PEOPLING THE PRE-DORSET PAST:

A MULTI-SCALAR STUDY

OF EARLY ARCTIC LITHIC TECHNOLOGY

AND SEASONAL LAND USE PATTERNS

ON SOUTHERN BAFFIN ISLAND

By

S. Brooke Milne, B.A. Hons, M.A.

A Thesis

Submitted to the School of Graduate Studies

In Partial Fulfillment of the Requirements

for the Degree

Doctor of Philosophy

McMaster University

PEOPLING THE PRE-DORSET PAST:
A MULTISCALAR STUDY

DOCTOR OF PHILOSOPHY (2003) McMaster University
(Anthropology) Hamilton, Ontario

TITLE: Peopling the Pre-Dorset Past: A Multi-Scalar Study of Early Arctic Lithic Technology and Seasonal Land Use Patterns on Southern Baffin Island.

AUTHOR: S. Brooke Milne, B.A. Hons. (University of Waterloo), M.A. (Trent University)

SUPERVISOR: Dr. A. Cannon

NUMBER OF PAGES: xvi, 455

Abstract

This dissertation aims to identify and understand the seasonal, subsistence, and social contexts of lithic tool production, use, and discard amongst the Pre-Dorset peoples inhabiting southern Baffin Island. Lithic artifact assemblages from four coastal and three inland site components are examined for patterns of variability that can be used to address two interrelated research problems. The first focuses on understanding functional differences between Pre-Dorset inland and coastal sites. While Arctic archaeologists generally believe the Pre-Dorset followed a season round structured by inland and coastal activities, comparative analyses to explore how sites in these locales were used and when they were occupied have not been conducted. The second problem seeks to study variability as though "people mattered." Current analyses of Pre-Dorset culture focus largely on culture historical issues, thus there is little sense of who these people were.

Over 24,000 lithic artifacts are analyzed using a combined methodological approach. Isolated patterns of variability are interpreted using two theoretical frameworks: the organization of technology, and agency theory. Because the stated research problems have different spatial and temporal dimensions, a multi-scalar framework is used to organize separate scales of analysis.

The results of this study indicate the Pre-Dorset people occupying southern Baffin Island did follow a seasonal round structured by inland and coastal activities. However, the primary incentive drawing people inland was the availability of lithic raw materials. Using a direct procurement strategy, specially organized task groups traveled to the interior during the warm season to renew their toolstone supplies and interact with other distant groups. Those individuals who did not travel inland remained at sites in the coastal uplands. At the end of summer, these groups reunited in the coastal uplands where Arctic char and caribou are abundant. The Pre-Dorset then organized their lithic and organic toolkits in preparation for the journey to their winter camps in the outer coastal regions.

Acknowledgements

In the fall of 1990, I was a first year student at Simon Fraser University, and all I wanted to do was play Division I soccer. At the time, I hadn't really thought about what I wanted to learn while at university. On the last day of "add/drop," I needed one more class to fill my term course load but all of the obvious choices were already full. My athletic advisor told me to sign up for an introductory course on early human origins and evolution; it was an anthropology course and there was still some space in it. It turns out his suggestion was one of the best pieces of advice anyone has ever given me. I found anthropology quite by accident and it literally changed my life. Even though I took few years off to pursue a career of a different sort (World Cup Snowboard racing!), I knew clear as day after that first year that I was going to get a Ph.D. in anthropology. Now, 12 years later, I have finished my Doctoral dissertation but I would not be where am I now had I not had the good fortune to meet and work with so many brilliant, generous people.

Thank you to my research advisor Dr. Aubrey Cannon for always challenging me to think. I have learned so much from him about archaeological theory, sampling procedures, statistics, and people and their actions in the past. Because of his efforts I believe this research project has evolved into a far more interesting and inclusive study that it might otherwise have been. I am very thankful Dr. Cannon was willing to act as my research supervisor. I appreciate Dr. Cannon's patience, guidance, and good humour, especially with reading all of the lithics literature and conference papers I've presented to him over the last several years. If anyone asks Dr. Cannon what "outrepassé" means, he'll surely be able to tell them!

Thank you to Dr. Robert Park for being a member of my committee, and for seeing me through this long journey. Dr. Park was my first archaeology instructor at the University of Waterloo and he has helped me immeasurably to get to this last stage of my student career. Dr. Park introduced me to Arctic archaeology and he has provided me with so many amazing opportunities to work on projects in the North. I greatly appreciate his advice, and feel very fortunate to have worked with him and learned so much from him over the years. Dr. Park has been, and continues to be, an important mentor to me.

Thank you to Dr. Chris Ellis for being a member of my committee, and for sharing with me his knowledge and expertise on the field of lithic technology. Dr. Ellis' enthusiasm about stone tool technology is infectious, and his understanding of lithics is awe-inspiring. I have benefited greatly from Dr. Ellis' advice and suggestions. His ability to see certain patterns that were less obvious to me helped strengthen this research project. Dr. Ellis always gladly answered my questions, and he helped me find many copies of crucial articles on lithic technology, for which I am indeed grateful.

Special thanks go to Dr. Douglas Stenton for all of his help over the years. Had it not been for Dr. Stenton's pioneering work in the interior regions of southern Baffin Island, my research project simply would not have been possible. He always had time to discuss my many questions about sites, logistics, planning, and permit applications, even when I phoned him from the tundra. Dr. Stenton's encouragement and guidance have been especially helpful for getting me through this degree. He too has provided me with so many great opportunities to work in the North and I look forward to working with him on other future projects.

There are several people in the Department of Anthropology at McMaster I would like to mention. Thank you to Dr. Andrew Martindale for helping me to finally understand a graduate course on archaeological theory. Dr. Martindale willingly read and commented on several of my conference papers, and he always took the time to ask how things were going. Dr. Martindale was also instrumental in conducting the faunal analysis on the Mosquito Ridge assemblage. I'd also like to thank him for telling me such funny stories about Sydney the Wonder Dog; they definitely made me laugh. I am thankful to Sarah Donnelly for cleaning and analyzing the Mosquito Ridge faunal assemblage. The results of her study provided important insights on the seasonality and function of this site.

Thanks hardly seem enough to say to the wonderful women who make our Department at McMaster work so well. Janis Weir, Rosita Jordan, Luce Lavigne, and Rabia Awan have helped me out on so many occasions and answered my endless questions on department matters. They are all very special and I am grateful to them for making the office such a welcoming place to walk into.

I would also like to pay special thanks to several people who helped me to build a strong academic foundation early on in my student career. They include Dr. Anne Zeller (University of Waterloo), Dr. Harriet Lyons (University of Waterloo), and Dr. Susan Jamieson (Trent University).

The fieldwork component of this research project would not have been possible without the help of the following people: Sarah Bonesteel, Alex Stubbing, Andrew Sandler, Brenda Mowbray, Dr. Paul Stubbing, Dr. Robert Park, and Dr. Douglas Stenton. Thanks to all for volunteering their time, efforts, and advice. I hope to someday replace the equipment that was "lost" due to our episodes of "camp rage!"

Thank you to Susan Irving, Pat Freeman, and Joanne Bird from the Prince of Wales Northern Heritage Centre in Yellowknife for arranging the loans of the collections included in this study. Thanks also to Stacey Girling at the Canadian Museum of Civilization in Hull for her assistance with the Shaymark loan.

Many thanks go to my good friends Sarah Bonesteel, Rhonda Bathurst, Dori Rainey, Rebecca Graham, Lee Hornberger, and Tara Grant who all helped keep my feet on the ground and a smile on my face even during the most stressed out of times.

Finally, I would like to thank my family. My mother Susan and sister Elisabeth are my greatest champions, most ardent supporters, and willing listeners. I could not have made it this far without their encouragement. Thank you to Rudy Dorner for always asking me how things were going. I greatly appreciate his generosity and genuine enthusiasm for my work. Special thanks go to Clara Belle, the most educated pug in the universe. She has been my constant companion and helped to maintain both my sanity and sense of humour during this journey.

I dedicate my dissertation to my mother, Susan Milne. She willingly proofread every one of my chapter drafts, and offered suggestions on form and clarity that helped me more clearly express what I wanted to say. Having read all of this material over the years she has become an expert in her own right on Arctic prehistory and lithic technology – thanks Mom!

My Doctoral research was generously funded by the Social Sciences and Humanities Research Council of Canada Doctoral Fellowship Program, The Association for Canadian Universities for Northern Studies (ACUNS) Studentship Awards Program, The Northern Scientific Training Program, and The McMaster University School of Graduate Studies.

Table of Contents

List of Figures

List of Tables

Chapter 1

Introduction

The aim of this dissertation is to identify and understand the seasonal, subsistence, and social contexts of lithic tool production, use, and discard amongst the Pre-Dorset peoples inhabiting southern Baffin Island. Pre-Dorset is the earliest known culture to occupy the eastern Canadian Low Arctic. [The Low Arctic is loosely defined as those areas lying south of the Parry Channel (see Figure 1.1). Those areas to the north of the channel are considered High Arctic since this is where conditions that define the Arctic are at their most extreme (McGhee 1996:44-45).] The Pre-Dorset are descendants from a larger cultural configuration known as the Arctic Small Tool tradition (ASTt). Irving (1957) gave this name to this culture because of the incredibly small stone tools that are found in their sites. ASTt remains were first discovered near Cape Denbigh, Alaska and based on these finds a western variant of the culture, known as the Denbigh Flint Complex, was defined by Giddings (1951). The micro-lithic industry characterizing ASTt sites is highly reminiscent of industries dating to the European Upper Palaeolithic leading to speculation this culture originated somewhere in the Old World, most likely Siberia (Giddings 1967).

The ASTt is considered a pioneering culture (Bielawski 1988). Its people were highly adapted to hunting both marine and terrestrial species, and the small, easily transportable toolkit, from which the culture name derives, is well suited to a highly nomadic lifestyle. These factors enabled the ASTt to expand some 4500 years ago into the huge, previously unoccupied territory of the eastern Arctic. Within a 500-year period, small groups of ASTt peoples colonized the Canadian High and Low Arctic, and Greenland (Maxwell 1985:45). This rapid migration was facilitated, in part, by climatic conditions at the end of the Post-Glacial Warm Period, which were warmer than those experienced in the Arctic today. Once established in these diverse areas, ASTt populations began to adapt to their respective local environments. Differences in their lifeways translated into regional variations in material culture. Archaeologists have used this diversity to identify three eastern ASTt variants: Independence I in the Canadian High Arctic and northern Greenland (McGhee 1976, 1979; Knuth 1954), Saqqaq in western Greenland (Meldgaard 1952; Larsen and Meldgaard 1958), and Pre-Dorset in the Canadian Low Arctic (Collins 1956, 1957; Maxwell 1973; Taylor 1968). Collectively, these variants are known as early Palaeo-Eskimos.

Arctic archaeologists generally believe the Pre-Dorset followed a seasonal round structured by inland and coastal activities. In the spring, Pre-Dorset populations presumably traveled inland to exploit caribou, Arctic char, and nesting waterfowl, and with the onset of winter, they moved back to the coast to hunt seals on the sea ice (e.g. Maxwell 1985:84-90; McGhee 1990:49; Meyer 1977:258-259; Wright 1995). This settlement pattern has been inferred for centuries for the Thule and Inuit, and it is believed earlier Pre-Dorset groups followed a similar pattern given the seasonal availability and distribution of subsistence and material resources in the Arctic. Yet despite the acceptance of this inland/coastal dichotomy, most research has focused on coastal sites. Little is known about Pre-Dorset inland occupations since few inland sites have been recorded, excavated, completely analyzed, and published. Moreover, attempts to locate and explore new inland areas continue to progress slowly (Bielawski 1988:57).

Further complicating this issue are problems with identifying Pre-Dorset site seasonality. Poor preservation conditions created by climatic fluctuations over the millennia, annual freeze-thaw cycles, and high soil moisture and acidity, have negatively impacted Pre-Dorset sites resulting in a paucity of preserved organic remains. Thus, this culture is known largely from its lithic artifacts (Maxwell 1984:359). Because faunal remains, organic artifacts (e.g. harpoon heads, needles), and structural features are not always present in Pre-Dorset sites, Arctic archaeologists cannot say for certain if inland sites represent summer occupations and coastal sites represent winter occupations. To date, few researchers have convincingly determined Pre-Dorset site seasonality (e.g. Le Blanc 1994; Ramsden and Murray 1995) and technological studies that interpret site function are lacking.

If the Pre-Dorset were seasonally nomadic, variability should exist in their site locations and artifact assemblages. A move from the sea ice in the spring to travel inland for the summer would necessitate changes in social composition, group mobility, settlement patterns, and subsistence pursuits. In turn, these changes would place different demands on the technological system leading the Pre-Dorset to implement alternative lithic reduction and use strategies better suited to meet changing situational needs. This adaptive flexibility undoubtedly created distinct localized patterns in the material record of this culture throughout the low Arctic. However, comparative analyses to explore similarities and differences in how Pre-Dorset inland and coastal sites were used and the artifact assemblages associated with them have never been conducted.

Archaeological research on Pre-Dorset culture continues to stress culture-historical issues, namely the refinement of regional chronological sequences (e.g. Gendron and Pinard 2000; Gordon 1996; Helmer 1991, 1994; Maxwell 1985; Schledermann 1990, 1996; Tuck and Ramsden 2001). As such, attention is focused on formal artifact descriptions and structural features because they are presumed to be sensitive indicators of temporal and cultural change (Bielawski 1988). However, despite their interpretive significance, emphasis on these narrow data sets leaves an impression that Pre-Dorset populations comprised toolkits and tent rings rather than actual beings. This, unfortunately, creates a kind of "people-less" history. Attempts have been made to construct an image of Pre-Dorset lifeways but these accounts are often based on ethnographic analogy to Inuit (e.g. Maxwell 1985; McGhee 1990) or they derive from creative narratives (e.g. McGhee 1979).

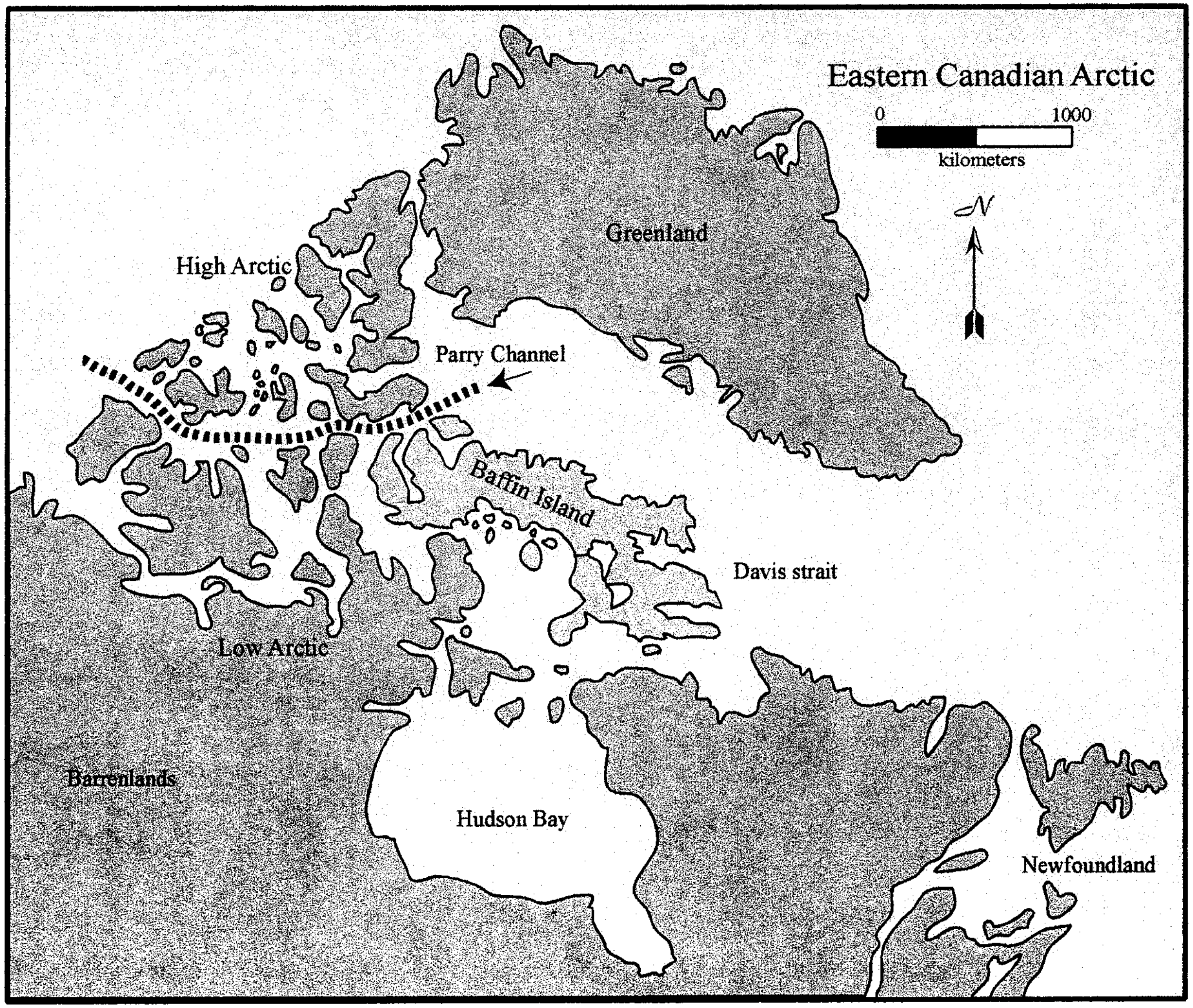


Figure 1.1 Map of the eastern Arctic indicating the location of the Parry Channel and the separation of the High and Low Arctic regions.

Because Arctic archaeologists generally treat diagnostic Pre-Dorset lithic artifacts as static typological entities, the systemic web of connections that exist among tools, and between tools and debitage is effectively destroyed (Le Blanc 1994:116). Few Arctic researchers consistently study lithic debitage in their analyses (e.g. Le Blanc 1984, 1994; Milne 1999, 2000a, 2000b) and this complicates efforts to understand why variation exists within specific tool categories and between site assemblages. Moreover, it is virtually impossible to examine how economic, social, and cultural factors contribute to assemblage variability because we cannot trace how lithic technology changes in different situational contexts from site to site. The net result is we are left with a somewhat sketchy interpretation of the Pre-Dorset as seasonal nomads predictably moving between inland and coastal areas to satisfy their immediate subsistence needs, all the while discarding diagnostic lithic tool types across the landscape.

Research Problems, Objectives, and Study Area

This study isolates and compares patterns of lithic assemblage variability in Pre-Dorset inland and coastal sites in order to address two interrelated research problems. The first focuses on identifying Pre-Dorset seasonal land-use strategies and patterns of resource exploitation. The second considers how agency may have influenced what strategies the Pre-Dorset used and when. My objectives for tackling these questions are twofold. I want to gain an understanding of how the Pre-Dorset adapted their technological behaviour in response to seasonal changes in the Arctic inland and coastal ecosystems. More explicitly, I want to examine functional differences in Pre-Dorset sites on a regional scale and use this information to assess whether or not this culture followed a seasonal round similar to that practiced by Inuit. I also want to study the existence of variability in Pre-Dorset sites "as if people mattered" (Dobres 1995, 1999a). It is important to remember that these sites represent the remains of daily interactions between individuals, their larger social group, and their physical surroundings. Because technology is intrinsically linked with such diverse interactions (Dobres 1999b; Sassaman 2000), site-specific patterns of variability can provide tangible insights into the social dynamics that structured Pre-Dorset culture and influenced when and how decisions were made.

To answer these questions and meet my objectives, I focus on lithic artifact assemblages excavated from three inland and four coastal site components on southern Baffin Island. The inland sites, known as Mosquito Ridge (MaDv-11 and MaDv-11 West) and Sandy Point (LlDv-10), are located on the western shore of Burwash Bay, which forms the southern margin of Nettilling Lake (see Figure 2.4). The coastal sites include Shaymark (KkDn-2), Davidson Point (KkDn-31), and Tungatsivvik (KkDo-3; Area Q and Area D), all of which are located at the head of Frobisher Bay, near the city of Iqaluit (see Figure 2.3).

The Pre-Dorset occupied many areas throughout the Canadian Low Arctic; however, including sites from diverse regions in this kind of study is unrealistic given the potential for local variations in resource distributions, topography, and microenvironmental conditions. By focusing on a single region, more meaningful interpretations can be drawn as to how localized populations behaved within the entire extent of their respective territories (Kelly 1994:134). Southern Baffin Island was selected for this study for several reasons. First, Mosquito Ridge and Sandy Point are the only inland Pre-Dorset sites presently known in Nunavut. Second, the interior lakes region of the island has been systematically surveyed, indicating a long-term cultural occupation spanning at least 3000 years (Stenton 1985, 1986, 1989). Third, ethnographic and ethnohistoric sources document the seasonal movements of Inuit between the southern Baffin coastal areas, including Frobisher Bay, and the interior regions, including Nettilling Lake (Boas 1888, 1901; Bilby 1923; Hall 1865). This information has important heuristic value and is used in combination with Stenton's (1989) work to construct multiple working hypotheses and related test expectations.

These are subsequently tested against the sites in this study to examine Pre-Dorset land use patterns in the southern Baffin region. Finally, the inland and coastal sites considered here are among the few Pre-Dorset sites excavated on Baffin Island where lithic debitage was collected.

Analytical Approach: The Complementarity of Macro and Micro Scale Variation

Each of the stated problems in this study has different spatial and temporal dimensions. Accordingly, my analysis of lithic assemblage variability is conducted on two separate scales: macro and micro. The macro-scale deals with phenomena that persist over the long-term (i.e. years, decades, centuries) and, in so doing, create consistent, recurrent material culture patterns that are visible on a broader, regional level. An established seasonal migration moving between the coast and inland would leave such discernible patterns because groups would repeatedly visit the same areas year after year performing similar activities in each respective locale. In contrast, the micro-scale focuses on small-scale patterns more commonly found at the individual site level. These phenomena may be the result of idiosyncratic behaviours spanning the occupation of a site or simply a moment in time. For example, if an experienced flint worker were teaching a novice the proper techniques used to make stone tools as a way to pass the time or as part of an ongoing apprenticeship, these actions would leave distinct patterns recording where these activities took place. However, unless one is looking for such patterns at the micro-scale, their uniqueness may go unrecognized amidst the more common broad scale analyses on site function, which seek generalizations in order to conduct inter-site comparisons.

Before questions concerning micro-scale variation can be effectively addressed, detailed macro-scale studies must first be conducted. When lithic artifacts are the most common form of evidence available with which to interpret a culture's lifeways (as is the case with the Pre-Dorset in the eastern Low Arctic), it is important to first understand how that culture organized its technological system. Once these broader techno-functional patterns are identified and interpreted, a more comprehensive and agent-centered understanding of prehistoric lithic technology can be pursued at the micro-scale (Dobres and Hoffman 1994:214). Without the identification of macro-scale patterns, it is difficult to recognize more unusual patterns that differ from the norm, including those that may be socially meaningful (e.g. Deller and Ellis 2001). Similarly, without micro-scale patterns, we would not be able to identify "people" in the archaeological record or the remains of their actions (Dobres 1999a:19). The micro-scale complements the macro-scale by focusing on more "interpersonal social arenas," and both are necessary in order to understand the complexities of hunter-gatherer lifeways (Dobres and Hoffman 1999:8), especially when using lithic remains.

While both scales of analysis are described as equally important and complementary, few attempts have been made to study lithic variability at the micro-scale. Because macro-scale analyses aim to use patterns of variability to identify specific behavioural systems, they tend only to "dip" down to consider site-specific patterning when it can help "build-up" regional generalizations (Dobres 1999a:15). Micro-scale variability has generally been treated as "noise," especially when it does not fit within the broader patterns isolated at the macro-scale (Hodder 2000:26). However, with the growing interest in agent-centered approaches in archaeology (see Dobres and Robb, eds. 2000a), micro-scale variation is now receiving attention. Several studies have used agency theory to examine micro-scale lithic variability in Palaeolithic sites (e.g. Dobres 2000; Dobres and Hoffman 1994; Pigeot 1990; Sinclair 2000; Wobst 2000). Agency theory has generally "avoided" the Palaeolithic and other hunter-gatherer cultures because the remains of these sites consist largely of lithics, which, by most standards, are considered too limited to support more complex interpretations (Wobst 2000:43). However, Dobres (1995, 1999a), Dobres and Hoffman (1994, 1999), and Wobst (2000) argue that socially significant micro-scale technological variability is present in prehistoric hunter-gatherer sites; we just need to change our way of "seeing" in order to identify it.

