 (cont.)

Element	Feature Type						
	LS	TR	TR MDN	SSH	MDN	N/A	Total
Sacrum	0	0	0	10	27	0	37
Scapula	1	0	1	1	12	0	15
Sesamoid	0	0	0	0	1	0	1
Tarsal	0	0	0	0	0	0	0
Thoracic	0	0	1	1	41	0	43
Tibia	0	0	1	2	42	2	47
Tibia+Fibula	0	0	0	0	2	0	2
Teeth	0	0	2	5	16	0	23
Ulna	0	1	3	1	12	1	18
Vertebra (ind.)	0	0	2	5	63	2	72
Total	**1**	**2**	**65**	**82**	**1034**	**32**	**1216**

Table B.2
QjJx-10 Bearded Seal element frequencies, 1992 surface examination

Element	Feature Type						
	LS	TR	TR MDN	SSH	MDN	N/A	Total
Astragalus	0	0	0	0	3	0	3
Atlas	0	0	0	0	6	0	6
Axial (ind.)	0	0	0	0	2	0	2
Axis	0	0	0	0	0	0	0
Baculum	0	0	1	0	0	0	1
Calcaneum	0	0	0	0	2	0	2
Carpal	0	0	0	0	1	0	1
Carp/Tars (ind.)	0	0	1	0	2	1	3
Caudal	0	0	2	0	5	0	7
Cervical 3-7	0	0	0	0	15	0	15
Costal Cart.	0	0	0	0	0	0	0
Cuboid	0	0	0	0	1	0	1
Cranial	0	0	0	0	7	0	7
Femur	0	0	1	0	17	1	19
Fibula	0	0	0	0	3	0	3
Humerus	0	0	0	1	12	0	13
Innominate	0	0	2	1	16	0	19
Long bone (ind.)	0	0	0	0	4	0	4
Lumbar	0	0	2	0	13	0	15
Mandible	0	0	0	0	2	0	2
Metacarpal	0	0	0	0	2	0	2
Metacarpal I	0	0	0	0	0	0	0

Table B.2 (cont.)

Element	Feature Type						
	LS	TR	TR MDN	SSH	MDN	N/A	Total
Metacarpal II	0	0	0	0	0	0	0
Metacarpal III	0	0	0	0	0	0	0
Metacarpal IV	0	0	0	0	0	0	0
Metacarpal V	0	0	0	0	0	0	0
Metapodial	0	0	0	1	7	0	8
Metatarsal	0	0	0	0	1	0	1
Metatarsal I	0	0	0	0	6	0	6
Metatarsal II	0	0	0	0	5	0	5
Metatarsal III	0	0	0	1	1	0	2
Metatarsal IV	0	0	0	0	5	1	6
Metatarsal V	0	0	0	0	9	0	9
Navicular	0	0	0	0	2	0	2
Patella	0	0	0	0	3	0	3
Phalanx (ind.)	0	0	2	1	26	2	31
1st Phalanx	0	0	1	3	37	6	47
2nd Phalanx	0	0	1	0	16	2	19
3rd Phalanx	0	0	1	1	15	2	19
Radius	0	0	4	1	12	0	17
Rib	0	0	4	7	140	4	155
Sacrum	0	0	0	0	12	0	12
Scapula	0	0	0	1	11	0	12
Sesamoid	0	0	0	0	0	0	1
Tarsal	0	0	0	0	0	0	0
Thoracic	0	0	2	2	11	0	15
Tibia	0	0	0	1	11	0	12
Tibia+Fibula	0	0	0	0	1	0	1
Teeth	0	0	0	0	0	0	0
Ulna	0	0	1	2	11	1	15
Vertebra (ind.)	0	0	3	1	37	0	41
Total	**0**	**0**	**27**	**24**	**493**	**20**	**564**