My previous research demonstrates that macro-scale patterns can be isolated in Pre-Dorset lithic assemblages and used to interpret site function (Milne 1999, 2000a). In this study I isolate macro-scale functional differences between inland and coastal sites in order to interpret seasonal land use strategies and patterns of resource exploitation. My analysis of micro-scale variability aims to understand who is making the tools at these sites. I want to know how changes in these broader phenomena alter the social relations of production since these relations determine who participates in tool making activities, when, and where. It is the agency of the toolmaker to know what strategies are suitable for certain situations and to decide if he or she will use them.

A combined methodological approach is used to isolate macro- and micro-scale patterns of lithic assemblage variability. Doing this generates multiple lines of evidence with which to interpret patterned variation (see Bradbury 1998; Bradbury and Carr 1999; Carr and Bradbury 2001). Multiple lines of evidence provide more accurate indicators of specific reduction strategies present in an assemblage than any single line of evidence can, and they serve as internal checks as to the reliability of an analysis and the interpretations based on it (Magne 2001:23). Four methods were selected for use in this study: individual attribute analysis, mass analysis, minimum analytical nodule analysis, and the Sullivan and Rozen (1985) method. Once isolated, patterns of variability are principally interpreted using two theoretical frameworks: the organization of technology (i.e. chaînes opératoire) and agency theory. A multi-scalar approach (Dobres 1995, 1999a; Marquardt 1992) is used to organize and integrate these different scales of analysis and interpretation.

Significance of Research

This research is significant for several reasons: it provides the first comparative analysis between Pre-Dorset inland and coastal lithic assemblages; it contributes valuable information on the inland segment of the Pre-Dorset adaptation; and it attempts to bring a sense of people to our interpretations of Pre-Dorset culture by emphasizing the role of individuals as social agents who actively contribute variability to the archaeological record within and between sites. This study uses lithic evidence as a means to answer more complex questions about Pre-Dorset land use strategies, economic pursuits, and social organization. It does not describe lithic artifacts as if they existed as their own entities, separate from the people who made them and the contexts in which they were used.

Organizational Framework

Chapter 2 provides background information on the physiography, climate, and resource base that characterizes southern Baffin Island and discusses the land use patterns practiced by the historic and prehistoric populations occupying this region. The Pre-Dorset inland and coastal site components included in this study are also introduced. Chapter 3 discusses what is presently known about the Pre-Dorset culture and the methods used to study its material remains. I address some of the interpretive limitations associated with these methods and argue instead that Pre-Dorset lithic assemblage variability can be better understood if it is examined using a perspective that recognizes lithic reduction as a continuum. Because hunter-gatherers typically stage the reduction of their lithic assemblages as they move throughout their territory, patterns of variability isolated in individual sites can be compared to understand what stages of the reduction continuum are represented among them. In turn, this information can be used to interpret differences in site function, patterns of resource exploitation, and land use strategies. By isolating these types of macro-scale patterns, more insightful micro-scale interpretations about Pre-Dorset social structure can be made.

Chapter 4 presents the theoretical frameworks used in this study and explains how they are applied to different scales of analysis. Multiple working hypotheses and related test expectations are constructed for this study and their presentation concludes the chapter. Chapter 5 outlines the research methodology used to isolate and examine patterns of lithic assemblage variability. The sampling strategy used in the debitage analysis is also explained. Chapter 6 describes and explains the data for each site component, and evaluates similarities and differences observed among the coastal and inland regions, respectively. Chapter 7 directly compares these coastal and inland patterns, and uses this information, along with that presented in Chapter 6, to evaluate the proposed research hypotheses. Chapter 7 also provides an assessment of the methodological approach used in this study and determines that the application of multiple analytical methods is not entirely effective for studying the lithic artifact assemblages of the Pre-Dorset culture. Chapter 8 summarizes this study and presents its conclusions.

Chapter 2

Study Area, Land Use Patterns, and Sites

This chapter presents background information on the study area and explains how it was used by the historic and pre-historic populations occupying southern Baffin Island. The local physiography, climate, and resource base are described to situate my discussion of recorded land use patterns in the region. This information is subsequently used in Chapter 4 to construct multiple working hypotheses and related test expectations. This chapter concludes with a description of the sites included in this study and their respective artifact assemblages.

Physiography

Following Greenland and Australia, Baffin Island is the third largest island in the world (see Figure 2.1). It spans approximately 1545 kilometers in length with maximum and minimum widths of roughly 675 and 240 kilometers, respectively (Soper 1928:2). The total area of Baffin Island is over 518,000 square kilometers. Polunin (1948:131) defines Southern Baffin Island by drawing a line from the Arctic Circle (66° 32'N) on the west coast to Neptune Bay on the east coast, and it includes all terrain between 66° 32' N to 61° 25' N and 63° 30' W to 78° 20' W (see Figure 2.2). Compared to northern Baffin, the physical features present in the southern regions are less variable and generally have much lower elevations, especially in the northwestern plains near the Foxe Basin (Polunin 1948:131). The coastlines of southern Baffin Island are irregular and more rugged with deep, narrow fiords and wider bays (Soper 1928:2). Numerous islands fringe the coastlines.

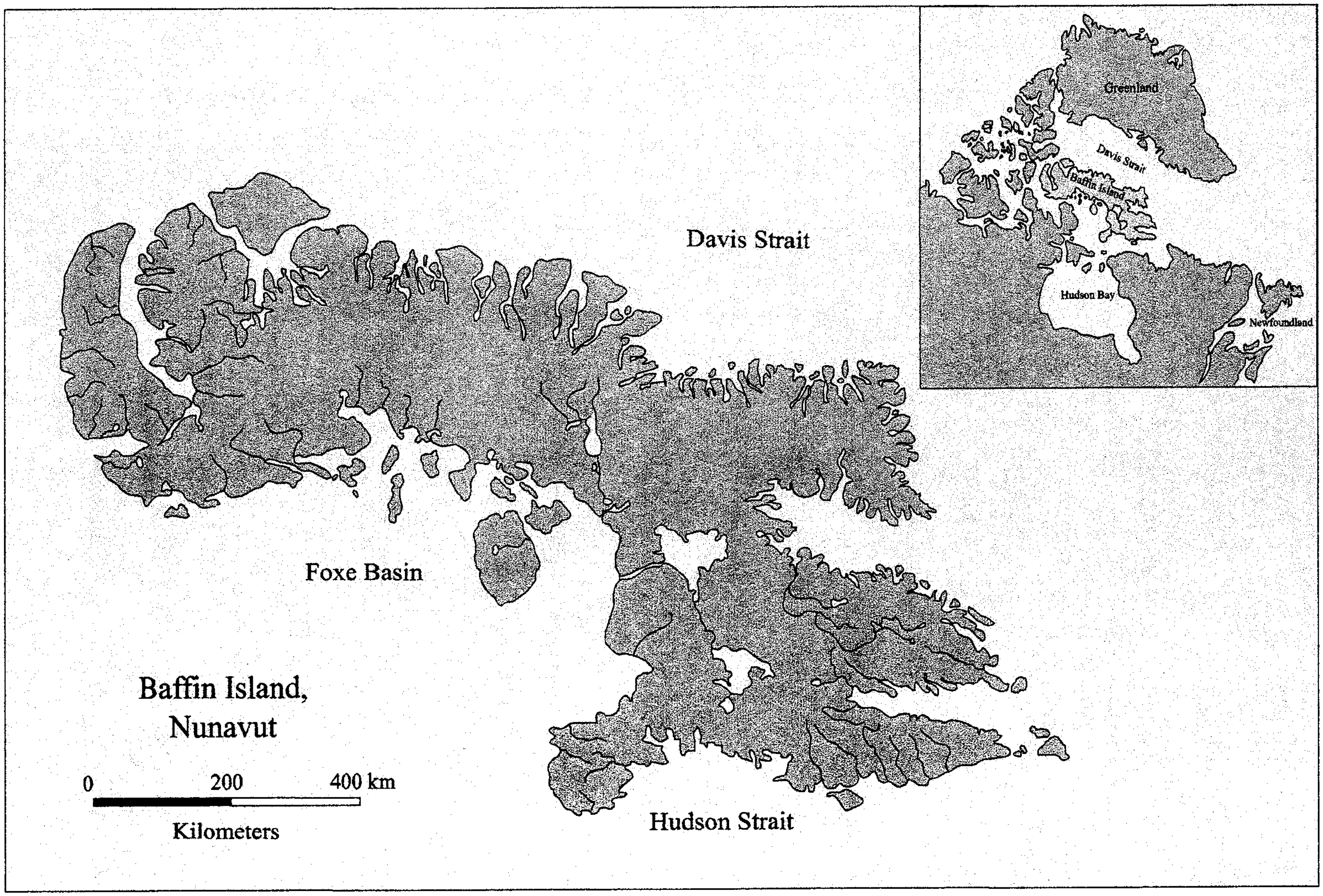


Figure 2.1 Map of Baffin Island.

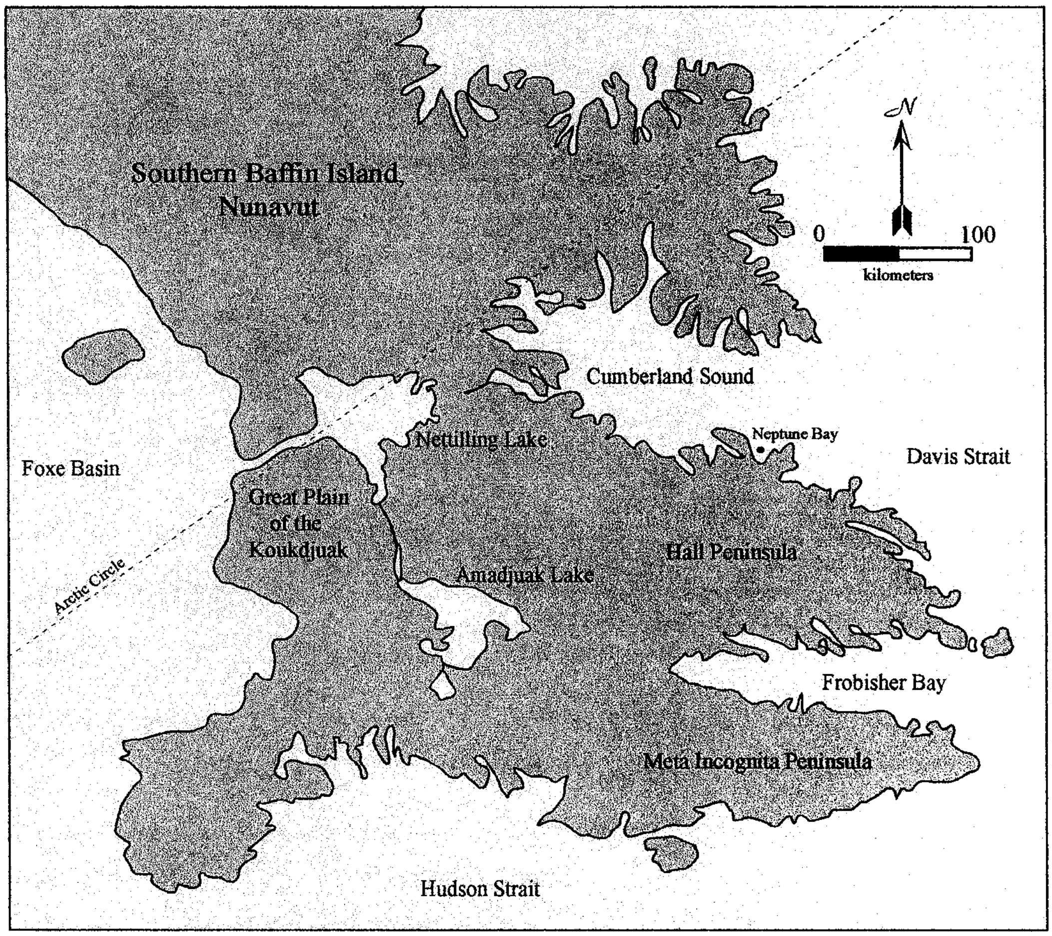


Figure 2.2 Map of southern Baffin Island illustrating the locations and features described in the text.

The mouth of Frobisher Bay is extremely wide where it meets the Davis Strait and it tapers significantly in width towards the head at Foul Inlet. Depths in the bay are considerable and exceed 200 meters to within 5 kilometers of its head (Stenton and Jacobs 1985:60). The Frobisher Bay region principally includes the upland areas of the Hall and Meta Incognita Peninsulas, the coastal islands that fringe the bay, and the lowlands extending northwestward from the head of the bay toward the Foxe Basin (Jacobs and Stenton 1985:60). The local topography consists of rolling glaciated hills of Precambrian rock. These hills rise to approximately 700 meters above sea level (a.s.l.) with relief on the north side of the bay being more gradual while on the south shore it is more abrupt (Jacobs and Stenton 1985:60). Many streams and rivers drain into the bay from the coastal upland areas including the Sylvia Grinnell River in Koojesse Inlet and the Jordan River in Foul Inlet. At the heads of the bays and inlets, and within the stream valleys, isostatic rebound has caused extensive terracing of glaciofluvial and marine sediments (Jacobs and Stenton 1985:60). The interior regions of southern Baffin Island are readily accessible from the shores of Frobisher Bay and its surrounding coastal upland areas (Boas 1964; Stenton 1989, 1991a).

Among the most dominant physical features in the interior of southern Baffin Island are its three large lakes and the riverine system that connects them. Nettilling Lake is the largest lake in the Canadian Arctic archipelago and is approximately 30 meters a.s.l. (Stenton 1989:88). Amadjuak Lake is slightly smaller and has an elevation of 90 meters a.s.l. (Soper 1928:2). Mingo Lake is the smallest and it too has an elevation of roughly 90 meters a.s.l. (Soper 1928:2). Mingo Lake drains into Amadjuak Lake; Amadjuak Lake drains into Nettilling Lake via the Amadjuak River; and Nettilling Lake drains into the Foxe Basin via the Koukdjuak River.

The topography of the Nettilling Lake region is somewhat variable. To the west and southwest lies the Great Plain of the Koukdjuak, which is a remarkably low-lying, flat, marshy tundra area. This plain, covering approximately 7,700 square kilometers, consists of flat-lying fossiliferous Palaeozoic limestones, which are covered in most places by a thick layer of glacial drift (Soper 1928:2). These same geological formations characterize areas surrounding Amadjuak and Mingo Lakes, and the western shores of the Foxe Basin (Soper 1928:2). Given the poor drainage on the Great Plain, it is inundated with countless small lakes and ponds. A network of glacial moraines and eskers cross the southern end of Nettilling Lake and are most pronounced in the Burwash Bay and Tikeraq Bay areas (Milne 2000c; Stenton 1989). These features resemble raised compact gravel roadways and they serve as natural travel routes for both animals and humans. To the south of Nettilling Lake, the terrain rises in elevation giving way to gently rolling hills while the east and northeast regions lie within the low edge of the Precambrian highlands, which make up the east coast of Baffin Island (Soper 1928:2). The geology east of the lake changes to granite-gneiss bedrock and the topography transitions into gently rolling hills, which eventually give way to the more rugged terrain that typifies the eastern Baffin coastline.

The physiographic features described in both regions of the study area have, in general, changed little since deglaciation. Certainly geomorphological processes have impacted some features and isostatic rebound has changed shoreline elevations but overall the landscape remains similar to what it was during the Pre-Dorset period.

Palaeo-Climatic Evidence

The Arctic environment has experienced climatic fluctuations for millennia. These conditions, oscillating between periods colder and warmer than present, (have and continue to) affect mean temperatures, sea ice formation, precipitation levels, vegetation diversity and distribution, and the stability of sea and terrestrial animal populations (Barry et al. 1977). Our understanding of how these fluctuations impacted Palaeo-Eskimo lifeways is less certain, however. Given the macro- and micro-environmental differences that characterize regions of the Arctic (Maxwell 1985:19-20), it is difficult to generalize about the extent to which Palaeo-Eskimos in every area were affected by variations in climate and resource availability (Arundale 1980). Despite this, many archaeologists agree that periodic changes in the Arctic environment did necessitate some kind of adaptive response (e.g. Dekin 1976; Fitzhugh 1976a, 1976b; Gordon 1975, 1996; Maxwell 1985; McGhee 1996; Schledermann 1990, 1996). These included shifts in economic exploitation patterns and settlement strategies, regional colonization and abandonment, and cultural transformation. In some areas, populations simply died out.

While there may be loose consensus that adaptive responses occurred, published interpretations on the links between climate and cultural change are variable (e.g. Dekin 1972a; Fitzhugh 1972; Maxwell 1985; McGhee 1972, 1996). Many of these differences relate to difficulties with dating Palaeo-Eskimo sites and individual attempts to correlate them with widespread climatic episodes in the Arctic (Maxwell 1985:33). Archaeologists recognize that the onset of significant climatic change in the Arctic was more rapid than previously thought and its occurrence was far less uniform from region to region (McGhee 1996:107). Localized seasonal changes likely had more immediate and severe impacts on Palaeo-Eskimo populations since it is extremely difficult to plan for such contingencies in the Arctic environment (Sutherland 1991:143; Tuck 1976:3). However, detecting these rapid occurrences in the archaeological record is complicated since short-term climatic fluctuations are unlikely to result in any appreciable changes in a group's material culture (Tuck 1976:3, 99) and most Palaeo-climatic evidence is unable to measure change in such finite intervals as weeks or months (Sutherland 1991:143). These factors, along with the complications associated with radiocarbon dating, make it extremely difficult to correlate sudden climatic shifts with broad scale cultural changes among the Palaeo-Eskimos in the eastern Arctic. While it is certain climate and its influence on available resources posed some adaptive challenges for the Palaeo-Eskimos, attempts to understand the nature of these interactions are best undertaken at a regional scale (Sutherland 1991:146).

The stratigraphic record of the Frobisher Bay area indicates a sequence of alternating cool/dry and warm/moist periods occurred after deglaciation (Jacobs et al. 1985). Following a 500-year interval of cooler-drier weather, Frobisher Bay experienced a period of climatic amelioration that lasted for approximately 1500 years (4500 – 3000 BP) (Jacobs and Stenton 1985:63). The warmest period on record for the region began by 2700 BP and lasted for roughly 900 years (Jacobs and Stenton 1985:63). Based on this Palaeo-climatic evidence, it appears the Pre-Dorset occupied Frobisher Bay during a period of relative climatic stability when conditions were quite favourable. Climatic evidence for the Nettilling Lake region during the Pre-Dorset period is sparse at present, and little more can be said other than it was deglaciated between 7000 and 5000 BP (Stenton 1991a:20). However, given the proximity of this area to Frobisher Bay, it is likely the inland region experienced similar favourable conditions during the Pre-Dorset period.

Contemporary Climatic Conditions

While specific details like mean annual temperatures and precipitation levels are presently unknown for the Palaeo-climatic record of the study area, contemporary data are useful for creating a base line knowledge with which to interpret what conditions were like during the Palaeo-Eskimo period. This information is also useful for interpreting abundances and seasonal variations of local resources and how they may have fluctuated in response to climate change.

Generally speaking, southern Baffin Island is characterized by long cold winters and short cool, cloudy summers (Maxwell 1985). The coldest mean annual temperatures are recorded in January and range from -32° C to -28° C while the warmest mean annual temperatures are recorded in July and range from 5° C to 8° C (Maxwell 1981:Table 5). Mean annual temperatures in the Frobisher Bay area demonstrate a seasonal inversion between the head and mouth of the bay. The warmest temperatures are recorded during July just inland from the head of the bay and slightly cooler temperatures are recorded near the mouth (Jacobs and Stenton 1985:60). In contrast, the coldest temperatures recorded in January occur at the head of the bay while slightly warmer temperatures occur at the mouth (Jacobs and Stenton 1985:60). Jacobs and Grondin (1988) have demonstrated that mean annual temperatures in the interior near Nettilling and Amadjuak Lakes are up to 2° C warmer compared to those recorded by Maxwell (1981) for the rest of the region. Both of these large lakes retain considerable heat throughout the year, which helps moderate summer and winter climates in this locale (Stenton 1989).

Total annual precipitation for southern Baffin Island averages between 175 mm and 250 mm, and 40 to 50% of this is recorded as rain (Maxwell 1981:Table 5). Average annual precipitation within Frobisher Bay itself is considerably higher with total accumulations of 436 mm; 37% of this falls as rain from June through August (Jacobs and Stenton 1985:60). By comparison, the interior region is notably drier with lower recorded accumulations of both rain and snow (Jacobs and Grondin 1988).

Ice Conditions

Freshwater lake ice freezes faster than sea ice and generally takes longer to melt and break-up (Damas 1972:11). These types of ice have notably different structural properties: sea ice is flexible because it consists of interlocking crystals while freshwater lake ice is brittle, lacks flexibility, and consists of loosely bonded crystals that align vertically in formation (Maxwell 1985:24-26). When lake ice melts, these vertical crystals start to separate forming fragile candles.

Sea ice in Frobisher Bay consists largely of annual ice. It begins forming by late October and breaks up by mid-July (Jacobs and Newell 1979). In winter, the upper part of the bay is locked in shore-fast ice, which extends the entire length of the north shore out to the Davis Strait. Extreme tidal ranges of up to 14 meters in Frobisher Bay cause large chunks of shore-fast ice to break off with the ebb and flow of the sea (Maxwell 1985:17). This creates open water tidal cracks and rough, choppy masses of hummocky ice close to shore. Throughout the winter, these tides also create areas of open water among several islands in the middle part of the bay (Jacobs and Stenton 1985:60). Distance to the floe edge from the head of the bay is on average 120 kilometers; however, given the warmer conditions experienced during the Pre-Dorset occupation of Frobisher Bay, the extent of fast ice from the head of the bay would have been less, meaning the floe edge was closer and more readily accessible (Jacobs and Stenton 1985:65).

Ice begins to form on Nettilling Lake by September and average thickness in winter is estimated at seven feet (Soper 1928:15, 19). Nettilling Lake proper is not free of ice until early August (Soper 1928:16) yet Burwash Bay, which forms the southern margin of Nettilling Lake, is free of ice sooner in early to mid-July. This is due largely to warmer conditions created by solar radiation and heat influx from water draining into the bay from the Amadjuak River (Jacobs and Grondin 1988; Stenton 1989:92).

Vegetation

The vegetation of southern Baffin Island is classified as Low Arctic (Polunin 1948). Within this biotic zone there are shrubs, sedges, grasses, lichen, heath, Arctic willow, and dwarf birch (Porsild 1958). Edible plants include sorrel, knotweed root, and a variety of berries (e.g. bilberry, cranberry, bearberry, and crowberry) (Stenton 1989:94). Generally, the Low Arctic is more productive than Middle to High Arctic regions, thus providing a higher carrying capacity for terrestrial species (Bailey 1960). The vegetation in Frobisher Bay is comparatively richer than other areas on southern Baffin Island but the abundance and diversity of plants declines towards the interior region (Jacobs and Stenton 1985:60).

The low-lying areas west of Nettilling Lake support wetland meadows consisting of sedges, grasses, and mosses (Stenton 1991a:20). Where drainage is better at higher elevations, grasses and sedges predominate, although many of the eskers and moraines, especially those at the south end of Burwash Bay, are sparsely vegetated, if at all (Stenton 1989:90). Arctic willow also grows in the area. Given the slightly warmer conditions that prevail in the Nettilling Lake region, specifically near Burwash Bay (Jacobs and Grondin 1988), dwarf birch are found outside their normal range (Stenton 1989:91). Generally speaking, this species is not found beyond the head of Frobisher Bay in the southern Baffin region (Jacobs and Stenton 1985:60) and its identification inland attests to the slightly warmer microclimate in the area.

Subsistence and Material Resources

Southern Baffin Island supports a comparatively rich and reliable subsistence resource base, and the distribution and seasonal availability of marine and terrestrial species in this area is more predictable compared to many Arctic regions (Maxwell 1985). This section describes the primary subsistence resources that are available in the Frobisher Bay and Nettilling Lake regions, their seasonal availability, and relative distributions. Availability of lithic raw materials is also discussed.