Table B.3
QjJx-10 Walrus element frequencies, 1992 surface examination

Element	Feature Type						
	LS	TR	TR MDN	SSH	MDN	N/A	Total
Astragalus	0	0	0	0	0	0	0
Atlas	0	0	0	0	2	0	2
Axial (ind.)	0	0	0	0	0	0	0
Axis	0	0	0	0	0	0	0
Baculum	0	0	0	0	1	0	1
Calcaneum	0	0	0	0	1	0	1
Carpal	0	0	0	0	0	0	0
Carp/Tars (ind.)	0	0	0	0	2	1	3
Caudal	0	0	0	0	0	0	0
Cervical 3-7	0	0	0	0	0	1	1
Costal Cart.	0	0	0	0	0	0	0
Cuboid	0	0	0	0	0	0	0
Cranial	0	0	0	2	31	2	35
Femur	0	0	0	0	9	1	9
Fibula	0	0	0	0	2	0	2
Humerus	0	0	0	1	16	2	19
Innominate	0	0	0	1	3	0	3
Long bone (ind.)	0	0	0	0	1	1	2
Lumbar	0	0	0	0	4	0	4
Mandible	0	0	0	0	8	0	8
Metacarpal	0	0	0	0	2	0	2
Metacarpal I	0	0	0	0	1	0	1
Metacarpal II	0	0	0	0	0	0	0
Metacarpal III	0	0	0	0	2	0	2
Metacarpal IV	0	0	1	0	0	0	1
Metacarpal V	0	0	0	0	0	0	0
Metapodial	0	1	1	1	13	2	18
Metatarsal	0	0	0	0	0	0	0
Metatarsal I	0	0	0	0	6	0	6
Metatarsal II	0	0	0	0	2	0	2
Metatarsal III	0	0	0	0	6	0	6
Metatarsal IV	0	0	0	0	2	0	2
Metatarsal V	0	0	2	0	13	1	16
Navicular	0	0	0	0	0	0	0
Patella	0	0	0	0	0	0	0
Phalanx (ind.)	0	0	0	1	7	1	9
1st Phalanx	0	0	1	0	17	1	19
2nd Phalanx	0	0	0	0	2	0	2
3rd Phalanx	0	0	1	0	3	0	4
Radius	0	0	0	0	4	0	4
Rib	0	0	7	5	86	6	104
Sacrum	0	0	0	0	0	0	0
Scapula	0	0	0	1	3	1	5
Sesamoid	0	0	0	0	0	1	1
Tarsal	0	0	0	0	0	0	0

Table B.3 (cont.)

Element	Feature Type						
	LS	TR	TR MDN	SSH	MDN	N/A	Total
Thoracic	0	0	0	0	2	0	2
Tibia	0	0	0	0	7	0	7
Tibia+Fibula	0	0	0	0	0	0	0
Teeth	0	0	0	0	6	1	7
Ulna	0	0	0	1	10	0	11
Vertebra (ind.)	0	0	0	0	0	0	0
Total	**0**	**1**	**13**	**12**	**274**	**21**	**321**

Table B.4
QjJx-10 Arctic Fox element frequencies, 1992 surface examination

Element	Feature Type						
	LS	TR	TR MDN	SSH	MDN	N/A	Total
Astragalus	0	0	0	0	0	0	0
Atlas	0	0	0	0	0	0	0
Axial (ind.)	0	0	0	0	0	0	0
Axis	0	0	0	0	0	0	0
Baculum	0	0	0	0	0	0	0
Calcaneum	0	0	0	0	2	0	2
Carpals	0	0	0	0	0	0	3
Carp/Tars (ind.)	0	0	0	0	0	0	0
Caudal	0	0	0	0	2	1	3
Cervical 3-7	0	0	0	0	0	0	0
Costal Cart.	0	0	0	0	0	0	0
Cuboid	0	0	0	0	0	0	0
Cranial	0	0	0	0	0	0	0
Femur	0	0	0	0	8	0	8
Fibula	0	0	0	0	0	0	0
Humerus	0	0	2	0	0	1	12
Innominate	0	0	2	0	1	0	3
Long bone (ind.)	0	0	0	0	0	0	0
Lumbar	0	0	0	1	0	0	1
Mandible	0	0	0	0	0	0	0
Metacarpal	0	0	0	0	0	0	0
Metacarpal I	0	0	0	0	0	0	0
Metacarpal II	0	0	0	0	0	0	0
Metacarpal III	0	0	0	0	0	0	0
Metacarpal IV	0	0	0	0	0	0	0
Metacarpal V	0	0	0	0	0	0	0
Metapodial	0	0	0	0	2	0	2
Metatarsal	0	0	0	0	0	0	0

Table B.4 (cont.)