Marines Resources: Seals

Ringed seals are considered the most important staple to Arctic cultures largely because they are non-migratory (Brody 1976). In Frobisher Bay, ringed and bearded seals are available year-round while harp seals migrate to areas at the mouth of the bay beginning in August (Kemp

1976:134). With the break-up of sea ice in the summer months, both ringed and bearded seals tend to move down the bay to the inlets and fiords fronting Davis Strait. However, ringed seals can generally be found in smaller numbers throughout the rest of the bay during this time of year. With the formation of shore-fast ice in the fall and winter, the availability of ringed seals is notably lower compared to other regions with more favourable ice conditions (Jacobs and Stenton 1985:62). These animals avoid areas with hummocky ice (Boas 1964:63) because it is difficult to maintain breathing holes. On the smooth ice further down the bay, both ringed and bearded seals are abundant since breathing holes are more easily maintained (Boas 1964:77). These animals are also readily available along the flow edge throughout the winter and in spring (Boas 1964:77; Kemp 1976:134).

Nettilling Lake takes its name from the English corruption of the Inuktitut word "netsik" meaning ringed seal (Stenton 2002 personal communication). This lake supports one of the few populations of freshwater ringed seals known in the world (Banfield 1974). While these animals remain in the lake year-round, the size of the population and its importance to human subsistence is not well understood (Stenton 1989). Boas (1964:22) describes the seals as being adequately abundant to support small groups wintering inland. However, Soper's (1928:41) accounts of his difficulties in procuring study specimens suggest the population is quite small.

Marine Resources: Fish

Fish resources in Frobisher Bay consist predominantly of Arctic char, tomcod, and sculpins (Jacobs and Stenton 1985:Table 1). In Nettilling Lake, one can find northern Pollack, Arctic stickleback, common stickleback, Greenland sculpin, Long-horned sculpin, and Arctic char (Soper 1928:117). Of these species, Arctic char is the most important and makes the only significant contribution to local human subsistence (Boas 1964:105; Stenton 1989:93). In the spring, as the ice is breaking up, large numbers of Arctic char leave the inland lakes and rivers beginning their seasonal migration to the sea. At this time their fat stores are very low. In the fall, these fish, which accumulate large fat stores over the summer, ascend the rivers back inland. The rivers that flow into the head of Frobisher Bay are known to be very productive for harvesting char, especially the Sylvia Grinnell River where large runs are fished in the early summer and again in the fall (Kemp 1976:136). Nettilling and Amadjuak Lakes support large stocks of Arctic char (Stenton 1989), as do other small interior lakes and rivers (Kemp 1976:136).

Marine Resources: Polar Bears

It is entirely likely that polar bears ventured, on occasion, to the inland region. The Koukdjuak River provides a direct route from the Foxe Basin to Nettilling Lake and the distance to be covered is not impossibly far. Stenton (2000 personal communication) was informed by a helicopter pilot of a bear near the inland area during one of his field seasons in the interior indicating these animals have a tendency to "go where they want." Therefore, polar bears must also be considered a potential but minor subsistence resource in this region.

Terrestrial Resources: Migratory Birds

Most wildfowl in the Arctic that are of importance to human subsistence are migratory, with the exception of ptarmigan. Consequently, most bird species are only available during the warm season. In Frobisher Bay, ducks and geese are plentiful at the head of the bay and near Ward Inlet (Kemp 1976:136). During the nesting season there is an abundance of eggs and the birds are easily caught during their annual moult. The Great Plain of the Koukdjuak is an important nesting ground for many bird species that summer in the Arctic; however snow geese are among the most abundant with numbers sometimes exceeding over one million by the autumn (Stenton 1989).

Snow geese winter in the mid-continental and southern coastal regions of the United States and in the spring, they visit various staging areas in Manitoba, Saskatchewan, and along the shores of the Hudson and James Bays where they accumulate fat stores (Alisauskas 2002:181-182). The geese arrive on the Great Plain in May and their fat stores are critical for sustaining them throughout the pre-laying period since the ground is still typically snow-covered at that time (Alisauskas 2002:181). The birds begin their annual moult in early July and are able to fly again in early to mid August (Soper 1928). By September, the geese migrate south again (Stenton 1989). During the moult, these birds represent a rich, reliable, and easily acquired subsistence resource for human populations in the interior region (Soper 1928).

Terrestrial Resources: Caribou

Baffin Island supports several resident caribou herds (Maxwell 1985:82). These animals are available year-round but their distributions vary considerably (Brody 1976; Soper 1928:63). The south Baffin herd is the largest on the island and its numbers are believed to exceed 60,000 animals (Stenton 1989:96). In the spring and summer, large concentrations of this herd are found inland near Nettilling and Amadjuak Lakes (Soper 1928:64), and in the Chorback Inlet district along the Hudson Strait (Stenton 1989:96). In winter, these animals either remain near Nettilling Lake or migrate to areas along the north shore of the Hall Peninsula and the head of Frobisher Bay (Jacobs and Stenton 1985:62; Stenton 1989:96). Smaller concentrations of this herd are found variously distributed year-round on the Foxe, Meta Incognita, and Hall Peninsulas (Brody 1976; Jacobs and Stenton 1985). Despite this seeming abundance of caribou in both regions of the study area, caribou herds experience dramatic cyclical fluctuations in population stability, which may last years to decades (Stenton 1991a:18). This creates sporadic and sharp declines in local numbers, if not complete disappearance. We can expect these same cycles to have occurred during the Pre-Dorset period, which would invariably have posed serious economic challenges for these people.

Material Resources: Lithic Raw Materials

The quality, abundance, distribution, and seasonal availability of lithic raw materials is known to play a key role in the economic, technological, and social organization of hunter-gatherer societies (e.g. Andrefsky 1994a, 1994b; Bamforth 1991; Bradbury and Franklin 2000; Kuhn 1989; Nelson 1991; Pigeot 1990; Ricklis and Cox 1993; Tankersley 1995; Walthal and Koldehoff 1998; Wenzel and Shelley 2001). Access to this material resource would have been fundamental to the Pre-Dorset occupying southern Baffin Island since stone tools were used in every facet of their domestic and hunting activities, and in the production of organic implements (Maxwell 1984, 1985). However, the abundance of lithic raw materials is restricted in this region.

In southeastern Baffin Island, Maxwell (1973:10-11) notes that sources of chert and other stones used in lithic tool production are scarce. There are no known quarry sites or sedimentary outcroppings where these materials can be reliably procured. Those sources that are available comprise small, weathered pebbles found on the ocean floor. These pebbles can only be obtained in the summer when the shore-fast ice is gone and when the tides recede. Maxwell (1973:11) states that the size of these pebbles, their inferior quality, and restricted availability must have directly impacted the size, stylistic treatment, and morphologies of the tools made from them.

These same restrictions in raw material availability are present in Frobisher Bay. Odess (1998:422-423) observes that similar small chert pebbles found in glaciofluvial deposits at the head of the bay and in local stream valleys were used by resident Palaeo-Eskimos. No quarry sites or sedimentary outcrops of chert are presently known in this region either (Stenton 1998 personal communication).

While coastal areas have an apparent dearth of chert resources, the interior of southern Baffin Island boasts a relatively abundant supply. The local geology consists of fossiliferous limestone, which is characterized as a soft and moderately soluble chemical precipitate sedimentary rock (Andrefsky 1998:51). Cherts, and other cryptocrystalline siliceous rocks, are durable chemical precipitates that form in association with softer versions, such as limestone (Andrefsky 1998:51-52; Ludtke 1992). Because limestone erodes at a faster rate than the veins, nodules, and bubbles of chert found within it, there are likely exposed outcrops of these lithic raw materials in the interior. In addition to the potential of these locally occurring sources, there are abundant secondary deposits of chert that were left by retreating glaciers that scoured the inland plains (see Millward 1930:53). These deposits consist of nodules of varying sizes, which are highly variable in colour, quality, and texture. Since the glaciers would have picked up these stones as they advanced and retreated over the landscape (possibly including regions other than southern Baffin), it is virtually impossible to know the origins of these secondary deposits. Amadjuak Lake is considered to be particularly important for acquiring chert. Amadjuak is an English corruption of the Inuktitut word 'ammaaq' or 'angmalik'. Ammaaq means chert (Stenton 1997:17) and the reference to ammaaq lake, loosely translated, means 'the place chert comes from' (Stenton 1998 personal communication). This attests to the known presence of chert in the inland region.

Historic Land Use Patterns on Southern Baffin Island

Having described the landscape, climate, and resource base for southern Baffin Island, I now discuss recorded Inuit land use patterns in this region. In the context of long-term history

(Duke 1991, 1992), the Pre-Dorset would have faced similar seasonal challenges, resource distributions, and logistical constraints as the Inuit living in this Arctic environment. Therefore, ethnographic and historic data are useful heuristically to construct testable models (see Chapter 4) about the lifeways of the Pre-Dorset that inhabited these same areas. The most accurate sources documenting Inuit land use patterns on southern Baffin Island are those written by Boas (1888 [1964], 1901). Other accounts by Hall (1865 [1970]) and Bilby (1923) represent personal diaries and testimonials of their explorations in the North. While these accounts do provide some useful details about Inuit lifeways, the descriptions are not as consistent as those provided by Boas.

Boas' (1964) discussion of seasonal land use strategies and patterns of resource exploitation focuses on three southern Baffin Island districts: Hudson Strait, Frobisher Bay, and Cumberland Sound. Within these districts there are numerous small Inuit groups with average populations between 20 and 82 individuals (Boas 1964:18, see table). In winter, the most important resource to the Inuit was the ringed seal. The skins were used for clothing and to make tents, the meat was consumed as the staple food, and the blubber was a critical source of fuel for heat and light. In summer, caribou were of paramount importance. The hides were used for clothing and bedding; the meat, marrow, and fat were consumed as the staple food; and the bones, antler, and sinew were important materials in the production of various tools and weapons. Boas (1964:11) states Inuit settlement patterns were wholly contingent on the seasonal distribution of these two key resources.

The Hudson Strait Inuit (Boas 1964:13-36) lived along the coast during the winter where seals were hunted at their breathing holes on the sea ice and along the floe edge. With the onset of spring, these people began a journey to the coastal upland areas. Along the way they hunted basking seals in great numbers. Eventually they reached the heads of local bays and fiords where they hunted caribou and fished throughout the summer. From the coastal upland areas, there are several easily accessible routes leading into the interior region around Amadjuak Lake. Periodically, the Inuit followed these routes inland to hunt, fish, and socialize with other Inuit from distant coastal areas. The Frobisher Bay Inuit had a similar pattern of camping where winters were spent in coastal locations near the mouth of the Bay and along the shores of Davis Strait (Boas 1964:14-15). In the spring, they moved to the head of Frobisher Bay. Mingo and Amadjuak Lakes are easily accessed along a route that parallels the Sylvia Grinnell River. Boas (1964:15) provides specific details regarding how the Frobisher Bay Inuit traveled to these inland areas. Furthermore, both Boas (1964) and Bilby (1923) note the importance of the interior lake region for caribou hunting and socializing with bands from the Hudson Strait district. Finally, the Cumberland Sound Inuit also practiced similar land use patterns to those described for the other two districts. During the winter they camped on the seacoast and then moved to the coastal upland areas at the heads of bays and fiords in the spring (Boas 1964). Nettilling Lake can be easily accessed via routes through Nettilling Fiord and Boas (1964:25-26) provides a detailed account of the Cumberland Sound Inuit making this journey. Soper's (1928:3-27) journey inland also details this travel route via Nettilling Fiord.

In the mid-1980s, Stenton (1989:111) consulted Inuit elders in the Hudson Strait, Frobisher Bay, and Cumberland Sound communities to obtain information regarding their travels inland. The elders told Stenton (1989:111) that while various factors influenced travel plans, trips to the interior "were undertaken in late spring or early summer specifically to acquire caribou skins for winter clothing"; caribou meat was dried and packed out to the coast but never at the expense of carrying skins. These trips were very important to the elders and their love for traveling coupled with the abundance of caribou, fish, geese, and fresh lake water were the main reasons given for going to the inland proper (Stenton 1989:111-112).

Using information gathered from historic and ethnographic sources, and from consultations with local Inuit elders, Stenton (1989:112-119, 1991a:21-27) identifies two patterns of land use among the southern Baffin Island Inuit. The first is the "coast-upland pattern." It consists of summer residences located at inner fiord sites that were situated close to productive fishing locations and where access to the interior for caribou hunting was unrestricted (Stenton 1989:112). The basic social unit in these camps consisted of individual families or small groups of related families who lived close to one another in the same locale (Stenton 1991a:21). Once these camps were established following the spring seal hunt, women, children, the elderly, and infirm pursued subsistence activities in the immediate vicinity where marine, plant, and avian resources could be readily obtained (Stenton 1991a:21). Small groups of male hunters left the camps for periods of days to weeks to hunt caribou in the interior (Stenton 1991a:21). The coastal upland camps were occupied until early fall, after which time these groups moved back to sites located on the outer coasts to make their preparations for winter on the sea ice. Stenton (1989:114) states that these summer hunting camps presumably moved over time from one fiord or inlet to another, and social group size and complement would have been flexible.

The second pattern is the "interior lake pattern" and seems to have been selected less frequently compared to the coastal-upland option (Stenton 1989:114). The interior lake pattern involved residential shifts during the spring or summer of one or more extended families to settlement locations along the shores of the large inland lakes (Stenton 1991a:25). This pattern required a great deal of preparation and planning to decide when to implement it, when to depart, which regions to exploit, and for how long the groups should stay (Stenton 1989:114-117). Once the caribou hunting season was over in early autumn, the Inuit moved back to the coast (Stenton 1991a:25). The interior lake pattern imposes greater time commitments on groups given the amount of traveling that is involved; is less flexible in terms of social organization since the entire group makes the journey; and involves higher energy expenditures in terms of planning and executing the necessary logistics (Stenton 1989:117).

Stenton (1989:117-119) explains that the existence of two different patterns of terrestrial land use on southern Baffin Island can be attributed to three primary factors: the importance of traveling, socializing, and caribou hunting. Travel is an essential part of the Inuit way of life. It is a way for hunters to acquire knowledge about the ecosystem on which they depend for survival and it provides a way for small, dispersed social groups to maintain contact. The southern Baffin Inuit occupy several widely separated coastal districts. Given the centrality of the interior region to these coastal areas, it was readily accessible by all groups and "may have served as a focal point for interactions on an interregional scale" (Stenton 1989:118). Stenton (1991a:25) also notes that group and interpersonal conflicts may have led individuals or small groups to travel inland so as to escape hostilities or to allow them to dissipate.

Caribou hunting is, however, most closely linked to these patterns and the availability of this resource can be expected to influence which pattern is adopted (Stenton 1989, 1991a). Caribou are an extremely important resource for populations living in the Arctic environment. The most optimal exploitation period for caribou is during the late summer and early fall because their hides have healed from seasonal warble fly infestations and their fat stores are rich in preparation for the winter (Brody 1976; Stenton 1991b). The periodic fluctuations in herd numbers and distributions undoubtedly affect the human groups that depend on them. Stenton (1989:33, 118) explains that when caribou numbers were high, a coastal-upland pattern was implemented because caribou distributions in these areas were sufficient to satisfy the subsistence and material needs of the Inuit. In contrast, when caribou populations were low, the interior lake pattern was implemented because the southern Baffin herd contracts to this area when the animals are under stress (Stenton 1989:132). When these reductions in the availability and distribution of caribou occur, the impacts appear to be most severe in the Frobisher Bay, Meta Incognita, and Foxe Peninsula regions (Stenton 1991a:25).

Costs related to time and energy expenditure are considerably different depending on which strategy is used. Even though there are some advantages in traveling to the interior lakes region (e.g. socializing, gathering information), Stenton (1989:118) found that most Inuit elders stated they normally did not make this journey to hunt caribou unless it was absolutely necessary. Reasons for not going inland include the long distance to be traveled, the rough terrain, and the fact that all of the hides, meat, and other materials had to be "packed-out" at the end of the season (Stenton 1989:118; Wright 1944:188). Boas (1964:22) observed some Inuit from Cumberland Sound living year-round on Nettilling Lake. They hunted seals during the winter and exploited caribou during the summer. Given the difficulties with making such a journey over a large distance, some groups may simply have stayed in the area to recoup the costs of getting there in the first place. However, the distance from Frobisher Bay to Amadjuak Lake is approximately 50 miles (Boas 1964:15), which all things considered, is not impossibly far. Regardless, Stenton (1989:119) states the adoption of the interior lake pattern was contingent on periodic declines in caribou population numbers; otherwise, Inuit consistently followed the coastal-upland pattern.

Archaeological Record of Land Use Patterns on Southern Baffin Island

The majority of archaeological sites presently known on southern Baffin Island are located on the coast (see Arundale 1980; Collins 1948; Dekin 1972; Jacobs and Stenton 1985; Maxwell 1973, 1985; Odess 1998; Schledermann 1975; Stenton 1983, 1987; Stenton and Rigby 1995). Consequently, the information available with which to interpret prehistoric land use patterns is biased largely towards the marine segment of the available resource base. Using data from the Lake Harbour region, Maxwell (1985:98) presents a fragmented interpretation of Pre-

Dorset settlement patterns in the area. He notes that sites are more frequently located on the exposed outer seacoasts rather than at the headlands of deep sheltered bays, and most of the camps appear to have been transitory since they yielded very limited amounts of debris. Only two larger sites, Closure and Loon, have evidence of long-term occupation, although Maxwell (1973:309) estimates the Loon site was revisited for a much shorter period, perhaps only 100 years given the homogeneity of the artifact assemblage. Because the Closure and Loon sites are far from productive fishing rivers and caribou crossings, Maxwell (1985:98) speculates they were winter aggregation sites. Moreover, the locations of the sites in proximity to the fast ice would have afforded the residents easy access to hunt seals at their breathing holes.

Published site evidence from Frobisher Bay adds little to Maxwell's (1985) interpretations. The Shaymark site represents the largest and best-known Pre-Dorset occupation in the area. However, interpretations of its function are not detailed. Maxwell (1973:308) suggests Shaymark was more intensively occupied than other sites in the area given the sheer size of its assemblage. He also thinks the site was occupied during the summer given the prevalence of spalled burins, which he believes were used in warm season activities, and the site's proximity to the char-rich Sylvia Grinnell River (Maxwell 1976:74-75). Another smaller single component Pre-Dorset site is located at the head of Burton Bay; however, limited test excavations yielded few artifact remains (Jacobs and Stenton 1985:65). Based on this seemingly scant evidence of Pre-Dorset occupation along the shores of Frobisher Bay, Odess (1998:424, 435) recently claimed that the area might have played only a minor role in this culture's settlement and subsistence systems. Yet evidence of Pre-Dorset artifacts found in secondary context at much larger Neo-Eskimo sites in the region indicates this statement is incorrect (see Park 1996, 1997; Stenton 1983; Stenton and Rigby 1995). Notable quantities of Pre-Dorset lithics have been found during the excavation of larger Thule winter houses located at various sites near the head of the bay. This indicates the Pre-Dorset did occupy the Frobisher Bay area and at some sites, like Peale Point, the occupations were intensive (Stenton 2002 personal communication).

Not until Stenton's (1985, 1986, 1989) work had the interior region been investigated archaeologically. Stenton (1989) carried out an extensive regional survey around Nettilling Lake to determine if prehistoric populations implemented similar land use patterns to those observed in the historic period on Baffin Island. Stenton's (1985, 1986, 1989) work remains the only systematic archaeological investigation undertaken in the interior of Baffin Island and dozens of historic and prehistoric sites are now known to exist in this area. Site remains belonging to Pre-Dorset, Dorset, Thule, and Inuit are found along the shores of the lake indicating a long-term occupation of this interior region spanning over 3000 years. Stenton (1989:334) observed that all of the sites investigated are strategically located to harvest primary resources (i.e. caribou), secondary resources (i.e. fish, geese), and non-food resources (i.e. building materials, fuel). Most sites contain habitation features related to both summer and autumn occupations. Winter structures were found at three sites; however, this does not suggest the site's inhabitants remained at a single location for an entire year (Stenton 1989:334). Stenton (1989:334-335) also observes that specific locations appear to have been used continually over time. At the Mosquito Ridge site (MaDv-11), there is evidence for continued occupation from the Pre-Dorset period to the Historic period. This suggests this site may been a focal point for the inland settlement system (Stenton 1989:335). Boas (1964:26) discusses the occupation of the Tikeraq area by Inuit from Cumberland Sound and notes that they always visited the same location. The presence of dozens of archaeological features along the Tikeraq Bay moraine further indicates its intensive use by the Thule and possibly earlier Palaeo-Eskimo groups (Milne 2000c; Stenton 1989). Subsistence resources, including waterfowl, char, caribou, and berries, are particularly abundant in both localities thus their long-term occupation should not be surprising.

Stenton's (1989:340) study found that family groups traveled on foot and by boat during the summer and/or early autumn to specific interior locations along traditional routes where they may have stayed for a few weeks or several months. Because Stenton's work represents the only archaeological investigation in this area, identification of discrete migratory routes between the inland and coastal areas is not presently possible because there are not enough data. Stenton (1989:348) explains that further exploration of archaeological sites in the interior region, the coastal uplands, and along migration paths between the two must be undertaken before we can begin to understand how often and for how long prehistoric groups on southern Baffin Island made trips inland. This will necessarily require that comparisons be made between sites from the interior lakes region and the coastal uplands. Stenton's (1989) study demonstrates that all Arctic cultures occupying southern Baffin Island exploited the same resource base, hunted in the interior, and occupied many of the same site locations over thousands of years.

Sites Included in the Study Area

This section briefly describes the sites examined in this study and their respective artifact assemblages. The coastal sites include: Shaymark (KkDn-2), Davidson Point (KkDn-31), and Tungatsivvik (KkDo-3) (see Figure 2.3). The inland sites include: Sandy Point (LlDv-10) and Mosquito Ridge (MaDv-11) (see Figure 2.4). The coastal sites are discussed first followed by the inland sites.

Shaymark (KkDn-2)

Shaymark (KkDn-2) is a large, single component Pre-Dorset site located adjacent to the Sylvia Grinnell River, near the city of Iqaluit. The site is situated on an old beach ridge approximately 12.2 meters a.s.l. and has a corrected radiocarbon date of 3675 BP (± 144)

(Arundale 1981:261). The eastern margin of the site descends steeply into a small cove where even today people come to fish char. At the time of occupation, this beach ridge was at sea level and the point of land on which it is situated resembled a narrow peninsula paralleling the river and projecting out into Koojesse Inlet (Maxwell 1973:277). Shaymark has sustained considerable disturbance by vehicle traffic and people who use the site for camping and picnicking. The site consists largely of a loose sand matrix and artifacts are easily churned up from their original subsurface contexts. Flakes and formal lithic artifacts can be easily spotted on the surface.

Maxwell (1973) discovered the site in the early 1960's. His original investigations consisted of surface collection and limited subsurface testing. Maxwell (1973:277) describes the presence of a small boulder tent ring at the extreme southern margin of the site. Numerous lithic artifacts were found inside and outside of this structure; however, detailed notes and sketches of this feature and the distribution of artifacts cannot be found. Maxwell's work yielded 561 lithic artifacts, including formal and informal tools, and utilized flakes; he did not collect unmodified debitage.

Dekin (1970), Stenton (1987, 1999), and Milne (2000b) have also investigated the site. In 1999, Stenton and Milne undertook mitigative excavations at Shaymark to limit further damage to the site and loss of information. With the help of the local community and students from Nunavut Arctic College, 285 meters^2 of the site were shoveled and screened through 1/4-inch and 1/8-inch mesh (see Figure 2.5). Additional areas surrounding the site were intensively surface collected, including a previously unknown and undisturbed component, which is referred to as Shaymark East. The discovery of this area and of numerous artifacts in the bedrock hills that border the northern margin of the site suggest the total area occupied by the Pre-Dorset is much larger than previously thought. This work yielded an additional 4878 lithic artifacts; of these 4400 are flakes and 478 are formal and informal tools, and utilized flakes. Table 2.2 lists the types and frequencies of the lithic artifacts found at Shaymark by Maxwell (1962, 1966), Dekin (1967, 1970, 1971), and Stenton (1999) and Milne (2000b). All of these items are included in this study.