Element	Feature Type						
	LS	TR	TR MDN	SSH	MDN	N/A	Total
Metatarsal I	0	0	0	0	0	0	0
Metatarsal II	0	0	0	0	0	0	0
Metatarsal III	0	0	0	0	0	0	0
Metatarsal IV	0	0	0	0	0	0	0
Metatarsal V	0	0	0	0	0	0	0
Navicular	0	0	0	0	0	0	0
Patella	0	0	0	0	0	0	0
Phalanx (ind.)	0	0	0	0	0	0	0
1st Phalanx	0	0	0	1	6	0	7
2nd Phalanx	0	0	0	1	1	0	2
3rd Phalanx	0	0	0	0	0	0	0
Radius	0	0	2	0	7	0	9
Rib	0	0	0	0	2	0	2
Sacrum	0	0	0	0	0	0	0
Scapula	0	0	0	0	1	0	1
Sesamoid	0	0	0	0	0	0	1
Tarsal	0	0	0	0	0	0	0
Thoracic	0	0	0	0	0	0	1
Tibia	0	0	2	0	3	0	5
Teeth	0	0	0	0	0	0	0
Ulna	0	0	1	0	4	0	5
Vertebra (ind.)	0	0	0	0	0	0	0
Total	**0**	**0**	**9**	**3**	**49**	**2**	**63**

Table B.5
QjJx-10 Small Seal element frequencies, 1993 excavation

Element	Feature										
	30	31	57	59	70	74	78	79	84	90	91	Total
Astragalus	0	0	0	0	2	0	0	3	5	0	1	11
Atlas	0	0	0	0	1	0	4	1	9	0	0	15
Axial (ind.)	0	0	0	0	0 (1)*	0	0	0	0	0	0	1
Axis	0	0	0	0	1	0	5	0	9	0	0	15
Baculum	0	0	0	0	0	0	0	0	0	0	0	0
Calcaneum	0	0	0	0	4	0	0	2	7	0	1	14
Carpal	0	0	4	0	0	0	9	3	29	0	0	45
Carp/Tars (ind.)	0	0	0	0	2	0	0	0	1	2	0	5
Caudal	0	0	1	0	3	0	8	5	21	0	1	39
Cervical 3-7	0	3	1	0	1	0	9	5	28	1	0	48
Costal Cart.	0	0	5	3	13 (1)	3	49	18	107	5	1	205
Cuboid	0	0	0	0	2	0	1	1	4	0	0	8
Cranial	0	0	0	0	0 (2)	0	1	1	5	1	0	10
Femur	0	2	0	0	5	0	12	7	39	1	0	66
Fibula	0	2	0	0	0	0	5	6	23	0	0	36
Humerus	0	0	0	0	4	1	12	14	25	3	2	61
Hyoid	0	0	0	0	1 (1)	0	0	0	0	0	0	2
Innominate	0	0	0	0	2	0	12	2	8	1	1	26
Long bone (ind.)	0	0	0	0	0	0	0	0	3	1	0	4
Lumbar	0	2	2	0	3	1	9	8 (2)	41	1	1	70
Mandible	0	0	0	1	1	1	10	0	33	2	1	49
Metacarpal	0	0	1	0	0	0	0	0	4	0	0	5
Metacarpal I	0	0	1	1	0	0	3	4	11	0	0	20
Metacarpal II	0	0	0	1	1	0	3	5	8	0	1	19
Metacarpal III	0	0	2	0	0	0	2	3	7	0	0	14
Metacarpal IV	0	0	1	0	1	0	3	2	12	1	0	20
Metacarpal V	0	0	2	0	0	2	0	2	10	0	0	16
Metapodial	0	0	0	0	0	0	1	2	7	1	0	11

Table B.5 (cont.)

Element	Feature											
	30	31	57	59	70	74	78	79	84	90	91	Total
Metatarsal	0	0	0	0	0	0	0	0	2	0	0	2
Metatarsal I	0	1	2	0	1	0	4	2	21	3	2	36
Metatarsal II	1	0	0	0	2	0	0	1	13	0	1	18
Metatarsal III	0	0	1	0	0	0	3	1	12	1	1	19
Metatarsal IV	0	1	1	0	1	0	2	3	8	2	0	18
Metatarsal V	0	0	0	0	3 (1)	0	2	3	5	1	1	16
Navicular	0	0	0	0	1	0	0	0	2	0	0	3
Patella	0	0	1	0	2	1	0	2	6	0	0	12
Phalanx (ind.)	1	0	0	1	2	1	2	3	22	1	1	34
1st Phalanx	0	0	1	0	1	1	8	3	30	0	1	45
Ft. 1st Phalanx	0	0	6	0	4	1	18	16	29	2	0	76
Hd. 1st Phalanx	0	2	2	0	4	0	20	6	23	3	2	62
2nd Phalanx	0	0	2	0	0	0	4	1	26	0	0	33
Ft. 2nd Phalanx	0	0	3	0	4	0	15	13	33	4	0	72
Hd. 2nd Phalanx	0	0	2	1	4	0	6	7	20	1	0	41
3rd Phalanx	0	0	2	1	1	0	10	7	41	3	2	67
Ft. 3rd Phalanx	0	0	5	1	1	0	5	1	7	0	0	20
Hd. 3rd Phalanx	0	1	0	0	1	0	2	0	0	0	1	5
Radius	0	1	1	0	1	2	3	5	33	0	0	46
Rib	3	3	10	4	41 (1)	6	68	80	301	7	5	529
Sacrum	0	0	0	0	2	0	10	12	41	2	0	67
Scapula	0	0	1	0	10	1	11	10	40	1	0	74
Sesimoid	0	0	2	0	0	0	9	6	9	0	0	26
Sternum	0	1	0	0	1	0	8	0	1	0	0	11
Tarsal	0	0	1	0	3	0	4	5	20	1	1	35
Thoracic	0	2	0	0	1	2	13	8 (1)	91	1	3	122
Tibia	0	2	0	0	1	2	4	8	36	1	4	58
Tibia + Fibula	0	0	0	0	0	0	0	1	7	0	1	9
Teeth	0	3	0	0	1	0	10	1	21	2	0	38
Ulna	0	0	1	0	4	0	9	9	24	0	0	47

Table B.5 (cont.)

Element	Feature											
	30	31	57	59	70	74	78	79	84	90	91	Total
Vertebra (ind.)	0	2	3	0	6 (1)	3	53	32	269	3	2	374
Total	**5**	**28**	**67**	**14**	**150 (8)**	**28**	**461**	**340 (3)**	**1649**	**59**	**38**	**2850**

* the numbers in parentheses indicate bones which were found in a "cache pit" depression within the excavated features 70 and 79

Table B.6
QjJx-10 Bearded Seal element frequencies, 1993 excavation

Element	Feature											
	30	31	57	59	70	74	78	79	84	90	91	Total
Astragalus	0	0	0	0	0	0	1	1	1	0	0	3
Atlas	0	0	0	0	0	0	0	0	1	0	0	1
Axial (ind.)	0	0	0	0	0	0	0	0	0	0	0	0
Axis	0	0	0	0	1	0	0	0	0	0	0	1
Baculum	0	0	0	0	0	0	0	0	0	0	0	0
Calcaneum	0	0	0	0	0	0	0	3	1	0	0	4
Carpal	0	0	0	0	0	0	1	0	0	0	0	1
Carp/Tars (ind.)	0	0	0	0	0	0	0	0	0	0	0	0
Caudal	0	0	0	0	0	0	4	2 (1)*	0	0	0	7
Cervical 3-7	0	0	0	0	1	0	2	3	1	0	0	7
Costal Cart.	0	0	1	0	0	0	1	4	0	0	0	6
Cuboid	0	0	0	0	0	0	0	1	0	0	0	1
Cranial	0	0	0	0	0	1	0	1	0	0	0	2
Femur	1	0	0	0	2	0	1	1	5	0	0	10
Fibula	0	0	0	0	0	1	1	0	0	0	0	2

Table B.6 (cont.)