Davidson Point (KkDn-31)

Davidson Point (KkDn-31) is a multi-component site possessing both Thule and Pre-Dorset occupations (Milne 1997). The site is located on a small saddle across the Sylvia Grinnell River and can be seen from Shaymark. Davidson Point is approximately 15 meters a.s.l. suggesting this Pre-Dorset occupation may be slightly older than that at Shaymark. The Davidson Point site is also located on a narrow rocky peninsula that parallels the river and extends out into Koojesse Inlet. Excavations at Davidson Point took place in 1996 and 1997 (see Park 1996, 1997). This work focused principally on the excavation of three Thule semi-subterranean winter houses (see Figure 2.6). Pre-Dorset lithic artifacts were found in secondary context throughout the interior of these structures and in the surrounding wall fill. The Pre-Dorset component is likely in close proximity to the Thule houses since the sod containing the lithic artifacts would have been cut from a nearby location and carried a short distance to be incorporated into the roof structures of these large features. The exact location of the Pre-Dorset component at Davidson Point is not presently known; however, Park (1999 personal communication) believes it may be located just south of the Thule houses where the ground is flat, well drained, and provides an ideal look-out point over the tidal flats of Frobisher Bay. There are also numerous tent rings located adjacent to the Thule structures and above them at a slightly higher elevation. These features were not tested and their cultural affiliation remains unknown. Park (1996) believes they are from a more recent occupation of the site. The excavations at Davidson Point yielded 186 used flakes, formal and informal tools, and 943 flakes. Table 2.1 lists their types and frequencies.

Tungatsivvik (KkDo-3)

Tungatsivvik is situated on the eastern shore of Peterhead Inlet, not far from the head of Frobisher Bay. The site is approximately 10 kilometers away from Shaymark and Davidson Point. The Pre-Dorset, Dorset, Thule, and Inuit have all occupied the site and nearly 100 cultural features have been recorded (Stenton and Rigby 1995). The most prominent of these are 18 Thule semi-subterranean winter houses located in the central part of the site (see Figure 2.7). To date, most of the work conducted at Tungatsivvik (see Park 1998, 1999; Stenton and Rigby 1995) has focused on these large structures; however, Pre-Dorset and Dorset artifacts have been found in secondary context from every excavated Thule house (Park 1998:14; Stenton and Rigby 1995:50). Consequently, we know the Palaeo-Eskimo occupation of the site is extensive.

Table 2.1 Types and frequencies of lithic artifacts recovered from the sites included in this study.

	Debitage	Cores	Utilized Flakes	Informal Tools	Burins Spalls	Burins	Bifaces	Scrapers	Microblades	Burin-like Tools	Totals
Shaymark	4447	23	62	153	476	208	137	14	434	1	5955
Davidson Point	943	10	18	43	30	15	29	8	27	0	1123
Tungatsivvik Area D	295	2	2	9	3	6	3	0	4	0	324
Area Q	314	5	4	2	11	8	6	3	6	0	359
Sandy Point	1176	13	10	19	6	16	18	3	16	0	1277
Mosquito Ridge Main Site	14398	19	13	47	90	24	38	2	210	0	14841
West	5402	7	19	34	37	23	31	5	73	0	5631

In 1998, efforts were made to identify the location of an isolated Palaeo-Eskimo component at Tungatsivvik. Several test units were excavated of which one, labeled Area D, resulted in the discovery of small concentrations of lithic debitage and several diagnostic Pre-Dorset lithic tools. Area D was further investigated in 1999. Ten one by one meter^2 units were excavated yielding additional flakes and tools; however, the overall quantities were relatively small (see Figure 2.8). No features were found in association with these artifacts. The surface vegetation in this area is thick consisting of grass, moss, and willow. The soil matrix comprised compact gravel mixed with soil and fine sand. Area D is located roughly 12 meters a.s.l. and is in close proximity to several Thule winter houses in the central area of the site.

In 1999, Robert Park found several pieces of lithic debitage lying on the surface in an area located east of the main site proper. This area, designated Area Q, was tested and yielded a number of diagnostic Pre-Dorset lithic artifacts including spalled burins, burin spalls, and a serrated stemmed endblade. Based on these finds, the excavation area was expanded to include a total of 5.25 meter^2 units. This work uncovered the remains of an elliptical tent ring structure measuring approximately 2 meters by 2.5 meters (see Figure 2.9). There are numerous boulder outcrops in this vicinity, which limit the amount of level surface area suitable for camping. The ground cover consists of grass, moss, lichen, and loose gravel. The soil matrix comprises compact gravel mixed with a thin layer of soil and coarse sand. The site has an elevation of 14.1 meters a.s.l. There is no evidence for any other cultural occupation or disturbance in this area of the site making Area Q the first isolated, undisturbed Pre-Dorset component found at Tungatsivvik. The types and frequencies of the artifacts recovered from Area D and Area Q are listed in Table 2.1.

Sandy Point (LlDv-10)

Sandy Point (LlDv-10) is a small inland Pre-Dorset site located on the western shore of Burwash Bay, which forms the southern margin of Nettilling Lake. The site is situated on a narrow point of land approximately 5 kilometers east of the West Burwash Moraine. Elevations at the site range from less than 1 meter to 2 meters above lake level (a.l.l.). Stenton (1986) first identified the site during an archaeological reconnaissance of this region in 1985. At the time of discovery, various forces of mechanical erosion (i.e. wave action, run-off, deflation, ice push) were negatively affecting the site. Consequently, mitigative excavations were undertaken the following year to prevent further damage and loss of information (Stenton 1986).

Sandy Point is arbitrarily divided into three components: mainland, channel, and island (see Figure 2.10). The mainland component lacks surficial features and is defined entirely by the areal distribution of lithic artifacts. This component is generally triangular in plan view and is further subdivided into two distinct zones: east beach and west beach. The east beach extends northward for roughly 50 meters and then tapers northeasterly for an additional 120 meters. The west beach is much larger measuring 410 meters in length and ranges in width from 3 to 12 meters. The soil matrix in both beach zones consists of fine-grain sand underlain by gravel and small cobbles.

The island component was originally part of the mainland; however, over time, erosion created a shallow channel (80 centimeters), which now separates the two areas. The island measures 88 meters in length and ranges from 3 to 12 meters in width (see Figure 2.11). The island beach zone is narrower than that on the mainland and consists of large boulders and cobbles, which have fallen from the surrounding banks. The island supports a thick vegetation layer consisting of grasses and moss. A substantial peat layer underlies the vegetation and below that is a matrix of cobbles and coarse sand. Most of the recovered artifacts were located between the peat and cobble layer. A sample of this peat produced a radiocarbon date of 2924 BP (± 65) (Stenton 1989:239); however, this date must be considered a minimum date for occupation since the cultural layer lies below the peat. The only discernible feature at the site is a small tent ring located at the north end of the island component. This tent ring is not associated with the Pre-Dorset occupation of the site since its stratigraphic placement is well above the Pre-Dorset cultural layer. The cultural affiliation of this feature is not known since it did not yield any temporally diagnostic artifact types.

Excavation procedures at Sandy Point consisted of surface collection and unit excavation. A total of 9 random and 11 non-random 2 by 2 meter units were excavated on the island and beach sand and fill from several of the excavated units was screened using 5 mm mesh (Stenton 1986). The recovered assemblage includes 1277 lithic artifacts. Of these 1176 are flakes and 101 are formal and informal tools, and utilized flakes (see Table 2.1).

Mosquito Ridge (MaDv-11)

Mosquito Ridge is a large multi-component site located on top of a gravel esker that extends roughly 5-6 kilometers from its most western extent where it intersects with the West Burwash Moraine out to its most eastern point where it descends into Burwash Bay (see Figure 2.12). There is a 20 meter break in the esker at about 3 kilometers, which is the approximate mid-point. The main site proper is located on that part of the esker to the east of the break (see Figure 2.13). The western shore of Burwash Bay borders the southern margin of the esker. The highest elevation for the site is recorded at 3.1 meters above Lake Level (Stenton 1989:194). The site has a calibrated radiocarbon date of 4290 – 4080 BP (Beta – 175504) making it one of the oldest sites presently recorded on Baffin Island, and among the earliest in the eastern Arctic. The Closure site near Kimmirut and Mitimatalik in the northern Baffin region have corrected radiocarbon dates of

4225 (± 383) BP and 4100 (± 167), respectively (Maxwell 1985:78-79). These dates derive from sea mammal fat whereas the Mosquito Ridge date was obtained from caribou bone.

Stenton first identified the Mosquito Ridge site in the mid-1980s and recorded 30 archaeological features including numerous tent rings and semi-subterranean houses. Subsurface testing conducted during Stenton's investigations indicate Inuit, Thule, and Pre-Dorset all occupied the site at different times over the millennia. On the crest of the esker, the surface cover includes a mixture of loose gravel, moss, and grass. The subsurface matrix comprises a layer of dark brown compact soil underlain by coarse sterile gravel.

A second subsurface component belonging to the Pre-Dorset occupation of the site was discovered on the crest of the esker to the west of the main break (Milne 2000c) (see Figure 2.13). A caribou path extends through this area resulting in the exposure of subsurface artifacts and the subsequent discovery of the component. There is no evidence indicating the Inuit and Thule occupied this area of the site (i.e. no semi-subterranean houses, heavily constructed tent rings). Because this area is nearly half a kilometer away from the main site proper and represents an isolated, undisturbed Pre-Dorset occupation, it is treated as a separate component at the site and is referred to as Mosquito Ridge West so as to maintain its distinction. Mosquito Ridge West mirrors the main site proper in terms of surface cover, stratigraphy, and location of artifact distributions. The occupants of this area of the site also established their camp on the crest of the esker. Mosquito Ridge West is bordered on the north by one of the two large ponds in the area and by Burwash Bay to the south. The most prominent features at Mosquito Ridge West are three large glacial erratics located on the southern bank approximately 25 meters southeast of the site.

During his original investigation of Mosquito Ridge, Stenton (1989) identified two possible Pre-Dorset tent rings and five lithic scatters at the eastern end of the main site area. Based on his findings, excavations undertaken in 2000 (Milne 2000c) focused on this area since it was most likely to yield evidence of an undisturbed Pre-Dorset occupation. An intensive surface survey covering a linear transect of 115 meters yielded several hundred lithic artifacts. Based on these distributions, two excavation grids were established and 47.75 square meters excavated (see Figures 2.14 and 2.15, respectively). A third excavation grid was established at Mosquito Ridge West and its location was determined by the areal distribution of surface artifacts and the productivity of 5 random test units initially excavated in the area (see Figure 2.16). A total of 33.5 square meters were excavated in Grid 3. All excavated fill from both components (with the exception of three units in Grid 1) was screened through nested 1/4 and 1/8 inch wire mesh.

This work did not uncover any definitive structural features. However, a notable quantity of faunal remains were present, which consist largely of snow goose (Donnelly 2002), indicating better than average preservation conditions compared to other Pre-Dorset sites from southern Baffin Island. This faunal assemblage is discussed in more detail in Chapter 6 and Appendix C. Artifact frequencies from Mosquito Ridge and Mosquito Ridge West are dominated by lithic debitage, which accounts for 97% of the entire assemblage. Specific tool types and frequencies are listed in Table 2.2.

Summary

The inland and coastal regions of southern Baffin Island have been exploited by Palaeo-Eskimos and Neo-Eskimos for millennia. This region supports a more diverse and abundant resource base than many other Arctic regions. Despite this, however, these resources are still highly variable in their seasonal availability and distributions. Stenton's (1989, 1991a) land use model describes how the Thule and Inuit adapted to these conditions, especially in those instances when unexpected declines in caribou resources occurred. The interior lakes region played a vital role in helping local populations mitigate these circumstances. Moreover, it was also an important location for non-subsistence related activities. The centrality of the interior region to all coastal areas made it an easily accessible location where distant groups could meet to socialize and exchange information about resources and local conditions. Given the presence of Pre-Dorset and Dorset sites in the interior region, it is likely these populations were going inland for similar purposes. However, the results of this study, which are discussed in Chapters 6 and 7, indicate the primary incentive drawing the Pre-Dorset to the interior was the abundance of toolstone, not caribou. Still, Stenton's model provides a good interpretive foundation with which to examine Pre-Dorset land use patterns in this region, and in subsequent chapters this information will be used to reconstruct an image of what the Pre-Dorset occupation of southern Baffin Island was like.

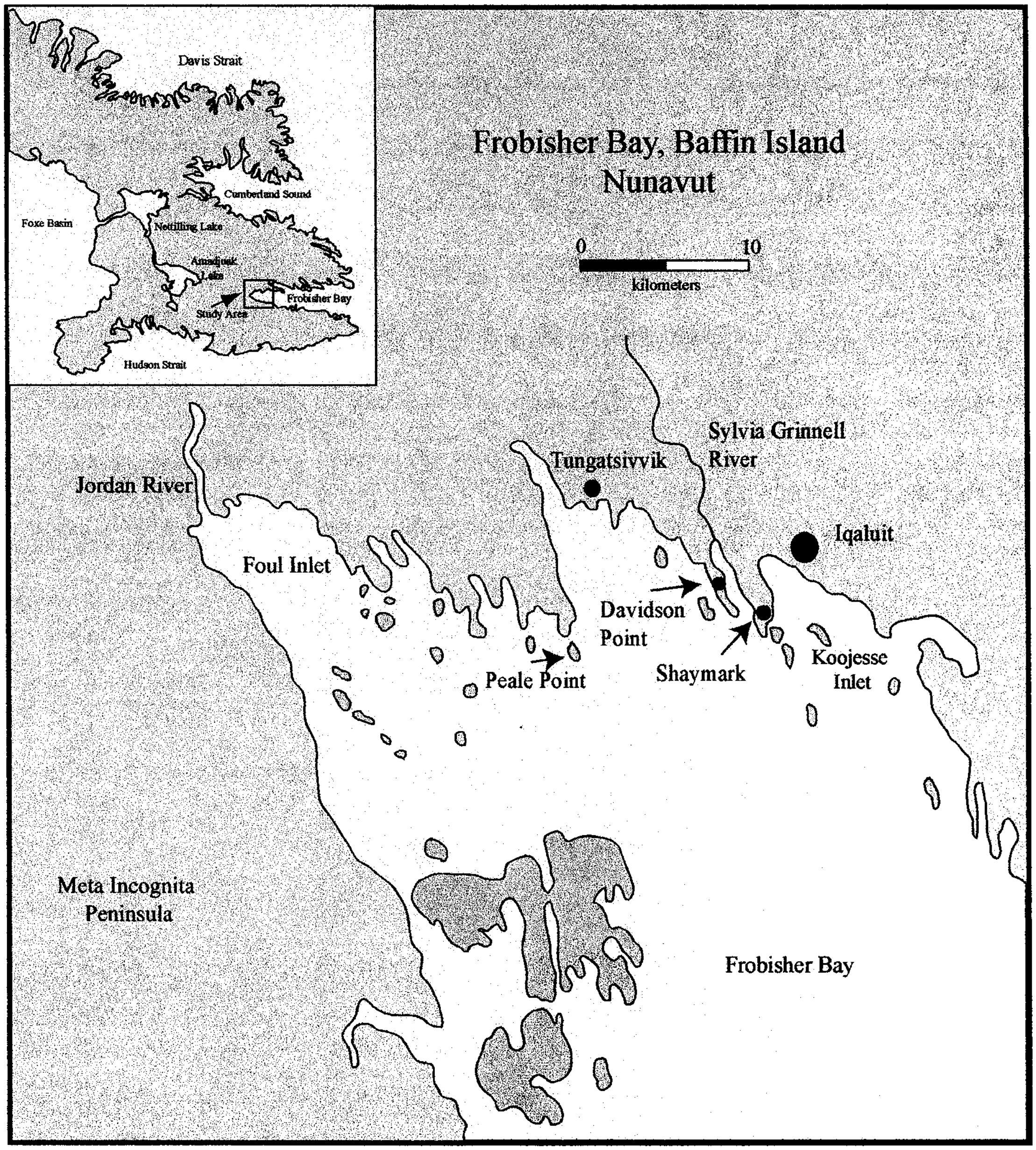


Figure 2.3 Map of the Frobisher Bay area indicating the locations of the coastal sites.

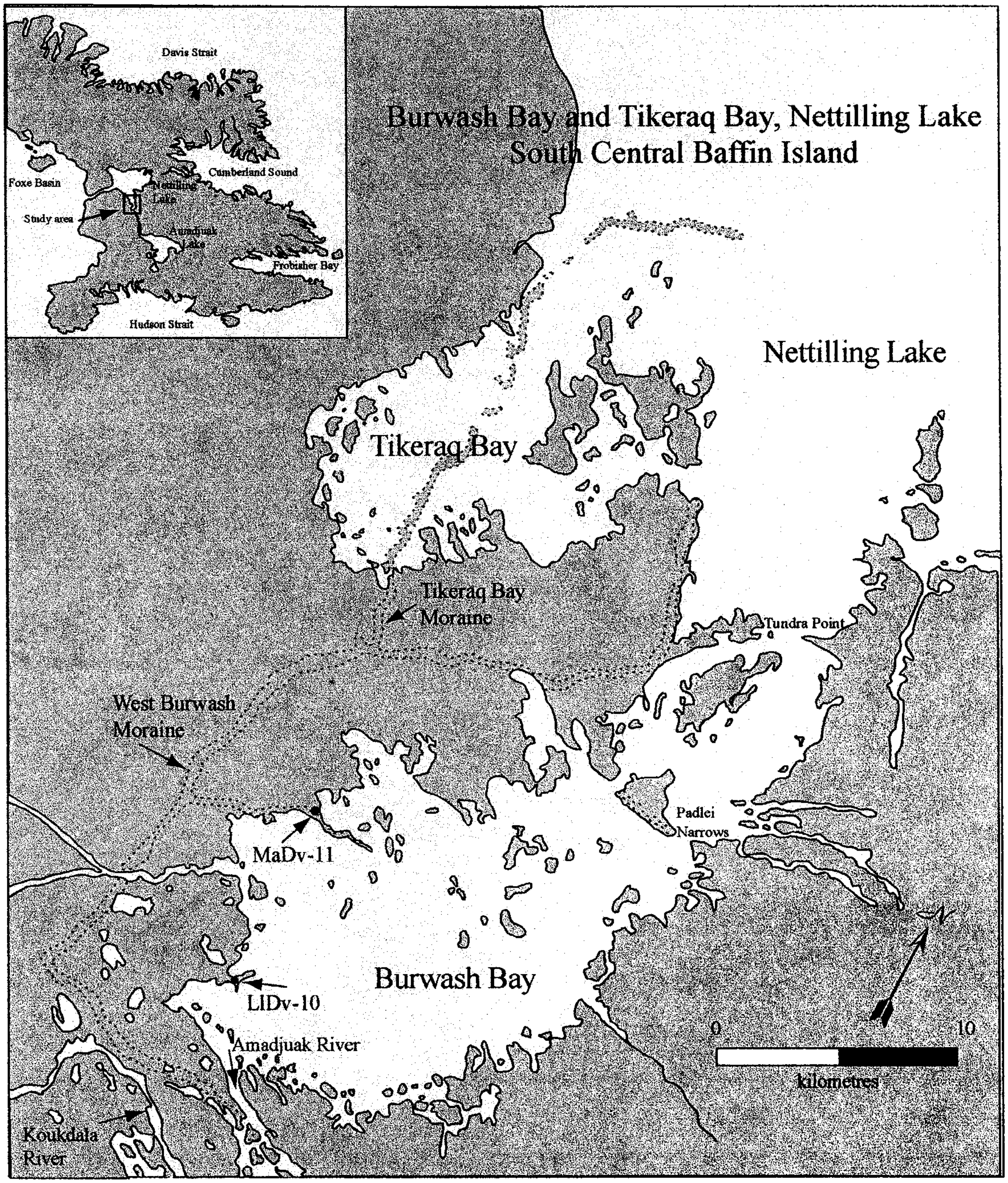


Figure 2.4 Map of the Burwash Bay District indicating the locations of the inland sites (modified from Stenton 1989).

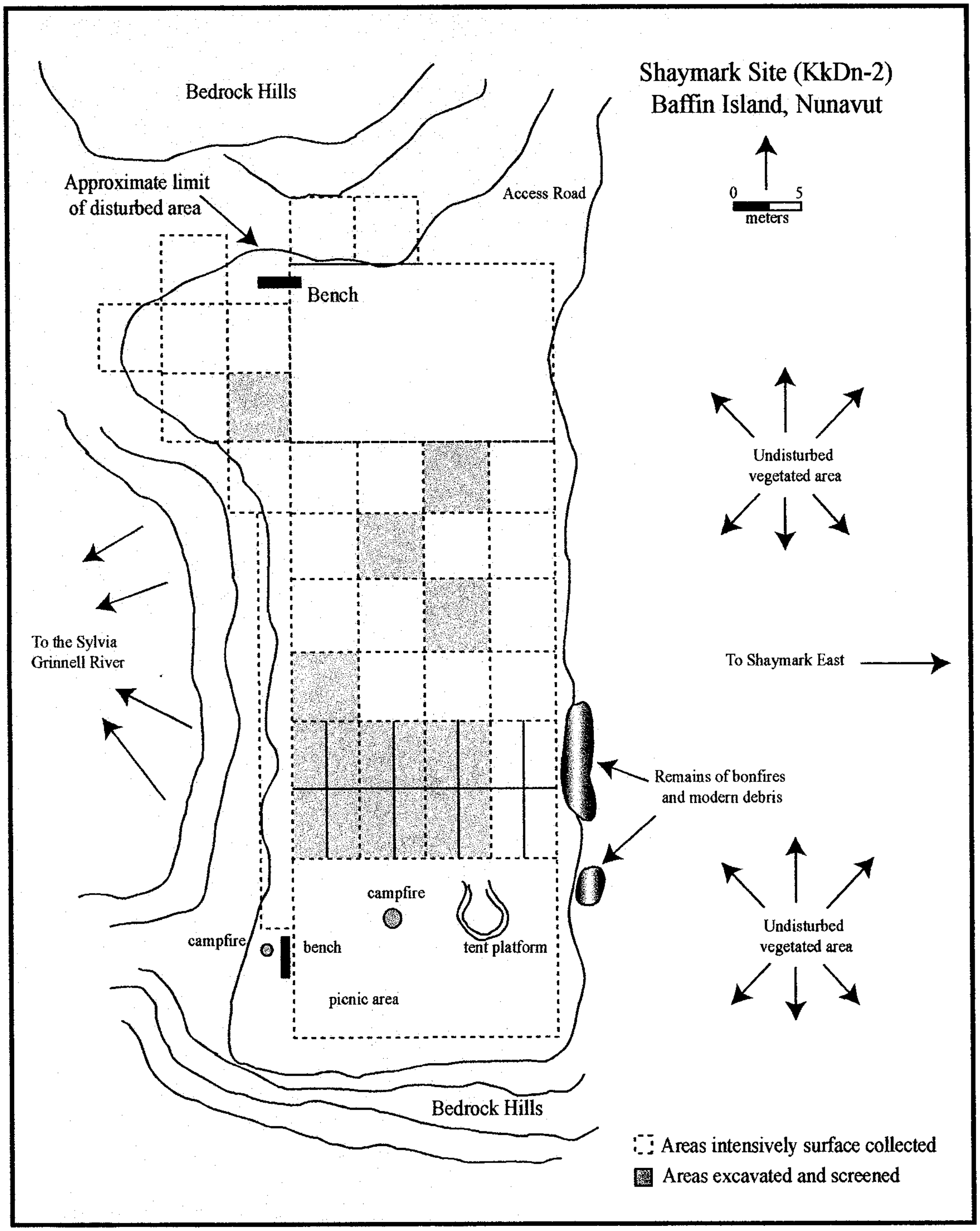


Figure 2.5 Map of the excavation conducted at the Shaymark site (KkDn-2) in 1999 (modified from Stenton 1999).