Element	Feature											
	30	31	57	59	70	74	78	79	84	90	91	Total
Humerus	0	0	0	1	3	0	0	0	0	0	0	4
Hyoid	0	0	0	0	0	0	0	0	0	0	0	0
Innominate	0	0	0	0	0	0	2	1	3	0	0	6
Long bone (ind.)	0	0	0	0	0	0	0	0	0	0	0	0
Lumbar	0	0	0	1	4	0	1	3	1	0	0	10
Mandible	0	0	0	0	0	0	0	0	0	0	0	0
Metacarpal	0	0	0	0	0	0	0	0	0	0	0	0
Metacarpal I	0	0	0	0	0	1	0	0	0	0	0	1
Metacarpal II	0	0	0	0	1	0	0	0	0	0	0	1
Metacarpal III	0	0	0	0	0	0	0	0	0	0	0	0
Metacarpal IV	0	0	0	0	0	0	0	0	0	0	0	0
Metacarpal V	0	0	0	0	1	0	0	0	0	0	0	1
Metapodial	0	0	0	0	1	0	0	2	0	0	0	3
Metatarsal	0	0	0	0	0	0	0	0	0	0	0	0
Metatarsal I	0	0	0	0	1	0	0	2	1	0	0	4
Metatarsal II	0	0	0	0	0	0	1	1	0	0	0	2
Metatarsal III	0	0	0	0	0	0	0	0	0	0	0	0
Metatarsal IV	0	0	0	0	1	0	0	3 (1)	0	0	0	5
Metatarsal V	0	0	0	0	1	0	0	2	1	1	0	5
Navicular	0	0	0	0	0	0	0	0	0	0	0	0
Patella	0	0	0	0	0	0	0	1	0	0	0	1
Phalanx (ind.)	0	0	0	0	2	0	1	2	1	0	0	6
1st Phalanx	0	0	1	0	2	0	3	1	4	0	0	11
Ft. 1st Phalanx	0	0	0	0	1	0	0	1	0	0	0	2
Hd. 1st Phalanx	0	1	0	0	6	0	1	15	3	0	0	26
2nd Phalanx	0	0	2	0	1	0	0	0	1	0	0	4
Ft. 2nd Phalanx	0	0	0	0	0	0	3	4	0	0	0	7
Hd. 2nd Phalanx	0	0	1	0	1	0	1	7	0	0	0	10
3rd Phalanx	0	0	0	0	0	0	0	2	0	0	0	2
Ft. 3rd Phalanx	0	0	0	0	2	0	4	4	0	0	0	10

Table B.6 (cont.)

Element	Feature											
	30	31	57	59	70	74	78	79	84	90	91	Total
Hd. 3rd Phalanx	0	0	0	1	1	0	2	3	0	0	0	7
Radius	0	1	0	0	1	0	0	0	3	0	0	5
Rib	0	0	1	0	20 (1)	1	19	23	19	0	0	84
Sacrum	0	0	0	0	0	0	2	0	0	0	0	2
Scapula	0	0	0	0	2 (1)	0	0	0	0	0	0	3
Sesimoid	0	0	0	0	0	0	0	0	0	0	0	0
Sternum	0	2	0	0	1	0	1	3	0	0	0	7
Tarsal	0	0	0	0	0	0	0	2	0	0	0	2
Thoracic	0	3	0	0	2	0	7	1	0	0	0	13
Tibia	0	0	0	0	0	0	1	0	0	0	0	1
Tibia + Fibula	0	0	0	0	0	0	0	0 (3)	0	0	0	3
Teeth	0	0	0	0	0	0	0	1	0	0	0	1
Ulna	0	0	0	0	0	0	1	5	2	0	0	8
Vertebra (ind.)	0	0	0	0	13	0	3	9	5	0	0	30
Total	**1**	**7**	**6**	**3**	**72 (2)**	**4**	**64**	**114 (5)**	**53**	**1**	**0**	**332**

* the numbers in parentheses indicate bones which were found in a "cache pit" depression within the excavated features 70 and 79