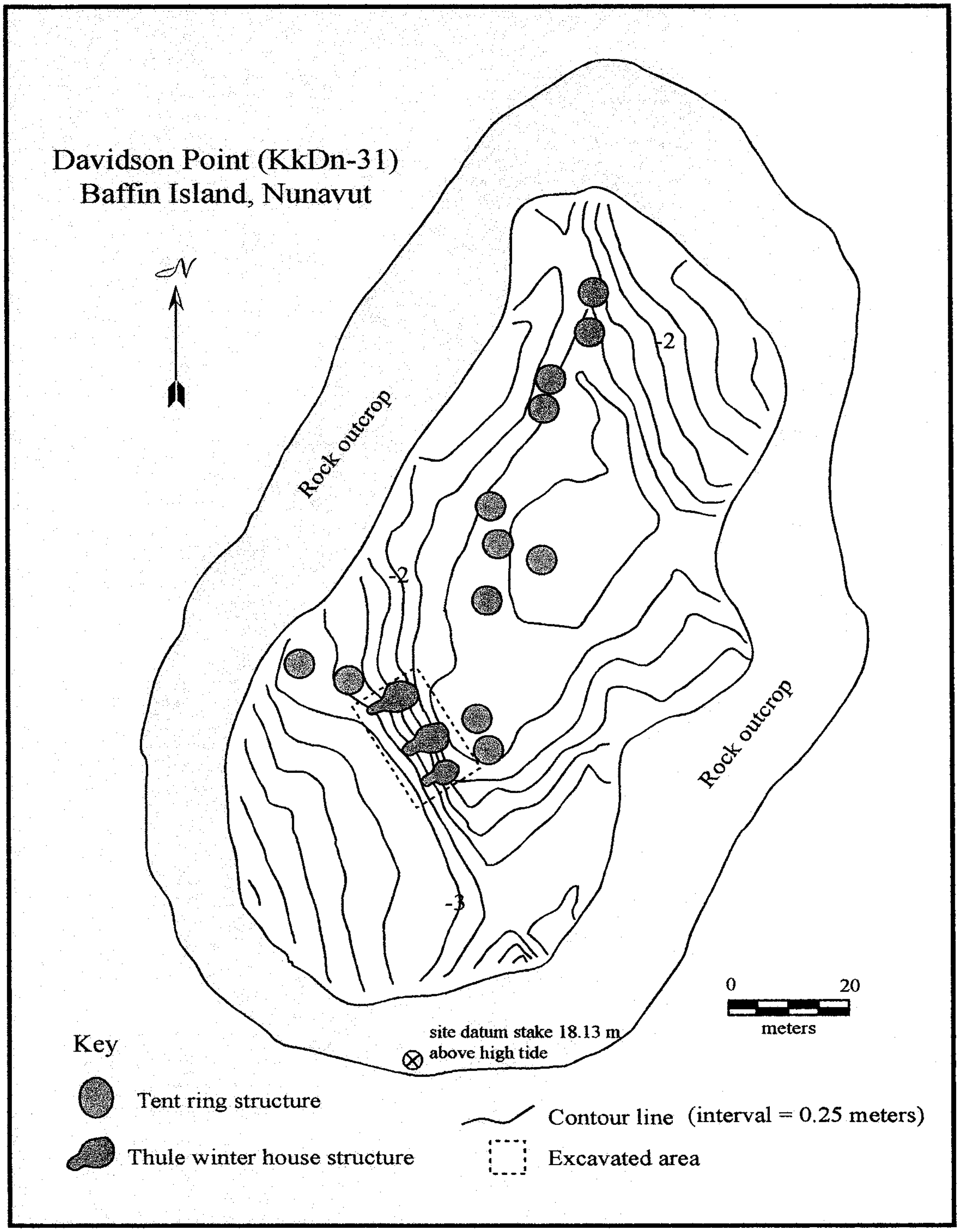


Figure 2.6 Map of the Davidson Point site (KkDn-31) area indicating the location of the Thule winter houses and recorded tent rings (modified from Park 1997).

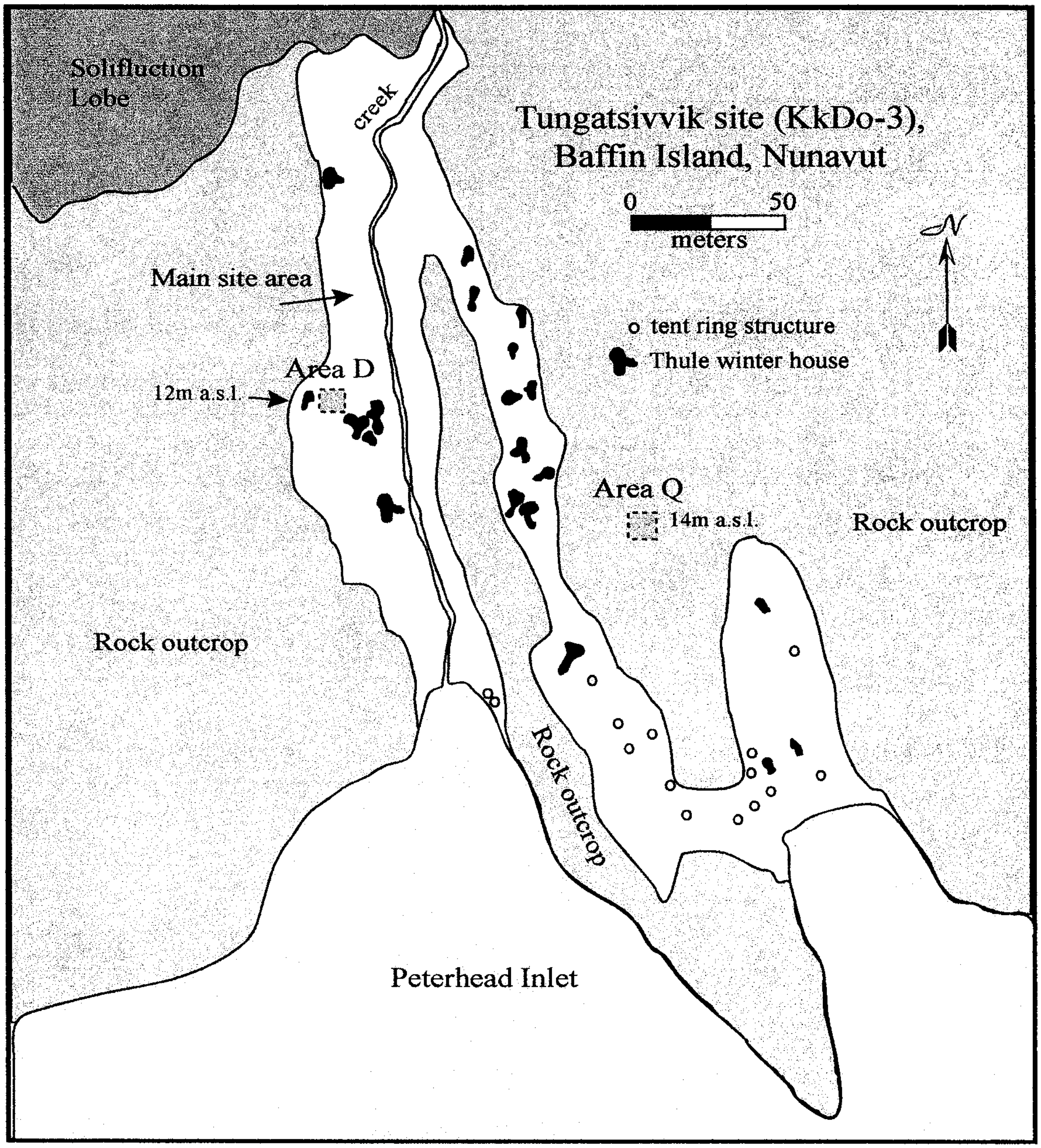


Figure 2.7 Map of the Tungatsivvik site (KkDo-3) area indicating the locations of Area D and Area Q (modified from Park 1999).

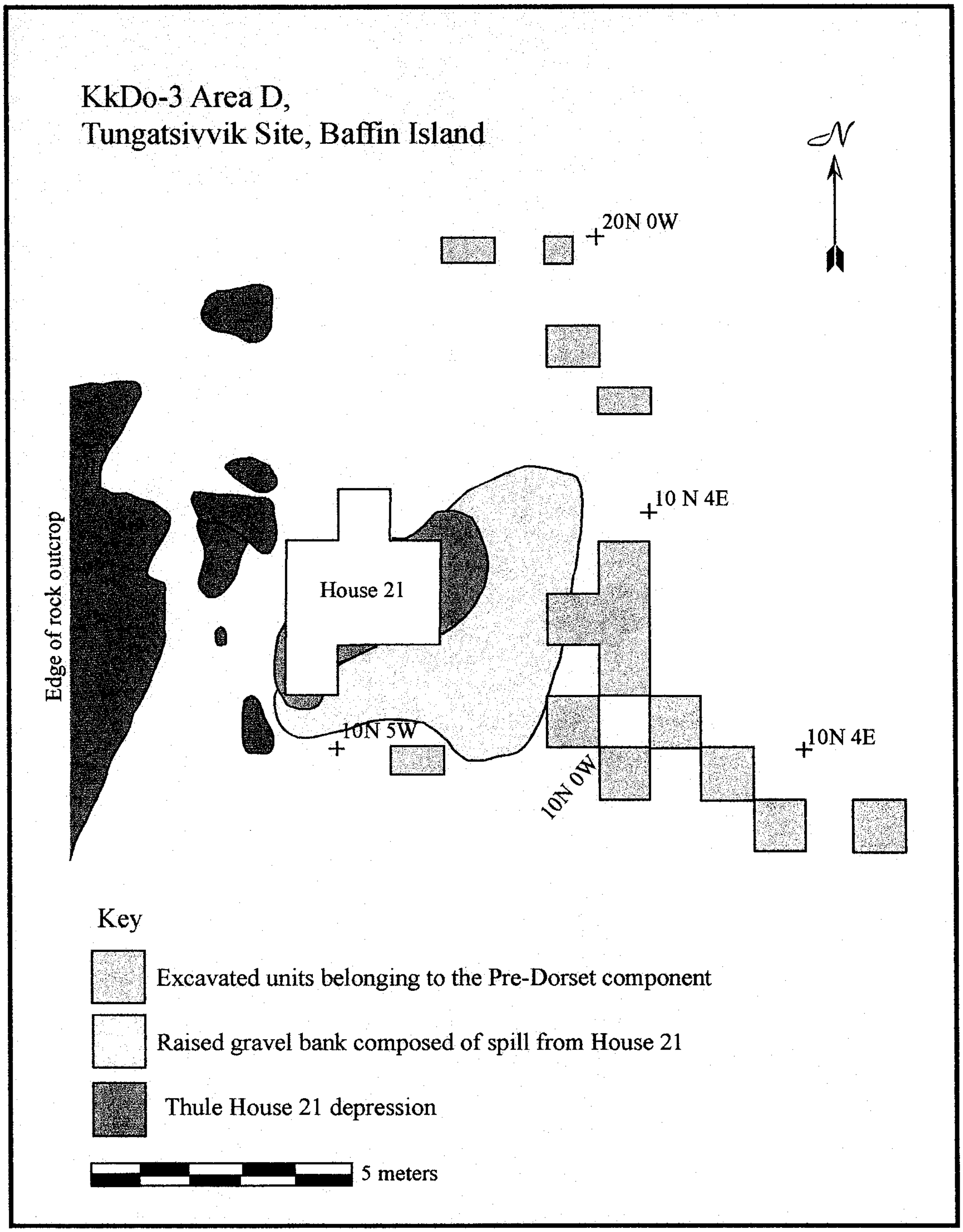


Figure 2.8 Map of the Area D excavation area (modified from Park 1999).

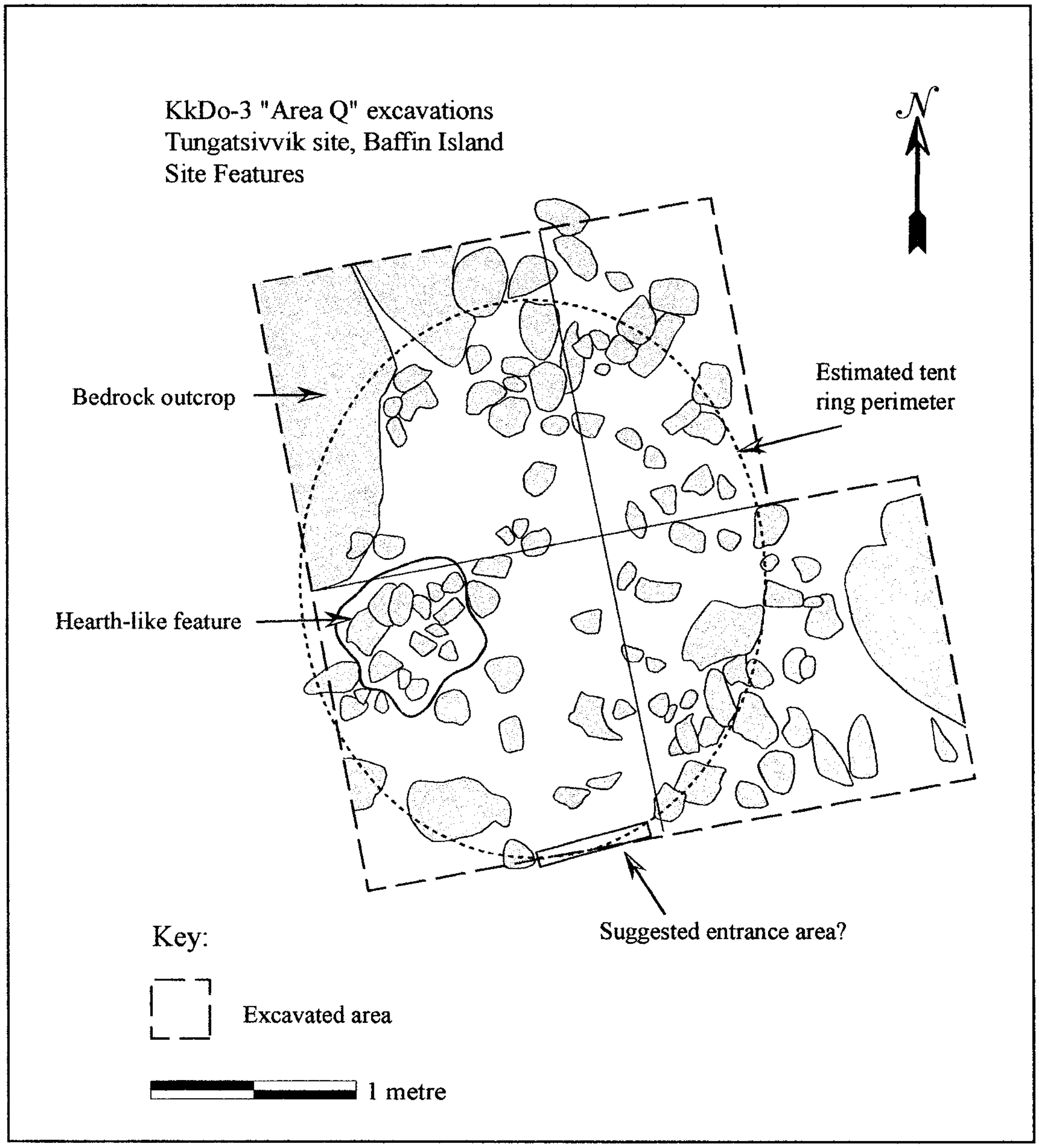


Figure 2.9 Map of the Area Q excavation area indicating the locations of the identified structural features (modified from Park 1999).

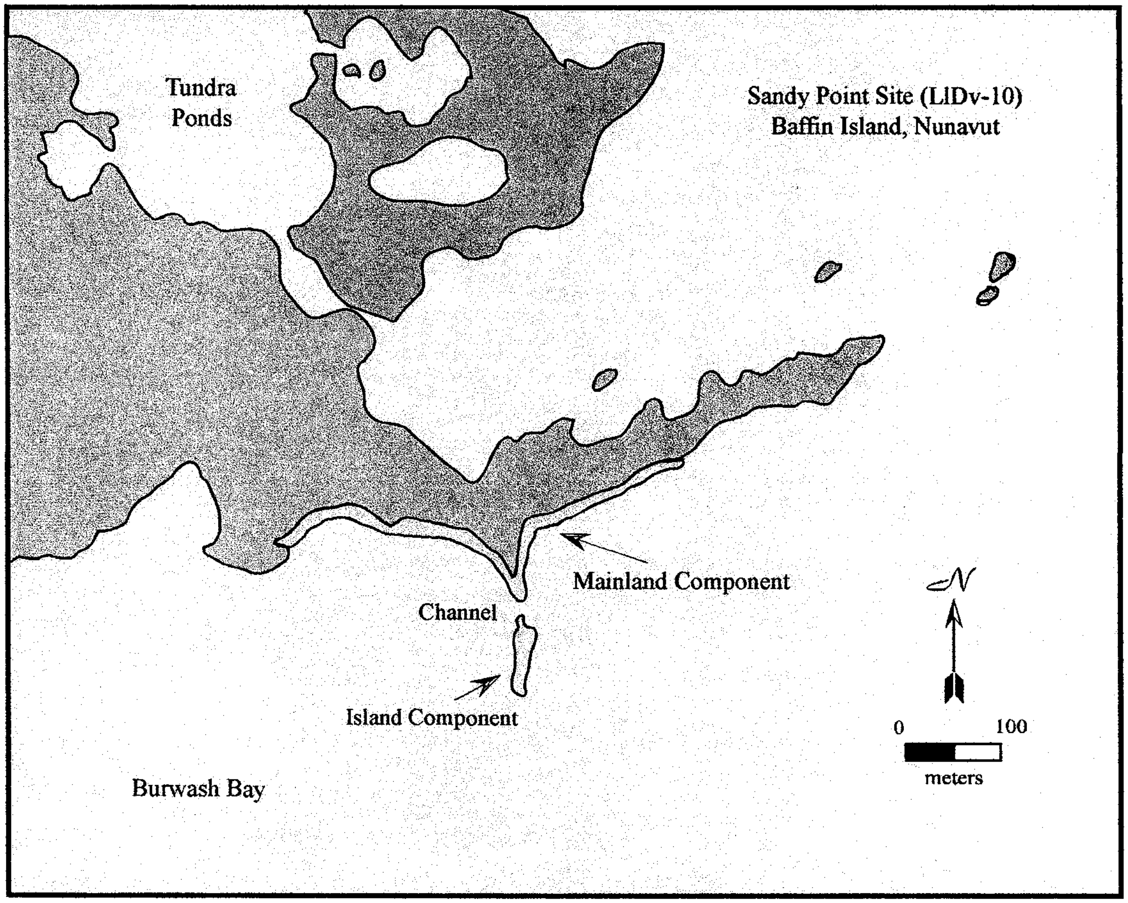


Figure 2.10 Map of the Sandy Point site (LlDv-10) components (modified from Stenton 1986).

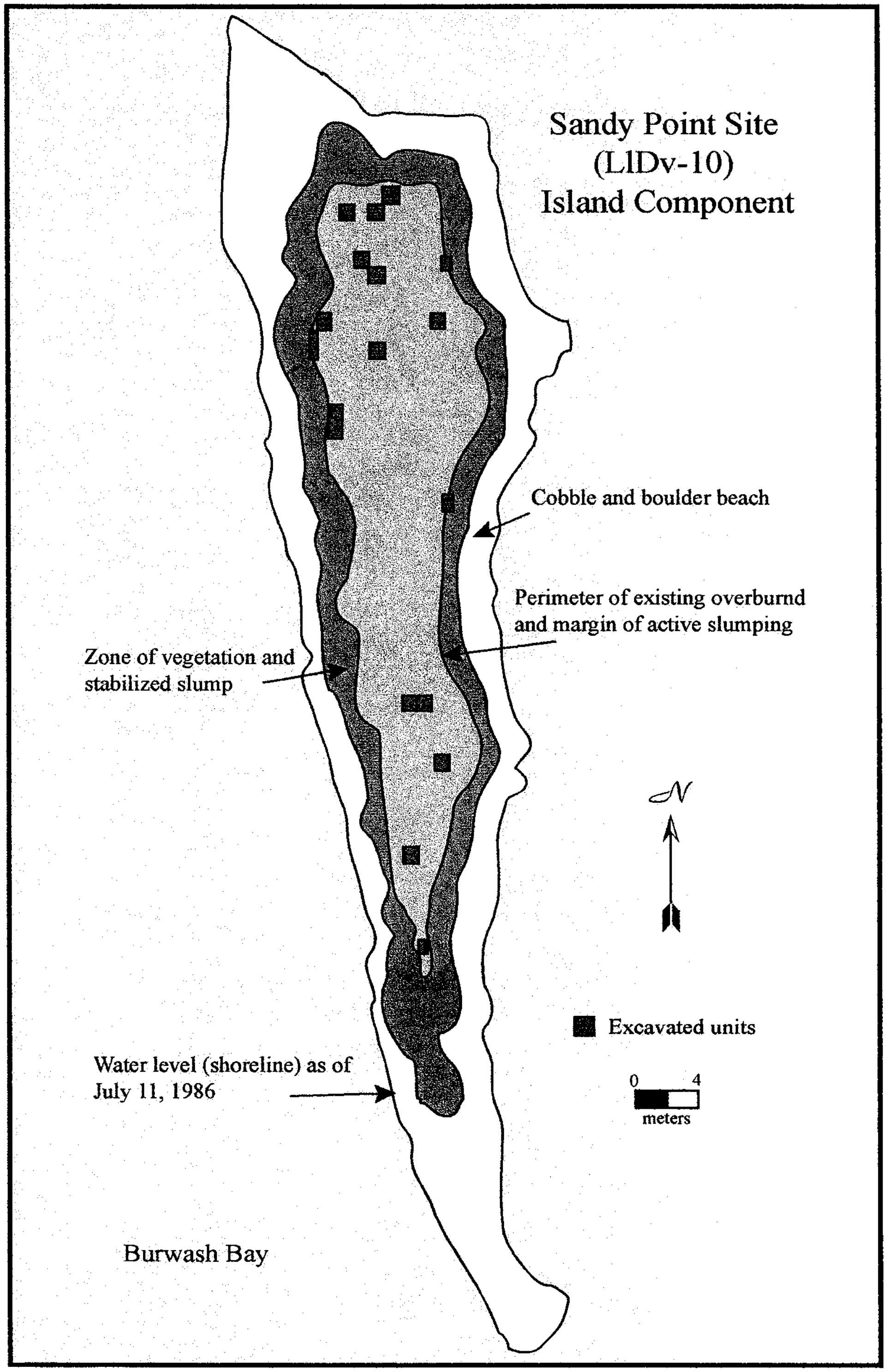


Figure 2.11 Map of the Sandy Point Island component indicating the location of the excavated units (modified from Stenton 1986).

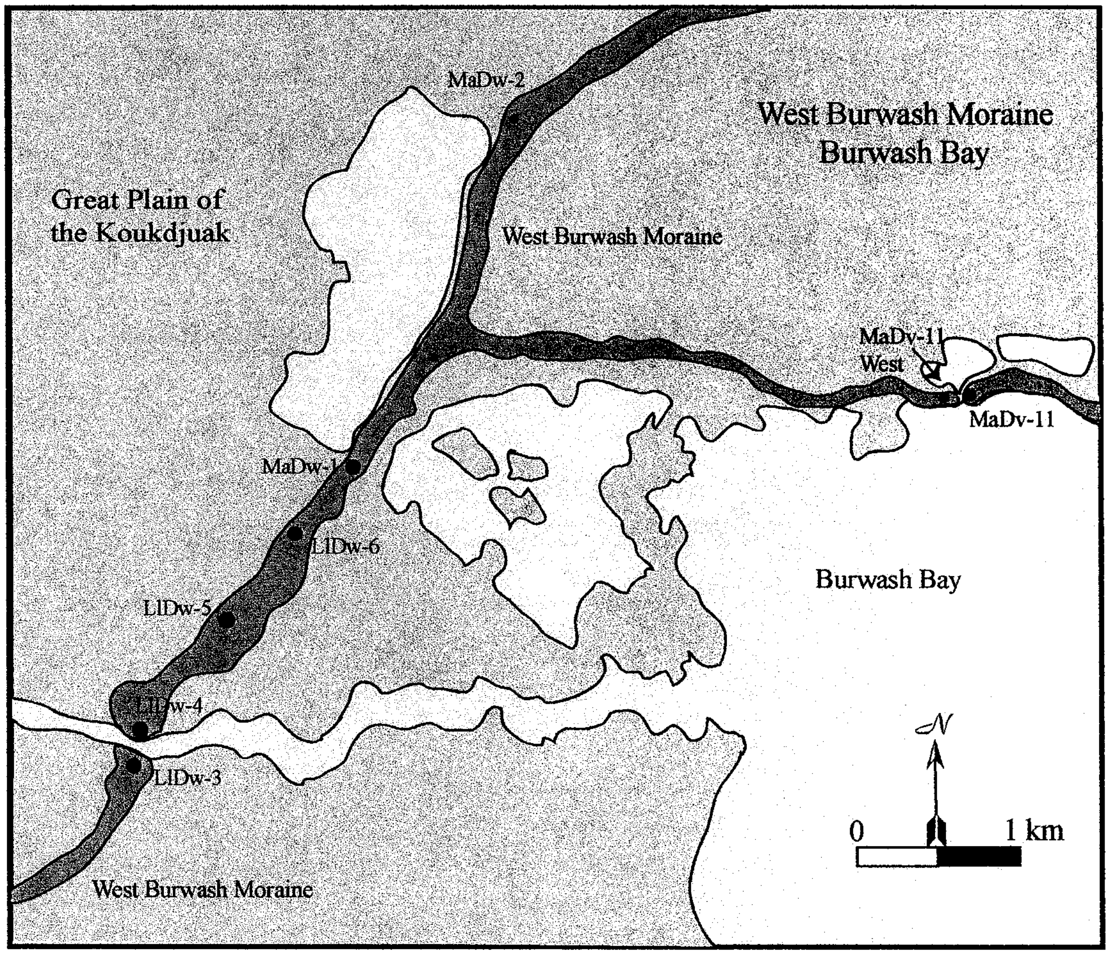


Figure 2.12 Location of the Mosquito Ridge (MaDv-11) site on the esker extension of the West Burwash Moraine (modified from Stenton 1989). The locations of other archaeological sites along the moraine are also indicated.

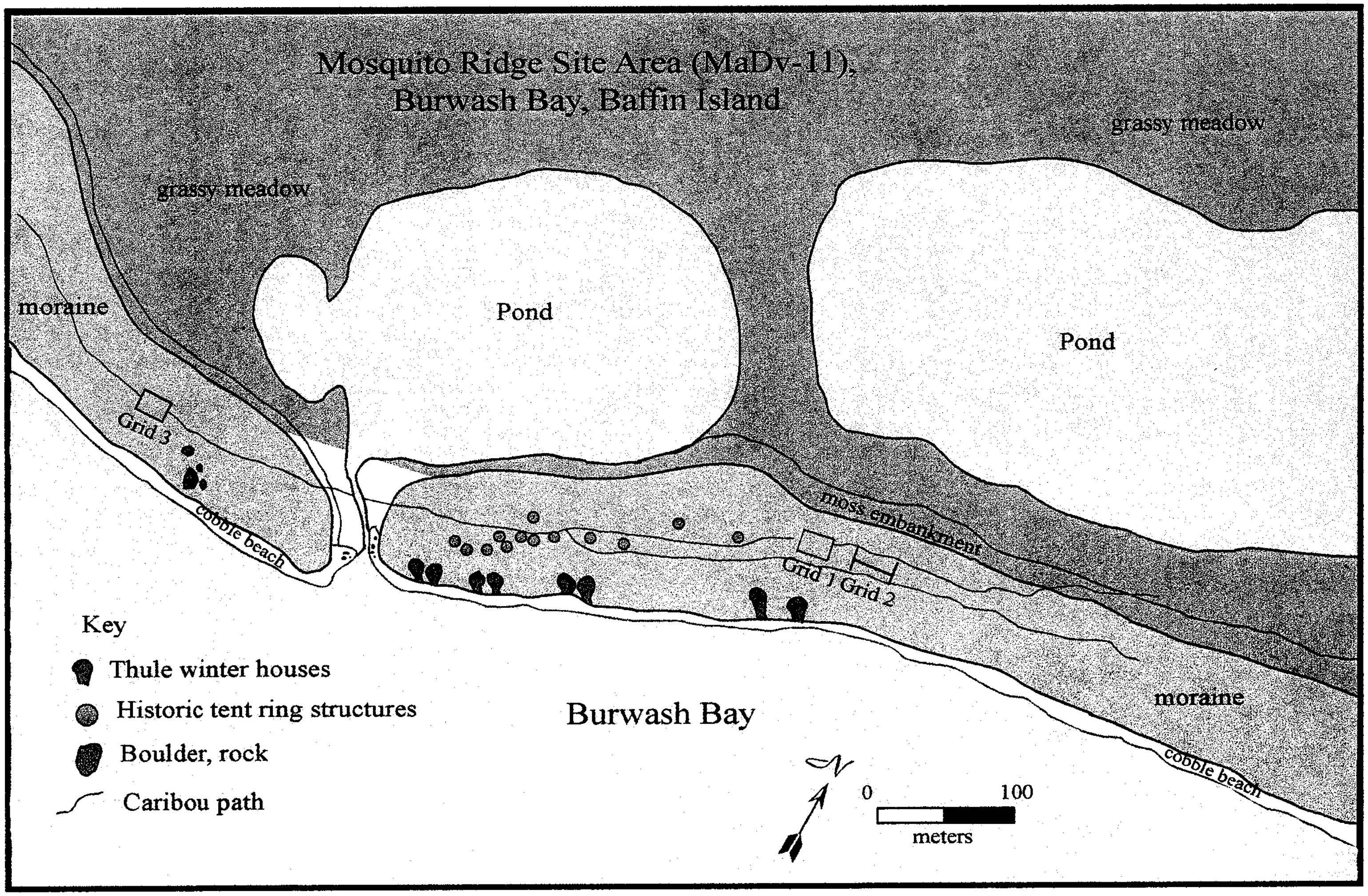


Figure 2.13 Map of the Mosquito Ridge site (MaDv-11). The three grid areas excavated in 2000 are indicated.

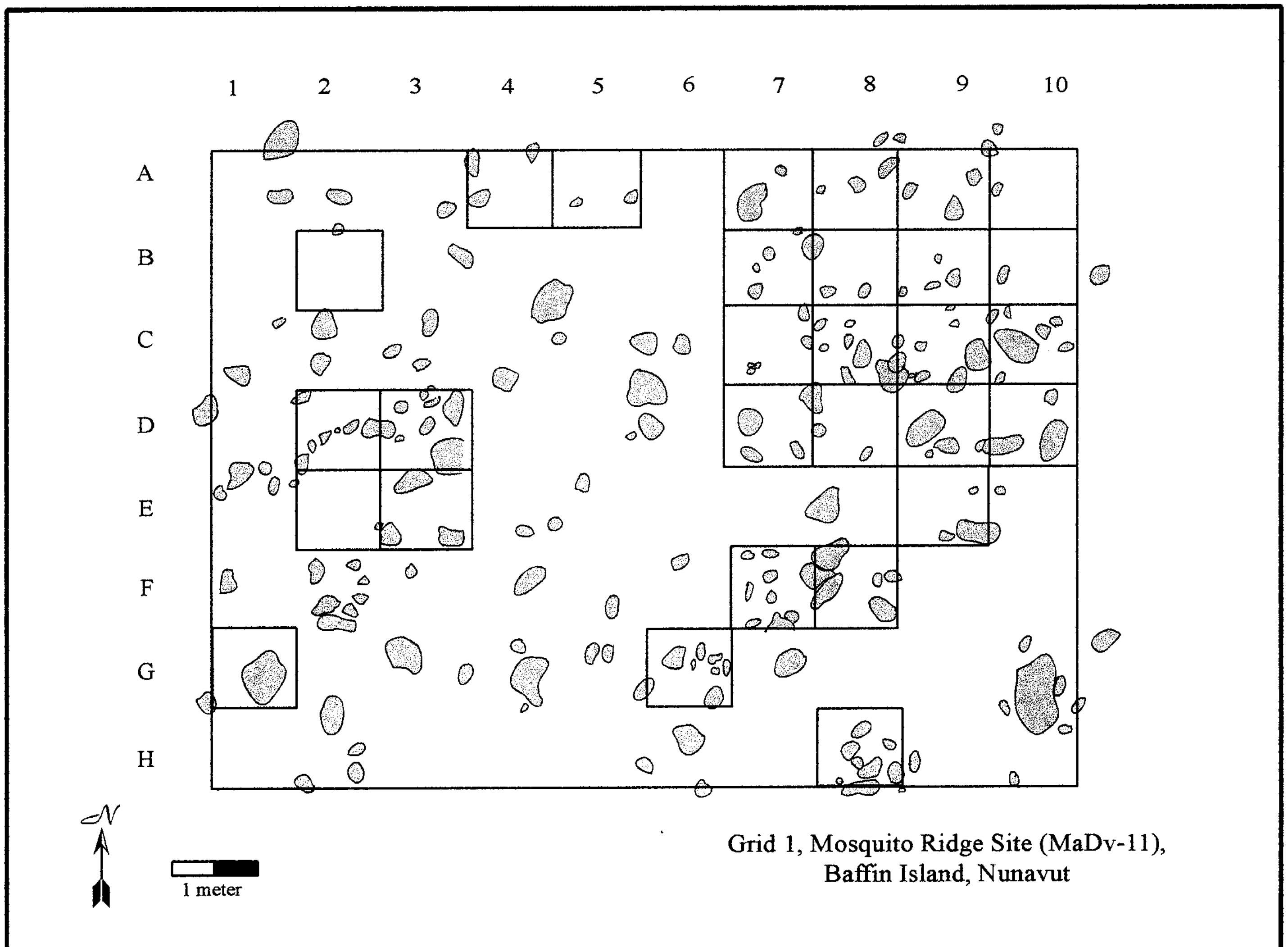


Figure 2.14 Grid 1 excavated at the Mosquito Ridge site (MaDv-11).

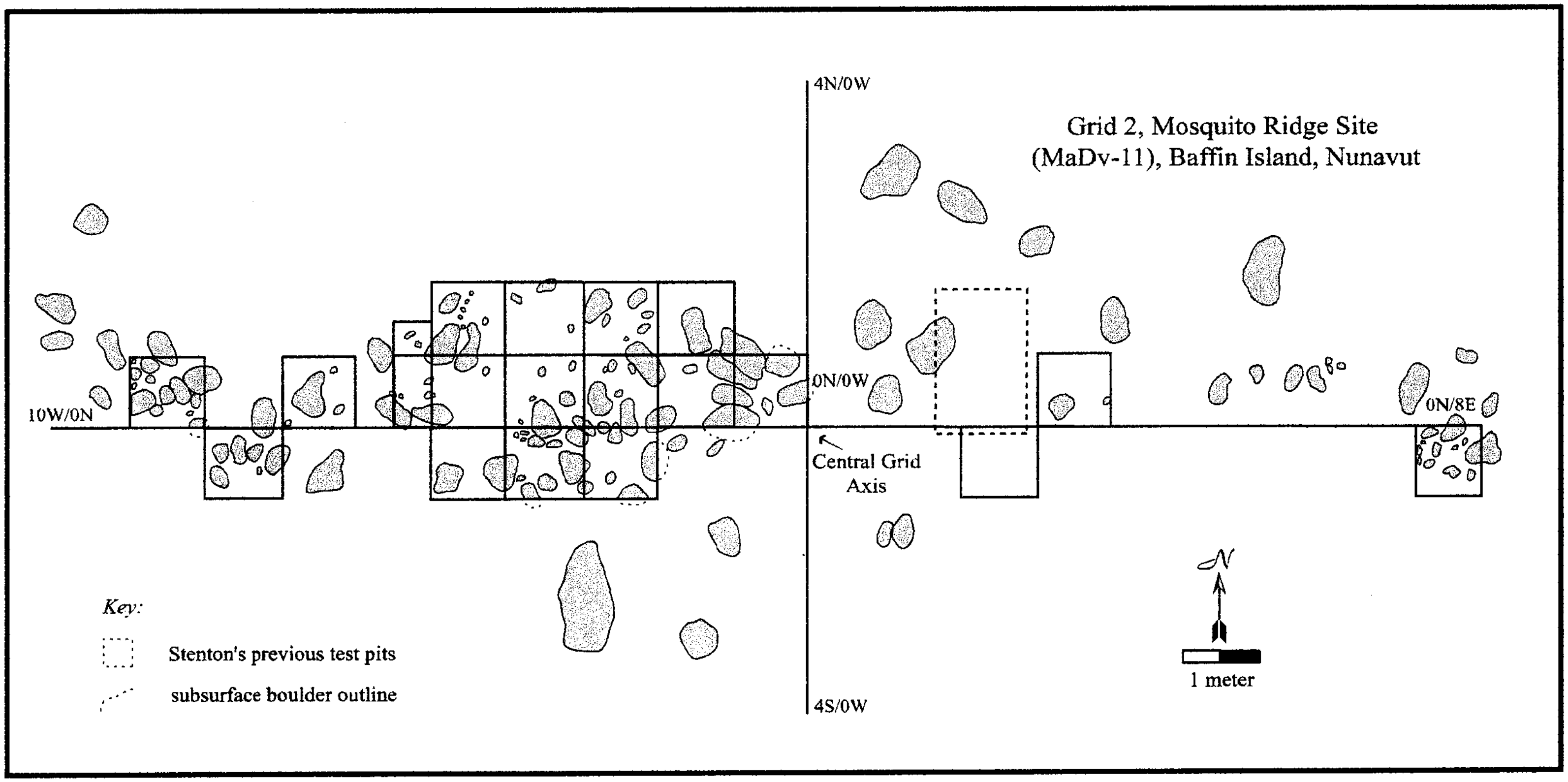


Figure 2.15 Grid 2 excavated at the Mosquito Ridge site (MaDv-11).

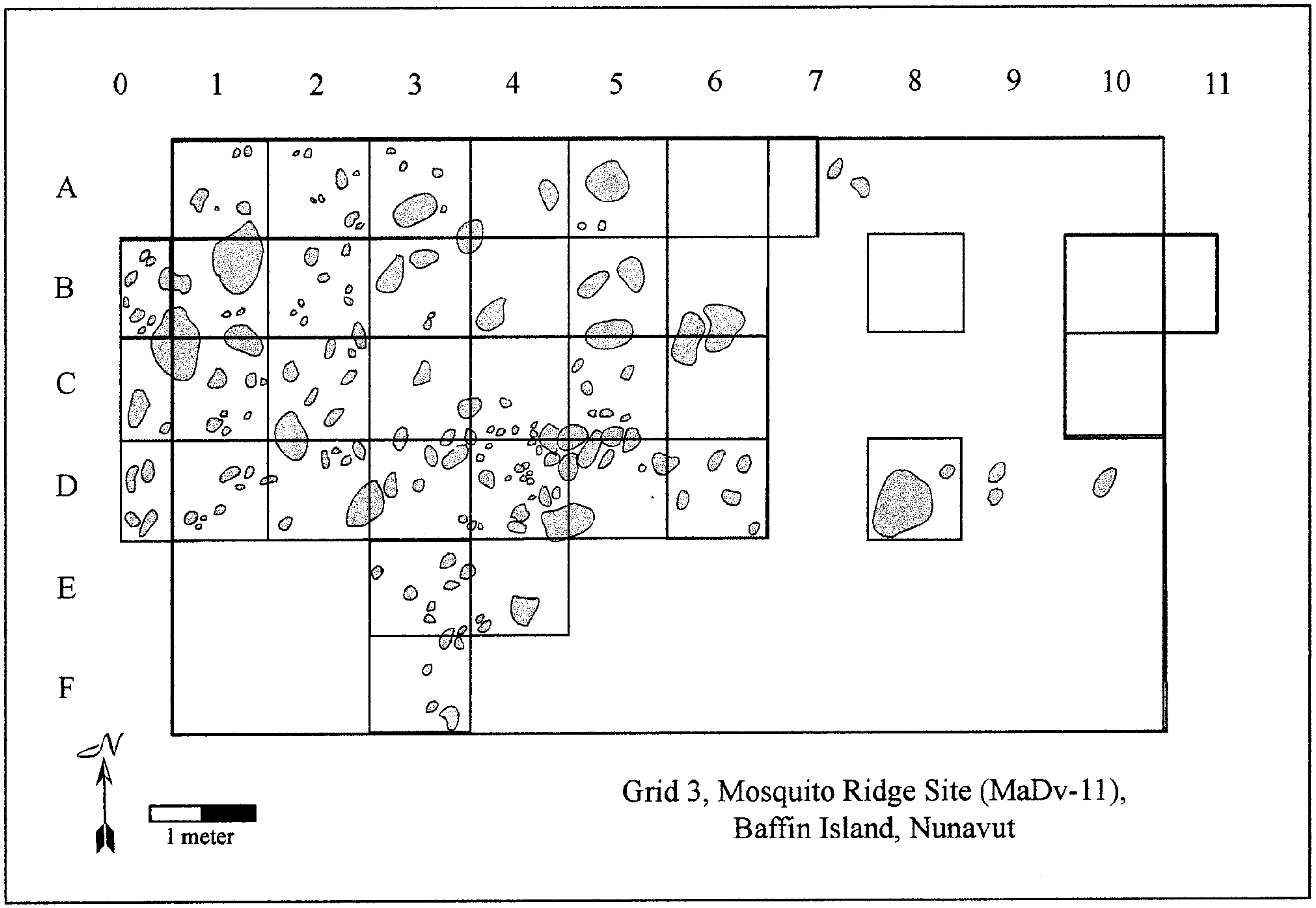


Figure 2.16 Grid 3 excavated at Mosquito Ridge West (MaDv-11).

Chapter 3

Pre-Dorset Culture and Lithic Technology

This chapter begins with a brief description of what is presently known about the Pre-Dorset culture in the eastern Low Arctic. The methods Arctic archaeologists use to interpret Pre-Dorset mobility, resource procurement, and site function are then discussed, as are the limitations associated with these approaches. An alternative perspective, which views lithic technology as a reduction continuum, is proposed as an effective way to use assemblage variability to interpret these phenomena. I conclude by discussing how specific kinds of lithic assemblage variability can be used to interpret changes in hunter-gatherer social organization.

Pre-Dorset Culture: Current Interpretations

Because of variable preservation conditions in many Low Arctic Pre-Dorset sites few organic remains are preserved, and thus this culture is known principally from its lithic artifacts. Diagnostic types include spalled burins, burin spalls and spall tools, microblades, scrapers, and endblades. It is important to note that while organic artifacts are scant, many of these lithic tools were used to manufacture bone, ivory, and antler implements indicating an extensive organic industry did exist (Maxwell 1984:361). Subsistence activities for the Pre-Dorset focused on marine and terrestrial species, and it is believed these people migrated between inland and coastal areas in accordance with seasonal resource changes (McGhee 1990; Maxwell 1985; Wright 1995). To accommodate this seasonal mobility, Pre-Dorset social organization is thought to have been flexible comprising 30 or more people during one season, likely winter, and dispersed camps of one or two families for the rest of the year (Maxwell 1985:98). Dwelling structures included lightly constructed skin tents during the warm season and snow walled houses during winter (Ramsden and Murray 1995).

Subtle differences in Pre-Dorset lithic assemblages are thought to indicate internal cultural change. Three cultural horizons have been established to reflect this: Early (2275 – 1650 BC), Middle (1650 – 1250 BC), and Late (1250 – 800 BC) (Arundale 1981; Maxwell 1976b, 1985). Differences among these horizons are based on changes in the relative frequencies of certain lithic artifact types and their stylistic traits, not on specific changes within the actual assemblages (Helmer 1994:23; Maxwell 1985:109). Noticeable changes in artifact types and style do, however, distinguish Pre-Dorset from Dorset (McGhee 1976, 1979; Maxwell 1973, 1976b, 1985:107-109; Owen 1988; Schledermann 1990; see Tables 3.1 and 3.2 respectively). A period of transformation occurred for the Pre-Dorset and while its catalysts are not entirely understood (Maxwell 1985; Nagy 1994), this change eventually led to the emergence of the Dorset culture.

Table 3.1 Changing Frequencies Over Time Among Diagnostic Pre-Dorset Types.

	Microblades	**Spalled Burins**	**Burin Spalls**	**Burin-like Tools**
Early Pre-Dorset (2275-1650 BC)	Low	Abundant	Abundant	Rare
Middle Pre-Dorset (1650-1250 BC)	Increasing	Abundant	Abundant	Rare
Late Pre-Dorset (1250-800BC)	High	Abundant	Abundant	Rare
Early Dorset (700-400BC)	Very High	Rare	Rare	Abundant

Table 3.2 Changing Stylistic Treatments Over Time Among Pre-Dorset Artifact Types.

	Polish	**Grinding**	**Notching**
Early Pre-Dorset (2275-1650 BC)	Rare	None	Rare
Middle Pre-Dorset (1650-1250 BC)	Increasing	None	Some
Late Pre-Dorset (1250-800BC)	High	None	Some
Early Dorset (700-400 BC)	High	High	High

Pre-Dorset Mobility

Kelly (1983:277, 1988:717) defines mobility as the way in which hunter-gatherers move across the landscape during their seasonal round. The structure of food resources in a given environment and the subsistence practices a culture uses to exploit them will determine the frequency of moves, the distances covered, and the how they are structured socially (Goodyear 1989:2; Jones *et al.* 2003:8; Kelly 1992:44). In the Arctic, all interpretations of early Palaeo-Eskimo lifeways are structured by assumptions of seasonal mobility (Bielawski 1988:57). The frequency of population movements was presumably determined by marked seasonal changes in the environment. With the spring break-up of the sea ice, people would have moved inland. Similarly, when the sea ice formed again, these people would have moved back to the coast. The degree of mobility practiced by the Palaeo-Eskimos in accordance with these seasonal changes is believed to have fluctuated between periods that were highly nomadic (i.e. while en route between the inland and coastal areas) and periods that were more sedentary (i.e. they stayed put once they reached the inland or coast) (Bielawski 1988:56). The distances covered during these seasonal migrations undoubtedly varied from region to region. But, generally speaking, they are thought to have been substantial. Group composition presumably changed to accommodate different degrees of mobility. When traveling long distances, groups dispersed into single-family units and during more sedentary periods, these units rejoined to form larger aggregations (Bielawski 1988:56).

This model of Palaeo-Eskimo seasonal mobility mirrors that practiced by the Inuit, and Arctic archaeologists rely on it to interpret site distributions and assemblage composition. In turn, these interpretations are used to reconstruct Palaeo-Eskimo lifeways. However, there are several problems with this practice. First, most of what is known about Palaeo-Eskimo culture derives exclusively from coastal sites (Bielawski 1988:58). In other words, the available data with which to study Palaeo-Eskimos is biased towards a single component of the seasonal round. Archaeologists do not presently know what role the inland regions played in the seasonal adaptations of these cultures. To compensate, the seasonal mobility model is used to fill in the blanks since it seems likely the Palaeo-Eskimos, like the Inuit, would have traveled inland as part of their seasonal round to exploit available resources in these areas.

The second problem centers on how Arctic archaeologists study Palaeo-Eskimo sites and relate them to broader patterns. It is widely acknowledged that the Palaeo-Eskimos were very mobile, yet many reconstructions of their lifeways are based on analyses of single sites or a few sites within a circumscribed area (Bielawski 1982:37). This practice makes it impossible to understand how sites across the landscape were differentially used and linked to one another in the context of a local adaptive system. In order to determine the extent of land covered by a seasonal round, and the frequency and consistency of movements within it, the full range of site types must be known. This can only happen when the focus of analysis is regional and multiple sites are included (Kelly 1994).

Finally, when the seasonal mobility model is used to interpret variability in Palaeo-Eskimo site location it tends to perpetuate a rigid view of behaviour. When coastal sites are examined, archaeologists presume corresponding inland sites must exist (e.g. Gendron and Pinard 2000:133; Murray 1996:83-84; Nagy 2000), even if it is unclear exactly where these sites might be. Because the model presents a simplified image of polarized movement between the coast and inland, it leaves little room to consider other areas where sites might be located on the landscape. Based on Boas' (1964) description of the southern Baffin Inuit and Stenton's (1989, 1991a) land use model, it is obvious individual choice and contingent circumstances played an important role in determining where Neo-Eskimo peoples moved in the Arctic environment, when, and for how long. They did not simply move between the coast and inland areas when the seasons changed.

Sites were also established in the coastal uplands and along migratory routes. This created more complex patterns of variability in Neo-Eskimo site location and function. Palaeo-Eskimo mobility should also be studied in such a way that allows for this kind of flexibility to be recognized should it exist.

Pre-Dorset Resource Procurement and Site Function

As already noted, mobility patterns are largely structured by the distribution and availability of food resources in a region. Likewise, the locations where these resources are procured determine variations in site function. In those sites where faunal remains are preserved, detailed assessments of Pre-Dorset resource procurement have been made (e.g. Le Blanc 1994; McGhee 1979; Murray 1996; Nagy 1996; Ramsden and Murray 1995). Sea mammals, namely ringed seal, were intensively exploited in Pre-Dorset coastal sites as were other species, including waterfowl, polar bear, and, to a much lesser extent, caribou and musk-ox (depending on the region). Inland sites were presumably the primary loci where caribou and other terrestrial species were hunted (e.g. Gendron and Pinard 2000; Murray 1996; Nagy 2000); however, there is little evidence to support this since few inland Pre-Dorset sites have been excavated.