Table B.7
QjJx-10 Walrus element frequencies, 1993 excavation

Element	Feature										
	30	31	57	59	70	74	78	79	84	90	91	Total
Astragalus	0	0	0	0	0	0	0	0	0	0	0	0
Atlas	0	0	0	0	0	0	0	0	1	0	0	1
Axial (ind.)	0	0	0	0	0	0	0	0	0	0	0	0
Axis	0	0	0	0	0	0	1	0	0	0	0	1
Baculum	0	0	0	0	0	0	0	0	0	0	0	0
Calcaneum	0	0	0	0	0	0	0	0	0	0	0	0
Carpal	0	0	0	0	0	0	0	0	0	0	0	0
Carp/Tars (ind.)	0	0	0	0	1	0	0	1	0	0	0	2
Caudal	0	0	0	0	0	0	0	0	0	0	0	0
Cervical 3-7	0	0	0	0	0	0	0	0	0	0	0	0
Costal Cart.	0	0	0	0	0	0	0	0	0	0	0	0
Cuboid	0	0	0	0	0	0	0	0	0	0	0	0
Cranial	0	2	0	0	0	0	1	0	2	0	0	5
Femur	0	0	0	0	0	0	3	0	0	0	0	3
Fibula	0	0	0	0	0	0	1	0	3	0	0	4
Humerus	1	0	0	0	0	0	3	0	3	0	0	7
Hyoid	0	0	0	0	0	0	0	0	0	0	0	0
Innominate	0	0	0	0	0	0	0	0	0	0	0	0
Long bone (ind.)	0	0	0	0	0	0	0	0	0	0	0	0
Lumbar	0	0	0	1	0 (1)*	0	1	0 (1)	0	0	0	4
Mandible	0	1	0	0	1	0	0	0	0	0	0	2
Metacarpal	0	0	0	0	0	0	0	0	1	0	0	1
Metacarpal I	0	0	0	0	0	0	0	0	0	0	0	0
Metacarpal II	0	0	0	0	0	0	1	0	0	0	0	1
Metacarpal III	0	0	0	0	0	0	1	0	2	0	0	3
Metacarpal IV	0	0	0	0	0	0	0	0	0	0	0	0
Metacarpal V	0	0	0	0	0	0	0	0	0	0	0	0
Metapodial	0	0	0	0	2	0	2	0	0	0	0	4

Table B.7 (cont.)

Element	Feature											
	30	31	57	59	70	74	78	79	84	90	91	Total
Metatarsal	0	0	0	0	0	0	0	0	0	0	0	0
Metatarsal I	0	0	0	0	0	0	1	0	1	0	0	2
Metatarsal II	0	0	0	0	0	0	2	0	0	0	0	2
Metatarsal III	0	0	0	0	0	0	0	0	2	0	0	2
Metatarsal IV	0	0	0	0	0	0	0	0	1	0	0	1
Metatarsal V	0	0	0	0	0	0	0	0	0	0	0	0
Navicular	0	0	0	0	0	0	0	0	0	0	0	0
Patella	0	0	0	0	0	0	0	0	0	0	0	0
Phalanx (ind.)	0	0	0	0	0	0	0	0	1	0	0	1
1st Phalanx	0	0	2	0	0	0	1	0	4	0	0	7
Ft. 1st Phalanx	0	0	0	0	0	0	0	0	0	0	0	0
Hd. 1st Phalanx	0	0	0	0	1	0	4	0	1	0	0	6
2nd Phalanx	0	0	0	0	1	0	1	0	0	0	0	2
Ft. 2nd Phalanx	0	0	0	0	0	0	0	0	0	0	0	0
Hd. 2nd Phalanx	0	0	0	0	0	0	0	0	1	0	0	1
3rd Phalanx	0	0	0	0	1	0	1	2	0	0	0	4
Ft. 3rd Phalanx	0	0	0	0	0	0	0	0	0	0	0	0
Hd. 3rd Phalanx	0	0	0	0	0	0	0	0	0	0	0	0
Radius	0	0	0	0	0	0	3	0	1	0	0	4
Rib	0	0	0	4	2 (1)	0	15	6	19	1	0	48
Sacrum	0	0	0	0	0	0	0	0	0	0	0	0
Scapula	0	0	0	0	0	0	0	0	1	0	0	1
Sesimoid	0	0	0	0	0	0	0	0	0	0	0	0
Sternum	0	0	0	0	0	0	1	0	0	0	0	1
Tarsal	0	0	0	0	0	0	0	0	0	0	0	0
Thoracic	0	0	0	0	0	0	0	0	0	0	0	0
Tibia	0	1	0	0	0	0	0	0	0	0	0	1
Tibia + Fibula	0	0	0	0	0	0	0	0	0	0	0	0
Teeth	0	2	0	0	1	0	0	0	0	0	0	3

Table B.7 (cont.)