When faunal remains are not present in Pre-Dorset sites, resource procurement activities are determined by assessing the logical proximity of a site to locally available resources (e.g. Maxwell 1973) and by examining formal tool frequencies (e.g. Renouf 1994; Sutherland 1996; Tuck 1975). For the first point, if a site were located on the coast in an area where ringed seals were plentiful, one might assume this was an important subsistence resource drawing people to the area and that the primary activity at the site was sealing. Relying on formal tool frequencies to interpret subsistence activities is not quite so clear-cut since many interpretations of tool function derive from inferences made by individual researchers. These inferences are based largely on tool morphology and comparisons made between Inuit and Palaeo-Eskimo material culture inventories. Table 3.3 lists some common tool functions inferred for Palaeo-Eskimo lithic artifacts and their season of use (from McGhee 1979; Maxwell 1973, 1976b, 1985).

Table 3.3 Palaeo-Eskimo lithic tool types, including inferred function and season of use.

Tool Type	**Inferred Function**	**Inferred Season of Use**
Microblades	Cutting skins for clothing, processing meat, cutting wood	Summer/Autumn, Year-Round
Microblade Cores	Used as a source for detaching microblades	Summer/Autumn, Year-Round
Burins	Used for working bone, antler, ivory, and wood	Summer/Autumn
Burin Spall Tools	Used as small piercing tools, possibly for skin working, may also be used for fine work on bone, antler, or ivory	Summer/Autumn
Stemmed Bifaces, small	Arrow points used for hunting small mammals and birds	Spring/Summer
Stemmed Bifaces, large	Points for spears used for hunting larger terrestrial and sea mammals, used also for butchering/cutting	Year-Round
Triangular Bifaces, small	Arrow points used for hunting small mammals and birds	Spring/Summer
Triangular Bifaces, large	Used as lance tips for hunting large terrestrial mammals	Summer/Autumn
Bipointed Endblades	Arrow points used for hunting terrestrial mammals	Summer/Autumn
Endblades, all shapes/sizes	Used for sea mammal hunting	Year-Round
Sideblades	Used for hunting large terrestrial or sea mammals	Year-Round
Ovate Bifaces	Used as knives for butchering and general purpose cutting	Unspecified
Large Bifaces	Used as raw material cores or preforms, possibly used for general purpose cutting activities	Unspecified
Flake Knives	Used for general purpose cutting, separating animal joints	Unspecified
Concave Sidescrapers	Used for working bone, antler, ivory, wood	Summer
Endscrapers	Used for working hides or bone, antler, ivory, wood	Summer
Utilized Flakes	Used for general purpose cutting and scraping	Unspecified

The frequent co-occurrence of certain artifact types has led some archaeologists to group them together into what they believe are task specific lithic tool kits (see Maxwell 1976b; Nagy 2000; Sutherland 1996). Tools used for hunting include all forms of endblades and sideblades. Tools used for butchering include microblades, flake knives, utilized flakes, and large bifaces. Tools used to make organic implements include burins, burin spall tools, sidescrapers, and endscrapers. Microblades and burin spalls are also associated with sewing activities (Maxwell 1985). When these proposed toolkits are recovered from sites in high frequencies, they are used to infer what resources were procured (i.e. seals, caribou, birds, fish) and what kinds of site activities were undertaken (i.e. butchering, organic tool production, sewing, hide working). Effectively, formal tool frequencies are used to interpret Palaeo-Eskimo site function and seasonality when more definitive evidence, such as faunal remains, is absent.

Using tool morphology to infer tool function is not uncommon; however, there are certain caveats with doing this, especially when tools were used as multi-purpose implements (Andrefsky 1998:190-191). Several studies have demonstrated that some artifact classes traditionally perceived as single-purpose tools were actually used in a variety of tasks (e.g. Lewenstein 1987; Michie 1973; Nance 1971; Odell 1981; Barton *et al.* 1996). These tools include bifaces (used for spear tips, cutting, butchering, drills), scrapers (used for scraping hides, bone, wood, antler), microblades (used for cutting, sideblades, engraving), and burins (used for scraping, grooving, cutting). These artifacts comprise a significant component of Palaeo-Eskimo lithic assemblages indicating direct correlations between tool morphology and site function may be spurious.

Use-wear analysis may be helpful in sorting out tool use; however, few of these studies have been conducted on Palaeo-Eskimo lithic tools (e.g. Maxwell 1985:94). While use-wear analysis has been successful in discerning whether tools were used to process hard or soft organics (e.g. Odell and Odell-Vereecken 1980), this technique is not refined enough to distinguish the specific materials a tool was used to work. In other words, if a scraper is determined to have been used to scrape a hard organic material, it is difficult to say definitively through use-wear analysis if that material was wood, bone, or ivory (see Keeley 1974). Two drawbacks of use-wear analysis are it can yield contradictory results and it can be extremely expensive to conduct since it requires the use of high power microscopes (Keeley 1974; Moss 1983).

Even if use-wear studies could identify a tool's specific use, lithic analysts have demonstrated that the tools left behind at a site frequently represent those items that were no longer wanted or needed by the site's inhabitants and, therefore, may have nothing do with site function (Jelinek 1978; Keeley 1982). Tool use-life is highly variable and this means archaeologists cannot draw simple conclusions about site function based on perceived relationships between assemblage composition and site activities (Shott 1997:198). Simply stated, the tools found at a site do not directly equate to activity performance; site formation processes must be considered when examining lithic assemblage composition (Shott 1989a, 1997, 1999).

Because culture-historical issues continue to dominate research on Pre-Dorset culture (e.g. Gendron and Pinard 2000; Gordon 1996; Helmer 1991, 1994; Maxwell 1985; Schledermann 1990, 1996; Sutherland 1996), attention remains focused on formal tool morphologies since they are presumed to be sensitive indicators of cultural and temporal change, and site function (Arundale 1980; Bielawski 1988). Established artifact typologies that are based on the presence or absence of diagnostic lithic tools types and the varying degree of lithic workmanship they display are used to facilitate artifact classification and analysis. This leads Arctic archaeologists to view Pre-Dorset formal tool types as static typological entities. When formal tools are treated in this manner, they begin to take on a life of their own where descriptions of individual tools and their observed similarities and differences become the focus of research (e.g. Tuck and Ramsden

2001), not the people who actually made and used the tools. It is certain lithic tools were made and used to satisfy this culture's adaptive needs; however, it is important to remember that these artifacts are part of a dynamic technological system, which means tools change in shape and size through the course of their production, use, and repair (Nelson 1991).

So, based on these points, how can site function be confidently determined using lithic artifact remains and how can we begin to understand how lithic technology was integrated into a culture's broader adaptive system? Andrefsky (1998:210-211) states one of the most effective ways to determine site function is to examine the frequency and diversity of formal lithic tools together with lithic debitage. Lithic tool use, and tool production and maintenance activities invariably occurred at the same time during the occupation of a site. As such, reduction strategies should be equally considered part of a site's function since they would have been closely linked to the other activities performed in the site area (Andrefsky 1998:210). The relative intensity of tool use and reduction strategies will be reflected in proportions of tools to debitage, the condition of the tools deposited (i.e. exhausted, expedient, curated), and the stages of reduction present.

In order to link functional interpretations of single sites to broader local and regional patterns, it is important to know where lithic raw materials are located across the landscape and how groups accessed them (Andrefsky 1998:38). The relative abundance or scarcity of raw material sources and their varying quality significantly affect assemblage variability (Andrefsky 1994a, 1994b) and while lithic artifacts comprise the majority of Palaeo-Eskimo site assemblages, the procurement of lithic raw material as a critical resource is rarely considered when discussing site function (e.g. Jensen 2000; Jensen and Brinch Petersen 1998; Le Blanc 1992). Those cultures, like the Pre-Dorset, who carried with them their lithic toolkit and whose access to raw material was seasonally restricted, would have staged the reduction of acquired toolstone as they moved throughout their territory so as to ensure they had an adequate supply to meet their tool using needs (see Binford 1979:268). This means different stages of reduction are represented at different sites. If Arctic archaeologists examine lithic assemblage variability among sites within a region with the aim of identifying how reduction was staged, a more comprehensive understanding of Pre-Dorset land use strategies and site function will be attained.

Lithic Technology as a Reduction Continuum

Lithic technology is a reductive medium where material is always taken away (Deetz 1968:48; Shott 1999:218). To make a stone tool, one must continuously remove pieces of different shapes and sizes in a systematic fashion until the desired form is obtained. The removal of this material is generally viewed as a staged process (Pecora 2001; Shott 1994:81-82). Stages can be defined as "any part of the manufacturing sequence that is set off from preceding and subsequent segments by the application of a distinct tool, technique, or transformational environment (heat or chemical)" (Gero 1989:94). Stone tool production can involve many different percussors (i.e. hammerstone, billet, pressure flaker) and reduction techniques (i.e. hard or soft hammer percussion, pressure flaking, bipolar) all of which create variation in flake attribute patterns (Cotterell and Kamminga 1987, 1990). By examining this variation, stages of reduction can be defined (Bradbury and Carr 1999:105).

Some archaeologists have proposed stage models to conceptualize what the lithic production process, from raw material procurement to finished product, might look like in the archaeological record (e.g. Bradley 1975; Collins 1975; Magne 1985; Magne and Pokotylo 1981; Pecora 2001; Odell 1989). For example, Collins' (1975:16-23) model of stone tool production includes five principal stages: (1) raw material acquisition; (2) core preparation and initial reduction; (3) optional primary trimming; (4) optional secondary trimming and shaping; (5) and optional maintenance and modification. Each of these steps produces distinct product groups (i.e.

debitage and tools), which, if isolated, can be used to infer the activities used to accomplish the particular manufacturing stage (Collins 1975:17). The complexity of a tool and its byproducts is dependent on how many stages are involved in its manufacture (Collins 1975:17). Formal tools would go through all five while informal tools may only go through the first two or three (see Pecora 2001:Figure 10.1 for a schematic representation of these reduction stages).

While these kinds of models are useful heuristically for understanding how tool production intensity varies, it is difficult to distinguish where one stage ends and another begins (Bradbury and Carr 1999:106). Consequently, some archaeologists prefer to think of stone tool production as a continuum rather than a staged process (e.g. Bradbury 1998; Bradbury and Carr 1999; Ingbar *et al.* 1989; Larson 1994; Shott 1996). A continuum-based approach views production as a "continuous process in which the relationship between individual flake attributes and the process of reduction is predictable" (Bradbury 1998:263). This approach does not deny the existence of distinct production stages (Bradbury and Carr 1999:106); however, it does not focus on trying to identify them. Instead, continuum based approaches aim to understand how much of the reduction continuum is represented in a site assemblage (Bradbury 1998:264).

Lithic Technology and Land Use Patterns

To understand how a lithic reduction continuum is distributed across the landscape, several factors must first be considered. These include mobility, raw material availability, and site function. Group mobility and access to raw material sources strongly influence how hunter-gatherers organize their lithic technology. As situational changes occur during the course of a seasonal round, different demands are placed on a group's technological system. To meet these demands and satisfy changing tool needs, alternative lithic reduction and use strategies are implemented. This section discusses how mobility and raw material access are linked to lithic reduction strategies. It also describes how differences in site function can be interpreted by understanding how a reduction continuum may be distributed spatially within a culture's territory.

Mobility

Archaeological perceptions of hunter-gatherer mobility and land use have been strongly influenced by Binford's (1980) forager-collector model. This model was developed using ethnographic data from around the world and its purpose was to classify the subsistence-settlement patterns of contemporary hunter-gatherer into broad comparative units depending on the kind of mobility they practiced. Mobility is defined as residential or logistical. Residential mobility involves the movement of the entire culture group from one location to another. Food is acquired on an encounter basis and hunters return to their residential base each day (Binford 1980:5). Residential mobility solves geographic disparities in resource availability by moving people close to the resources to be exploited (Chatters 1987:340). Foragers are typically associated with residential mobility given their daily food-procurement activities and absence of food storage (Binford 1980:9). In contrast, logistical mobility involves the movement of individuals or small groups away from the residential base for a period of time after which they return. Logistical mobility is used to bridge gaps caused by incongruent distributions in critical resources (Binford 1980:10). If consumers are near one critical resource but far away from another, task groups will be sent out to procure specific resources and bring them back to the residential base. Binford (1980:12) recognized that any number of groups might possess diverse combinations of these traits and because of this, he stressed this classification scheme should be viewed as a continuum rather than as a polarization where groups are either foragers or collectors.

Some archaeologists have opted not to use Binford's model to assess prehistoric hunter-gatherer mobility since the ethnographic groups on which it is based are so dissimilar from the archaeological ones under consideration that the model cannot offer secure inferences concerning prehistoric lifeways. Instead of describing mobility as residential or logistical, it is simply gauged as mobile or sedentary (e.g. Amick 1996; Cowan 1999; Kelly 1996; Kelly and Todd 1988; Parry and Kelly 1987; Tankersley 1998). Since the degree and type of mobility practiced by the Pre-Dorset on southern Baffin Island is presently unknown, I also use this simple dichotomy of mobile versus sedentary. Minimally it acknowledges that these populations moved farther distances and more frequently during some seasons than they did during others.

Raw Material Availability

Lithic raw materials should be considered an exploitable resource in the same sense as plants and animals (Bamforth 1986:40; Beck *et al.* 2002:482; Daniel 2001:261). Lithic materials are continuously available at their source and are not mobile (Nelson 1991:77). Consequently, they are easily manipulated when encountered and can be exploited repeatedly once an abundant location is discovered. However, lithic raw materials are not always consistently distributed in great abundance across the landscape and their quality tends to vary among source areas (Andrefsky 1994a, 1994b; Goodyear 1989). Source areas are also affected by seasonal conditions where ground cover (i.e. ice and snow) may reduce their availability (Kuhn 1991; Rolland 1981; Trigger 1989; Wenzel and Shelley 2001). Because there is no necessary relation between the location of food and lithic resources, access to raw materials is compromised when other activities must be pursued away from the source (Andrefsky 1994a; Bamforth 1986; Beck and Jones 1990; Kelly 1988). As a result, effective acquisition strategies must be used to ensure an adequate supply.

Lithic raw materials may be acquired by means of trade, embedded, or direct procurement strategies (Seivert and Wise 2001:86). Each method has different associated costs in relation to actual distances to the source (Kuhn 1991:78). "Distance is a measure of the time and effort costs of acquiring raw material" (Hayden 1989:10). If raw material is obtained through trade, the cost of the transaction is established by the agreed value of the goods or services exchanged (Morrow and Jefferies 1989:30). If an embedded procurement strategy is used, activities to obtain raw materials may be subsumed within the normal functioning activities of the society (Binford 1978a, 1979). This poses few additional costs in terms of time and effort expenditure; it also avoids scheduling conflicts with other activities. In contrast, when raw materials are not locally available and cannot be acquired through trade, there are direct implications for hunter-gatherer mobility and settlement location (Andrefsky 1994b:378). In these instances, specific trips have to be made to obtain materials at a distant source and this means significantly higher costs. Mobility associated with subsistence and raw material acquisition, and their associated costs in terms of time and energy, directly influence a group's choice of technological strategies and subsequent treatment of toolkits (Seivert and Wise 2001:87).

Lithic Reduction Strategies

The artifacts archaeologists recover are the only surviving expression of the technological strategies used by a culture and each one represents a specific planning option suited to the conditions of the immediate environment (Nelson 1991:65). These options require different degrees of time and energy investment in the design, production, use and maintenance of tools (Andrefsky 1994a:22; Camilli 1989:22). Some tools can be produced with very little effort while others require a great deal (Andrefsky 1998:30). The dynamic nature of technology means these strategies can be readily implemented to adapt to changes in tool using needs and resources (Ricklis and Cox 1993:445). Curation and expediency are the most commonly cited technological strategies used by hunter-gatherers. Bipolar reduction is another; however, its use is dependent more on contingent circumstances relating to time and raw material shortages.

Binford (1973) introduced the concept of "curation." He originally described a curated technology as one in which "a tool, once produced or purchased, is carefully curated and transported to and from locations in direct relationship to the anticipated performance of different activities" (Binford 1983:143). Binford's (1973:242-244) discussion of the concept also implies the importance of technological efficiency and tool conservation for future use. Curation is perceived as a corollary of mobility, which requires transport (Shott 1996:261). Use of this concept has not been without criticism, however (see Bamforth 1986; Hayden 1975; Kuhn 1989; Nash 1996; Odell 1996). Because Binford's original use of the term was generalized, it has been defined in many different ways and grown to encompass more variables then Binford had intended (Shott 1996:262). Nash (1996) and Odell (1996) have demanded that the use of "curation" be discontinued in lithic studies, or if it is used, a specific statement concerning which definition is being applied be made. Accordingly, archaeologists have clarified their use of the term (e.g. Daniel 2001; Nelson 1991; Shott 1996).

Nelson (1991:62) expands Binford's original definition by stating curation is a "strategy of caring for tools and toolkits that can include advanced manufacture, transport, reshaping, and caching or storage." Curation includes the advanced preparation of raw materials in the anticipation of inadequate conditions (materials, time, or facilities) for preparation at the time and place of use (Nelson 1991:63). Curated tools are generally made from high quality raw materials because they are isotropic, brittle, and have a high degree of plasticity making them amenable to resharpening and rejuvenation, thus prolonging use-life (Andrefsky 1994a:21; Goodyear 1989:4; Morrow and Jefferies 1989:30). Consequently, these tools will be conserved more intensively, especially if raw materials are in short supply (Andrefsky 1994a, 1994b). In general, curation implies a greater investment of time and energy in tool production and maintenance, and longer tool use-life.

In contrast, technological expediency implies minimal effort in tool production (Andrefsky 1998:30; Carr 1994:36). Expedient tools are made for immediate use, using locally available materials (Binford 1973:267). They exhibit minimal specificity in design and are not readily maintained (Camilli 1989:22). Expedient tools are made, used, and discarded in the same location and tend to be raw material wasteful (Andrefsky 1994a; Parry and Kelly 1987). To implement an expedient technological strategy, there needs to be adequate raw material, no time stress (Torrence 1983), and longer occupation or reuse of a site to take advantage of raw material stockpiling or local abundances (Carr 1994:36; Nelson 1991:64). Curation and expediency should not be viewed as mutually exclusive strategies (Nelson 1991:65). They can occur simultaneously depending on the demands of local conditions.

Bipolar reduction is implemented in several different contexts. It is used when toolstone size is small, when resource stress is acute, or when time is lacking (Jeske and Lurie 1993). Bipolar reduction involves using a stone hammer and anvil to flake small cores, and exhausted or broken tools (Goodyear 1993; Shott 1999:220). It is an efficient method to quickly produce useable flakes; however, because the knapper has poor control during reduction, the force of a single blow can shatter the entire core or tool (Shott 1999:220). Bipolar reduction is directly related to land use patterns since movement within a specific territory limits access to raw material source areas, especially if they are localized in distribution (Goodyear 1993). This strategy is typically used to extend the use-life of curated tools in an effort to mediate raw material shortages during a group's seasonal round (Goodyear 1993).

Choice of Reduction Strategies

Many forces, both cultural and natural, undoubtedly affected the ways in which people made and used stone tools. "Mobility provides the infrastructure for raw material acquisition and subsequent tool production since site location and seasonality will determine when and where people encounter raw material, and what those materials may be needed for" (Seivert and Wise 2001:87). Groups that are highly mobile and occupy large territories are confronted by several problems, two of which are time stress and raw material distribution. Time stress refers to the temporal availability of resources, which places constraints on an individual's ability to successfully procure them (Torrence 1983; Jeske 1989:35; Vierra 1995:23). If resources are broadly distributed and available for short periods of time (i.e. seasonal), populations must schedule their activities carefully so the activities do not conflict (Binford 1979; Jochim 1981; Torrence 1983). Because these groups are highly mobile, they are more likely to encounter areas with restricted access to lithic sources. As a result, tools must be designed to overcome problems created by mobility and raw material shortages (Parry and Kelly 1987:300). Bifaces, standardized cores, and other portable tools meet these needs and are associated with a curated technological strategy (Jeske 1989:36; Kelly 1988:719). There is more time and energy invested in their design, production, use, and maintenance, and their smaller size reduces carrying costs (Andrefsky 1994a; Binford 1973, 1977, 1979; Lurie 1989; Nelson 1991). These tools are made in advance of use so scheduling conflicts and time stress are significantly reduced. Curated strategies meet the needs of highly mobile groups and are, therefore, more commonly associated with them.

In contrast, groups that are more sedentary are commonly observed to use expedient technological strategies (Andrefsky 1994a:22). Because site occupation is longer, there is an increased opportunity to stockpile required raw materials for stone tool manufacture (Bamforth 1986; Parry and Kelly 1987). The need to manufacture portable, standardized tools to mitigate temporary restrictions in raw material abundance decreases as does the degree of energy investment in tool manufacture (Parry and Kelly 1987:300; Binford 1973:243). Carrying costs are no longer a significant factor since tools are made and used in the same location. Minimally, tools of this nature are made to fulfill a short-term task, and their function and raw material quality are the only factors affecting their shapes (Parry and Kelly 1987:300). Expedient flake tools adequately satisfy most technological needs in these situations.

For highly mobile populations, acquisition of raw material by most any means (except opportunistically) will be costly given the incongruities in distribution across the landscape regardless if the source is a quarry or another group. While an embedded strategy may serve to reduce costs associated with the initial attainment of raw material, source areas will likely not be encountered at every location where other activities occur. Consequently, highly mobile groups typically employ a curated technological strategy requiring high quality toolstone with which to manufacture formal tool types. Lithic conservation strategies are used as a result, including bipolar liquidation. For more sedentary groups, costs of obtaining raw material are presumed to be lower since local sources tend to be nearby in sufficient abundance, particularly if they are stockpiled. This permits the use of an expedient strategy, which is raw material wasteful (Andrefsky 1991; Parry and Kelly 1987). Informal tool types dominate these assemblages and there are no attempts to conserve lithic raw material.

Andrefsky (1994a, 1994b, 1998) recently criticized this dichotomization. While he does acknowledge some studies provide convincing evidence linking mobility and tool production effort, Andrefsky (1994a, 1994b) uses ethnographic and archaeological data from sites in the western United States to illustrate that raw material abundance and quality have equally important effects on lithic technological strategies. By using a broad regional approach, Andrefsky (1994a:24) is able to assess how raw material availability, tool production strategies, and settlement configuration are linked. The sites he investigated exhibit regular patterns of lithic tool production and use that correspond to local raw material abundance and quality of sources, regardless of group mobility (Andrefsky 1994a). When raw materials are scarce, high quality non-local resources are procured and fashioned into formal tools. When high quality raw materials are available, most artifacts will be made from them, regardless of the amount of effort expended in their production (Andrefsky 1998:38). When poor quality sources are available, they will be used to make informal tools while non-local high quality toolstone will be used to make formal types. When raw material abundance and quality are considered together in terms of their effect on tool production, a regular pattern emerges (Andrefsky 1994a:30; See Figure 3.1).

		Lithic Quality	
		High	Low
Lithic Abundance	High	Formal and Informal Tool Production	Primarily Informal Tool Production
	Low	Primarily Formal Tool Production	Primarily Informal Tool Production

Figure 3.1 Relation of quality and abundance of lithic raw material and kinds of tools produced (from Andrefsky 1994a:30).

Reduction Continuum and Site Function

Given the correlations between energy expenditure in tool production, prehistoric mobility, and raw material access, variations in tool design, production, and raw material types can provide clues to assess how technology was organized within and between sites in an area

(Andrefsky 1991:132; Cowan 1999:593). Additionally, because lithic technology is interrelated with other cultural systems, its staged reduction among sites provides a spatial dimension with which to interpret differences in site function and land use patterns. Because time is not equally available at all sites (Nelson 1991:79), toolmakers often worked on a tool, stopped, transported it to another location, and began work again (Andrefsky 1998:30; Binford 1979:268). This means completion of an entire reduction continuum often did not occur in a single site location (Binford 1977, 1979; Larson 1994). Consequently, lithic assemblage variability tends to be pronounced between sites since different reduction segments occurred in different places in association with different activities (Binford 1983:282).