Element	Feature											
	30	31	57	59	70	74	78	79	84	90	91	Total
Ulna	0	0	0	0	0	0	0	0	0	0	0	0
Vertebra (ind.)	0	0	0	1	0	0	6	0	0	0	0	7
Total	**1**	**6**	**2**	**6**	**10 (2)**	**0**	**49**	**9 (1)**	**44**	**1**	**0**	**131**

* the numbers in parentheses indicate bones which were found in a "cache pit" depression within the excavated features 70 and 79

Table B.8

QjJx-10 Arctic Fox element frequencies, 1993 excavation

Element	Feature											
	30	31	57	59	70	74	78	79	84	90	91	Total
Astragalus	0	0	0	0	2	0	1	6	0	0	0	9
Atlas	0	0	0	0	3	0	5	3	2	0	0	13
Axial (ind.)	0	0	0	0	0	0	0	0	0	0	0	0
Axis	0	0	0	0	3	0	3	4	2	0	0	12
Baculum	0	0	0	0	0	0	1	1	0	0	0	2
Calcaneum	0	0	0	0	1	0	2	8	1	0	0	12
Carpal	0	0	0	0	4	0	4	0	0	0	0	8
Carp/Tars (ind.)	0	0	0	0	0	0	0	2	0	0	0	2
Caudal	0	0	3	0	3	0	15	10	3	0	0	34
Cervical 3-7	0	0	0	0	4	0	6	7	1	0	0	18
Costal Cart.	0	0	0	0	0	0	0	0	0	0	0	0
Cuboid	0	0	0	0	0	0	0	0	0	0	0	0
Cranial	0	0	0	1	6	0	48	1 (2)*	3	0	1	62

Table B.8 (cont.)

Element	Feature										
	30	31	57	59	70	74	78	79	84	90	91	Total
Femur	0	0	0	1	5	0	15	14	3	0	0	38
Fibula	0	0	0	0	2	0	6	7	0	0	0	15
Humerus	0	0	1	0	6	0	5	25	2	0	0	39
Hyoid	0	0	0	0	0	0	0	3	0	0	0	3
Innominate	0	0	0	1	2	0	11	10	0	0	0	24
Long bone (ind.)	0	0	0	0	0	0	0	0	0	0	0	0
Lumbar	0	0	0	0	2	0	6	24	0	0	0	32
Mandible	0	0	0	0	1	0	2	0	1	0	0	4
Metacarpal	0	0	0	0	0	0	0	0	0	0	0	0
Metacarpal I	0	0	0	0	0	0	0	0	0	0	0	0
Metacarpal II	0	0	0	0	1	0	2	1	1	0	0	5
Metacarpal III	0	0	0	0	2	0	3	2	0	0	0	7
Metacarpal IV	0	0	0	0	2	0	2	2	0	0	0	6
Metacarpal V	0	0	0	0	2	0	3	1	0	0	0	6
Metapodial	0	0	0	0	0	0	3	0	2	0	0	5
Metatarsal	0	0	0	0	0	0	0	0	0	0	0	0
Metatarsal I	0	0	0	0	0	0	0	0	0	0	0	0
Metatarsal II	0	0	0	0	2	0	2	3	0	0	0	7
Metatarsal III	0	0	0	0	2	0	4	2	0	0	0	8
Metatarsal IV	0	0	0	0	2	0	6	4	0	0	0	12
Metatarsal V	0	0	0	0	2	0	2	6	0	0	0	10
Navicular	0	0	0	0	0	0	0	0	0	0	0	0
Patella	0	0	0	0	0	0	3	0	0	0	0	3
Phalanx (ind.)	0	0	0	0	0	0	0	1	1	0	0	2
1st Phalanx	0	0	0	0	8	0	20	22	0	0	0	50
Ft. 1st Phalanx	0	0	0	0	0	0	0	0	0	0	0	0
Hd. 1st Phalanx	0	0	0	0	0	0	0	0	0	0	0	0
2nd Phalanx	0	0	0	0	5	0	14	10	0	0	0	29
Ft. 2nd Phalanx	0	0	0	0	0	0	0	0	2	0	0	2

Table B.8 (cont.)

Element	Feature										
	30	31	57	59	70	74	78	79	84	90	91	Total
Hd. 2nd Phalanx	0	0	0	0	0	0	0	0	0	0	0	0
3rd Phalanx	0	0	0	0	2	0	2	1	1	0	0	6
Ft. 3rd Phalanx	0	0	0	0	0	0	0	0	0	0	0	0
Hd. 3rd Phalanx	0	0	0	0	0	0	0	0	0	0	0	0
Radius	0	0	2	0	3	0	2	16	3	0	0	26
Rib	0	0	0	0	22	0	47	115	5	1	0	190
Sacrum	0	0	0	0	0	0	1	1	0	0	0	2
Scapula	0	0	0	0	3	0	5	10	0	0	0	18
Sesimoid	0	0	0	0	2	0	0	2	0	0	0	4
Sternum	0	0	0	0	0	0	1	8	0	0	0	9
Tarsal	0	0	0	0	2	0	6	4	0	0	0	12
Thoracic	0	0	0	1	4	0	16	20	3	0	0	44
Tibia	0	0	0	0	2	1	12	16	5	0	0	36
Teeth	0	0	0	0	4	0	9	0	1	0	0	14
Ulna	0	0	0	0	7	0	9	19	2	0	0	37
Vertebra (ind.)	0	0	0	0	2	0	3	1	0	0	0	6
Total	**0**	**0**	**6**	**4**	**125**	**1**	**307**	**392 (2)**	**44**	**1**	**1**	**883**

* the numbers in parentheses indicate bones which were found in a "cache pit" depression within the excavated features 70 and 79

APPENDIX C

Table C.1
Skeletal element frequencies for the order Pinnipedia (from King 1964)

Element	Frequency	% of Average Total
Cranium	1	0.5
Mandible	2	1.0
Atlas	1	0.5
Axis	1	0.5
Cervical (3-7)	5	2.5
Thoracic	15 (Walrus 14)	7.5 (Walrus 7.0)
Lumbar	5 (Walrus 6)	2.5 (Walrus 3.0)
Sacrum	1 (3)	0.5 (1.5)
Caudal	10-12	5.0-6.0
Innominate	2	1.0
Rib	30	15.0
Sternum	1 (8-9)	0.5 (4.0-4.5)
Scapula	2	1.0
Clavicle	0	0
Humerus	2	1.0
Radius	2	1.0
Ulna	2	1.0
Carpal	14	7.0
Metacarpal	10	5.0
Femur	2	1.0
Patella	2	1.0
Tibia	2	1.0
Fibula	2	1.0
Astragalus	2	1.0
Calcaneum	2	1.0
Other tarsals	10	5.0
Metatarsal	10	5.0
1st Phalanx	20	10.0
2nd Phalanx	16	8.0
3rd Phalanx	20	10.0
Total	194-196	

(or 203-206, including the sacral and sternal pieces)

Average Total **200 (avg. of min. and max. number of bones)**

Table C.2
Skeletal element frequencies for the family Canidae (from Olsen 1990)

Element	Frequency	% of Total
Cranium	1	0.5
Mandible	2	1.0
Atlas	1	0.5
Axis	1	0.5
Cervical (3-7)	5	2.5
Thoracic	14	7.0
Lumbar	6	3.0
Sacrum	1	0.5
Caudal	20 (avg.)	10.0
Innominate	2	1.0
Rib	24	12.0
Sternum	1 (3)	1.5
Scapula	2	1.0
Clavicle	0	0
Humerus	2	1.0
Radius	2	1.0
Ulna	2	1.0
Carpal	14	7.0
Metacarpal	10	5.0
Femur	2	1.0
Patella	2	1.0
Tibia	2	1.0
Fibula	2	1.0
Astragalus	2	1.0
Calcaneum	2	1.0
Other tarsals	10	5.0
Metatarsal	10	5.0
1st Phalanx	20	10.0
2nd Phalanx	10	5.0
3rd Phalanx	20	10.0
Total	**200**	