Binford's (1980:9-12) collector-forager model has also influenced archaeological concepts of functional site types. Foragers tend to produce residential bases and resource acquisition locations. The residence is the hub of all activities while locations are places where extractive tasks are exclusively carried out. Collectors also produce residential bases and locations; however, additional sites include field camps, stations, and caches. A field camp is a temporary operational center for a task group; stations are places where hunters observe game and the landscape; and caches are field storage locations. Distinctive lithic assemblages are inferred from each of these functional site types (Binford 1978a, 1978b, 1979, 1980).

While this model serves as an important heuristic device with which to conceptualize prehistoric hunter-gatherer mobility and site function, it implies certain conclusions about the cultural processes that led to a site's formation that may not be entirely accurate in every case (Nelson 1991; Odell 1994). Furthermore, because archaeologists associate collectors with curation there is an implication that foragers are linked with expediency, which is simply incorrect (Bamforth 1986; Carr 1994). As an alternative to using this model, Sullivan (1992:100) proposes that archaeologists use Binford's (1982:5) "occupation" concept as the unit of analysis.

An occupation refers to the uninterrupted use of a place by participants in a cultural system and imbues interpretive neutrality concerning function and length of stay (Sullivan 1992:100). Sullivan (1992:100) believes the occupation concept is ideally suited for settlement pattern studies that aim to track changes in land use because the full range of functional variability present among sites in a region can be assessed before they are designated as specific types. Since archaeologists do not know how the Pre-Dorset staged their lithic reduction in relation to their seasonal activities, Sullivan's occupation concept will be used in this study. This will allow variability among sites on southern Baffin Island to be examined first to understand how they differ functionally. Thereafter, interpretations concerning site types can be made.

However sites are conceptualized, identifying and comparing them on a regional level is necessary to interpret hunter-gatherer land use patterns (Schreiber 1996:636). A land use pattern is the distribution of human activities across the landscape and the spatial relationship between these activities and features of the natural environment (Kantner 1996:636). The remains of these sites represent the playing out of a set of adaptive strategies where a culture positioned itself within its physical environment in order to satisfy its somatic and social needs (Binford 1978a:253; Kooyman 2000:129).

Lithic Assemblage Variability and Social Organization

For more than a century (e.g. Cushing 1895; Holmes 1891), archaeologists have replicated prehistoric lithic artifacts in order to understand the processes of stone tool production. Through these replications, contemporary knappers have clearly demonstrated how difficult it is to acquire and master the skills necessary to work flint (e.g. Callahan 1979; Crabtree 1966, 1972). As with any craft, experts consistently produce finely made objects while those who are novices frequently make mistakes. Furthermore, novices tend to make the same mistakes over and over again, which creates distinct material patterns that are readily discernable from those made by experts (Bonnichsen 1977; Shelley 1990; Stout 2002). Archaeologists are now focusing on how differences in skill identified through experimental replication can be used to understand the learning process associated with prehistoric lithic technology (e.g. Ahler 1989a; Shelley 1990).

Typically, when people think of stone tools, an image of a spear point, finely chipped out of flint, comes to mind. To make implements like this requires considerable skill, and, since no one was ever “born” a master flint knapper (Shelley 1990:187), we can be certain individuals gradually learned by observing experts, and through trial and error on their own. Several archaeological (e.g. Pigeot 1990; Walthall and Koldehoff 1998; Will 2000) and ethnoarchaeological (e.g. Stout 2002; Weedman 2002) studies have found experimentation by novice knappers does not just occur anywhere at anytime with anyone. Specific conditions relating to raw material availability, location, age, and social organization determine where and when novices will engage in tool production. Some of these conditions are, however, easier to predict in the archaeological record than others.

Because novice knappers frequently make mistakes, their reduction episodes consume significant quantities of lithic raw materials (i.e. they are raw material wasteful) (Findlay 1997; Pigeot 1990; Shelley 1990; Walthall and Koldehoff 1998; Will 2000). Consequently, archaeologists should expect to find patterns associated with novice actions in locations where raw material is abundant. These locations may include lithic quarries or other raw material source areas such as bedrock outcrops or pebble-strewn beaches (Findlay 1997; Shelley 1990; Will 2000). Since lithic raw material is a critical resource for mobile hunter-gatherers, its acquisition is a scheduled activity within the course of a seasonal round. As such, opportunities for novices to engage in knapping activities will also be scheduled in accordance with raw material procurement and other economic tasks (Pigeot 1990:138). If access to lithic source areas is restricted due to seasonal or geological conditions, episodes of novice knapping will be equally so.

Predicting where novice knappers will learn in relation to raw material source areas is simpler than predicting who will teach them and at what age this process begins. Ethnoarchaeological studies (Stout 2002; Weedman 2002) provide important insights as to how learning and stone tool production are structured socially among hunter-gatherers. Technology is an inherently social phenomenon (see Chapter 4) and lithic production takes place in a highly structured social arena where status is carefully negotiated through the display of individual skill (Dobres 1995; Dobres and Hoffman 1994; Sinclair 2000). For those individuals who have not yet acquired the necessary skills to competently knap stone, access to this arena will be restricted. To gain access these individuals must go through a period of apprenticing, which can last for many years (Stout 2002:702). The apprenticeship of skills is a gradual operation occurring most typically during an individual's childhood or adolescence (Pigeot 1990:136). Sometimes individuals are in their early teens when they first start to learn while in other instances they may be in their late teens or early twenties (Stout 2002:702; Weedman 2002:738). It is important to note, however, that to be an apprentice, one does not necessarily have to be a child (Findlay 1997:207). The age of apprenticeship undoubtedly varies among cultures but it is the adult who agrees to instruct and guide a novice who ultimately determines when this process begins (see Stout 2002:702).

Among hunter-gatherers, those adults who instruct novices are usually close family members (Binford 2001; Stout 2002; Weedman 2002). They recognize it is their social responsibility to ensure children receive the necessary education that enables them to develop into functioning members of the cultural group (Binford 2001:467). Accordingly, they invest their time and energy to provide the child with educational experiences in a wide range of settings

(Binford 2001:467). This usually entails repeated visits to important places during which time the child assumes the role of an apprentice and is guided by this knowledgeable person (Binford 2001:467). However, skill acquisition does not just involve learning "how to do"; it also involves learning "how to act" (Stout 2002:694).

Stout's (2002) ethnoarchaeological study of the stone adze makers of Irian Jaya, Indonesia describes how novice knappers are enculturated through the learning process. This industry is controlled by a semi-hereditary group of males and its figurehead is the head adze maker. This individual oversees the local quarry where stone is procured to make these tools. The quarrying process involves intense consultation among expert knappers, including the head adze maker, to determine which stones are most suitable for adze production. When all agree on the merits of the stone, nodules are extracted and roughed out. The head adze maker then takes the blanks back to his residence and redistributes them among experts and novices for further reduction. Novices are given smaller blanks so as to curtail competition with established craftsmen in the group and to regulate the use of a valued resource (Stout 2002:698). While the redistribution process is not overly rigid, no person is allowed to remove blanks or knapping tools from the head adze man's house. All members of the group recognize and respect this rule. To break it has resulted in death (Stout 2002:702).

Elder experts socially control each step in the learning process. They decide when a novice is ready to learn, what stones they will knap, where they can knap, and for how long the apprenticeship will last. The actual interaction that occurs between novices and experts is far more relaxed, however. Novices are encouraged by experts and rewarded when they successfully remove a flake. Novices also receive guidance on what reduction techniques to use and what attitude to have towards this revered activity (Stout 2002:703). The adzes made by the novices are too small to be of any functional use so the process of making them is meant solely to provide practice of the craft (Stout 2002:702). This interaction not only provides support and motivation for novices while they are learning but it also fosters other important social values that are vital to this culture's lifeways, including dedication, perseverance, and concentration (Stout 2002:703). Learning to make stone adzes facilitates the enculturation of novices by exposing them to the accepted norms that structure their technological, social, and economic environment.

Based on this discussion, novices will engage in flint knapping when raw material is abundant, when they are of a certain age, and when an adult agrees to teach them. The timing of these episodes is structured so as to ensure they do not conflict with other activities performed by the group (Pigeot 1990:138; Dobres 1995). In the course of a seasonal round, social relations are bound to change with the performance of different tasks. Some tasks pose greater risks for a group if they are unsuccessful in completing them. To reduce potential risk, individuals will form different kinds of social units. These units may be based on long-term cooperative ventures between families or individuals; they may also be temporary *ad-hoc* associations that dissolve once a task is complete (Binford 2001:465). The relationships that structure these social units are not always based on kinship. They may be determined by such factors as compatibility in age, physical abilities and skill, reproductive requirements, or individual states such as pregnancy or disability (Binford 2001:466). This means the social organization of hunter-gatherers is potentially more flexible than what is traditionally thought. Social units did not simply comprise members of a nuclear or extended family, and they did not just change to accommodate seasonal subsistence pursuits. Other important tasks, such as acquiring a technological skill, figured prominently in the lives of these people and required equally important changes in social organization to accommodate them.

Assemblage variability present at a site will be conditioned by the character of the task unit(s) present (Binford 2001:466). This is clearly illustrated by Stout's (2002) study where the remains of novice and expert adze makers indicate differences in technological skill levels. Further inferences about social organization can be made based on these patterns including individual age, gender segregation (since they were all males), and social relations (i.e. they were relaxed). Dobres (1995, 1999, 2000) made similar inferences based on patterned variation in organic tool production among Late Magdalenian sites in France. She found that at one site, Mas d'Azil, artifact remains indicated a focus on blank and preform production, and a greater diversity existed in the technical strategies used to make these implements. In contrast, at the site of La Vache, the main activity was intensely focused on the repair and maintenance of harpoon heads. There was also a greater emphasis on expert skill at this site as represented by elaborate incised decorations on harpoon shafts, and elongated and sharpened harpoon barbs, which exceeded functional requirements.

Dobres (1995:38) states these findings suggest differently focused technological activities as well as different kinds of production contexts existed at these sites. At Mas d'Azil, people were planning for future technological needs by producing an excess of blanks and preforms. The flexible use of various technical strategies indicates a more relaxed social atmosphere where status and power was not being negotiated through the display of individual tool production skill. In contrast, at La Vache, individuals were engaged in more purposeful and directed activities likely related to hunting game and fishing. The intense repair and maintenance of their harpoons in the midst of these structured group activities provided an arena in which to express social status, power, and rank through the control and display of their technical "know-how" (Dobres 1995:40). Dobres (1995:41) explains that the flexibility in technical strategies practiced on a site-by-site basis may be interpreted as the embodiment of a general flexibility in social conduct that could be manipulated to suit the specific settings in which people found themselves. In other words, as social organization changed in accordance with group activities and settlement patterns, so too did the social relations of technological production. As enculturated members of a group, individuals knew how to behave in different kinds of situations, particularly in the technological realm. In this regard, patterned variation in the archaeological record could be isolated and used to infer how group composition changed among sites in relation to the demands of different activities and arenas of social interaction. An important point made by Dobres (1995:42) is that it is not imperative that archaeologists identify the "individual" actors contributing to this variability in order to understand its sources; rather, one needs only to recognize that the actions responsible for it can be attributed to individuals.

Unraveling the complexities of prehistoric hunter-gatherer social organization using lithic artifact assemblages seems daunting. Where does one begin? Pigeot (1990) shows the potential information that can be gained by isolating patterns attributable to novice knapping episodes. Her study of Late Magdalenian lithic artifacts indicates these events are socially structured, integrated within the broader economic system, and easily discernible because of their distinct material patterning. Identification of sites possessing evidence of novice flint knapping at least provides a starting point to determine how they compare to other sites within a culture's seasonal round. Archaeologists can identify low skill level in lithic assemblages based on their understanding of replicative studies (Ahler 1989a; Shelley 1990) and they can attempt to interpret the social contexts in which these episodes occur by referring to studies such as Stout's (2002), Weedman's (2002), and Dobres' (1995, 1999, 2000). If archaeologists examine how patterns of low skill level are distributed among sites in a region they can begin to understand how this variability may reflect changes in social organization in the prehistoric past.

Summary

Variability in Pre-Dorset lithic artifact assemblages is generally explained in terms of temporal and cultural change; site function is inferred based on diagnostic type frequencies; and seasonal mobility and land use patterns remain poorly understood because available site data are biased towards coastal locations. In this study, I use an alternative interpretive approach that views lithic technology as a reduction continuum to analyze Pre-Dorset lithic assemblage variability. This approach explicitly considers how raw material abundance, mobility, and resource procurement strategies structure the organization of technology. By isolating discrete patterns of assemblage variability within and between sites, the distribution of the reduction continuum can be assessed. Patterned variation in lithic artifact remains can also be used to understand prehistoric hunter-gatherer social organization. This kind of analysis will prove useful for research on Pre-Dorset culture since very little is known about group composition let alone how it may have changed during the course of the seasonal round.

Chapter 4

Theoretical Frameworks and Statement of Research Hypotheses

The Pre-Dorset, like their Alaskan ASTt ancestors, must have been well adapted to their surroundings and capable of dealing with various situational contingencies given their long existence in the eastern Arctic. This kind of adaptive flexibility is a hallmark of cultures living in this northern environment, regardless of the temporal period. However, the current methods used to study Pre-Dorset culture, namely traditional artifact type lists and the seasonal mobility model, perpetuate a view of behaviour that denies this culture recognition that it was capable of a knowledgeable and skilled existence. Patterned variation in artifact assemblages is examined for what it can tell us about the temporal placement of a site and its "likeness" to other early Palaeo-Eskimo variants while site location and distribution is examined in the context of a presumed seasonal round where movements were bounded between the inland and coastal regions. The Pre-Dorset were more than the formal lithic tool types found in their sites and they did not move across the landscape like automatons. If Arctic archaeologists are to understand what patterned variation means in terms of this culture's broader adaptive system, new interpretive approaches must be applied.

Agency as an interpretive approach can bring a sense of "people" to the Pre-Dorset culture because it recognizes an individual's capacity to act (Ahearn 2001:112). In any culture, including the Pre-Dorset, a range of known behaviours exists from which an individual can choose in order to complete a task or to interact with others. This range provides individuals with a greater degree of flexibility in their adaptation since some options are better suited to certain situations than others. Invariably, these respective actions leave different material patterns in the archaeological record, and recognizing when and where they occur across the landscape is critical if one it is to understand a culture's overall adaptive system. The most effective way to do this is through multi-scalar analysis. Macro-scale analysis helps identify the entire range of behaviours practiced by individuals within their territory while micro-scale analysis enables us to understand the reasons they selected those options and not others.

It is important to note that agency does not just "people" the past; rather, it recognizes their active role in maintaining and changing existing cultural systems. Since every behavioural option represents a potential source of change, individuals may decide to act in ways that maintain cultural norms or they may act in ways that do not. At present, culture change observed among prehistoric hunter-gatherers is typically explained as a corollary of temporal or environmental change, thus making the role of people invisible. Agency provides a tool with which to understand how the individuals comprising these cultures initiated change because it recognizes people are the mechanisms bringing it about, not just the stimuli external to them.

At present, it may not be possible to identify where individual agency led to change in the archaeological record of the Pre-Dorset. More sites must be investigated in order to first identify the complete range of behavioural options available in their overall adaptive system. This should not, however, discourage archaeologists from using agency to understand why the Pre-Dorset chose to use certain technological strategies as they encountered different situations during the course of their seasonal round. Agency can bring a sense of people to the Pre-Dorset because it recognizes their variable actions yield variable material patterns in the archaeological record.

Lithic Assemblage Variability, Agency, and the Pre-Dorset

Assemblage variability is important to agent-centered approaches because it is the primary means by which agency can be identified (Brumfiel 2000:253; Cannon 2003). In a material context, such as lithic technology, variability allows archaeologists to gauge the degree of social conformity demanded by past societies (Brumfiel 2000:253; Dobres 1995). Demands for conformity are determined by the rigidity of the social relations of production. In turn, the rigidity of these relations varies depending on social organization and the tasks being performed. It is the agency of the toolmaker to know what reduction and use strategies are appropriate to implement in a given situation (i.e. when, where, and with whom) and to decide if he or she will use them or do something else. A low degree of variability would imply strict adherence to social conformities while a high degree of variability would imply a more relaxed social atmosphere and an individual's choice to have done otherwise (Brumfiel 2000; Clark 2000; Dobres 1995).

Examining variability from this perspective recognizes the capacity for individuals to make informed decisions about their actions; it recognizes "people mattered" (Dobres 1999a). Because lithic technology was used in every facet of Pre-Dorset culture, understanding assemblage variability in terms of agency will expose the social relations that shaped the decisions and actions of those individuals who engaged in this technological realm. It will also provide insights on how social organization changed with the pursuit of different activities during the course of the seasonal round. In effect, an agent-centered approach is complementary to functional interpretations since variability attributed to site function indicates what people did while variability attributed to agency indicates why they did it.

Agents and Technology

Every human is an agent and every agent is capable of purposeful action (Cowgill 2000:52; Last 1995:149; Marquardt 1992:104). In the course of daily life, people interact with their surroundings and each other while "taking care of business" (Dobres 1999a:15). Pivotal to these interactions is the use of technology (Dobres 1999b; Sassaman 2000:152). Technology serves a dual purpose: it enables agents, both individually and collectively, to engage with the material conditions of their existence to extract the natural resources they need; and it allows agents to express culturally specific social relations in a tangible form (Dobres and Hoffman 1994:215). The material correlates of these daily interactions create a "palimpsest" of technological events that are visible at the site level (Hodder 2000:25). Since agents differentially participate in culture (Binford 1965:205) and invariably "do more than one thing at a time" (Dobres 1999a:21), variability in the technological remains of these interactions is expected.

Within the context of lithic analysis, technological variability is often examined using a behavioural paradigm. Behavioural approaches seek to identify specific material, mechanical, or natural constraints that may predictably influence the use of different technological strategies in different environmental situations (Wobst 2000:44). Since there are few contemporary stone-tool using cultures to observe, much of what we know about lithic technology derives from experimental replication and use studies (Kelly 1994:132). While these studies contribute significantly to our understanding of variability, their quest to isolate specific types of artifact patterns and their behavioural determinants creates a sort of "somnambulation" of technology where lithic artifacts are increasingly separated from their makers and the social contexts in which they were made and used (Dobres 1995:26; Dobres and Hoffman 1994:227). Too often, behavioural analyses are limited to technical descriptions of controlled reduction sequences and their material correlates. They fail to go the extra step to interpret what this information means in the broader context of culturally significant behaviour. Wobst (2000:44) states this shortcoming creates a sense that stone-tool using cultures lacked agency; technology was forced upon them by a hostile nature and was used specifically to mitigate the hostile forces nature imposes.

Archaeologists know people in the past did not behave like robots or "rats running in a maze" (Wobst 2000:40). Rather, people were confronted on a daily basis with decisions about what to do, when, and why. These decisions often involved choices that had to be balanced against one another and against a host of other demands that were placed on people's time, attention, skills, labour, and resources (Dobres 1999a:21). Since technology is intrinsically involved in these daily interactions, technological variability indicates the existence of choices for agents when faced with a decision (Brumfiel 2000:253) and it is the agency of the individuals to decide what to do. Having said this, we must remember that individuals were not *free* agents who, within the context of their social sphere, acted impulsively when faced with unlimited choices (Cowgill 2000:51). People act rationally, reason, and make informed decisions based on previous experiences, perceived needs, and personal interests (Cowgill 2000:55-56; Marquardt 1992:105; Wobst 2000:41). Conditioning these choices are the broader physical and sociohistorical structures of an agent's surroundings (Brumfiel 2000:249; Cowgill 2000:56-57; Marquardt 1992:105-106).

Structures and Choice

According to Marquardt (1992), the behavioural potentiality of an individual or group is constrained by the existence of context specific physical and sociohistorical structures. Physical structures relate to phenomena in the natural environment including climate, geology, topography, and natural resources (Cowgill 2000:56; Marquardt 1992:105). Archaeologists recognize that people in the past were not passively at the mercy of these structures (Duke 1991, 1992); however, they do place constraints on the range of adaptive choices people can make and the tasks that can be practically achieved within a given environment.

Sociohistorical structures include all of the social institutions, relations, and ideas in which individuals find themselves situated (Cowgill 2000:56). While sociohistorical structures cannot be tangibly evaluated the way physical structures can be, they are equally significant in how they influence behaviour (Marquardt 1992:105). These structures provide individuals with an historical frame of reference when making decisions about what is right or proper in terms of established cultural norms and what is likely or unlikely to occur in response to certain actions (Cowgill 2000:56). Through enculturation, individuals learn to act within the parameters of these sociohistorical structures, obeying, questioning, resisting, and manipulating them over time (Cowgill 2000:56; Dobres 2000:133).

While physical and sociohistorical structures imbue the world with cultural meaning, individual agents perceive these meanings differently depending on their age, intelligence, ability, experience, and gender (Marquardt 1992; Dobres 1995, 1999a, 1999b). Behavioural choices also vary depending on the situation and an agent's role within it. Simply stated, people act differently depending on what they are doing, with whom they are doing it, and where they are (Dobres 1995:29). Given these considerations, the potentiality of individual agents to act differently even within culturally specific structural parameters is seemingly endless. Furthermore, the technological remains of these actions (provided they had material correlates) would be extremely variable resulting in an absence of definitive patterning from which archaeologists could attempt to interpret the past.

The likelihood of this unconstrained potentiality being realized is extremely low. As Cowgill (2000:58) notes, there are certain types of recurrent structures and within them are recurrent situations in which all agents, regardless of culture or time period, must participate and make decisions in regards to. These structurally determined situations might include subsistence pursuits; production of technology; establishment of the family unit and new marital unions; negotiation of gender and status relations, and access to power; conflict resolution; and the founding of new social networks. It is useful to think of human behaviour within these recurrent situations because many of them leave discernible material remains and are, therefore, archaeologically accessible. They also effectively narrow the range of possible activities that are likely to have happened in the past including the behavioural choices available to agents that participated in them (Cowgill 2000:58).

Scales and Multi-Scalar Analysis

How and when an agent makes a decision is additionally influenced by two other factors: space and time. Different scales are used to gauge space and time. Scales refer to a particular amount of space and time relative to the total amount potentially under consideration and they are ultimately influenced by the broader physical and sociohistorical structures constraining human behaviour (Marquardt 1992:107). Spatial scales may be macro (e.g. a region) or micro (e.g. a site, an activity area) while temporal scales may span years, decades, centuries or simply a day or moment. Marquardt (1992:106-107) states individuals can operate simultaneously on several scales and decisions are made according to their long or short-term effects on a regional or local level.

For each decision an agent makes, there is a corresponding effective scale (Marquardt 1992:107). Agents identify patterns of homogeneity at these effective scales and make decisions to comply with them or to manipulate and change them (Marquardt 1992:107). In any culture, there is always some degree of flexibility around the established norm and individuals may choose to push the boundaries ever so slightly or to relax them altogether (Dobres 1995, 1999a). This means patterns of technological variability will differ depending on the effective scale at which decisions are made; however, the degree of variation will be largely dependent on the agent's intended action. The ability for agents to act on different scales creates the potential for them to initiate structural change, and understanding the sources of this variability and isolating where it occurs may help identify the events leading to it. Change can occur because of deliberate action, exogenous factors, or merely through the gradual and imperfect replication of the norm over time (Cowgill 2000:57; Dobres and Robb 2000b:13). The most effective way for archaeologists to comprehend these complex networks of agents, structures, scales, and technological variability is by means of multi-scalar analysis (Hodder 1999; McGlade and van der Leeuw 1997; Marquardt 1992).

A multi-scalar approach provides an organizational tool to help understand how phenomena of different duration and intensity interact with each other to create the past (Duke 1991:35). The past comprises many scales that are all equally interesting to the archaeologist; however, the scales chosen for investigation are dependent on the type of data and the questions being asked of them (Dobres 1999a:19). To begin an analysis, a scale must first be specified (Marquardt and Crumley 1987:9). The archaeologist then seeks to identify and interpret material patterns at that scale. Once these patterns are known, another scale is selected for analysis where the patterns of connectivity in the data will differ (Marquardt 1992:108). The patterns identified for each respective scale are held constant as new patterns are sought for additional scales. When material patterns have been identified and interpreted on several scales, they are compared to determine if there are causative links among them. Even if these interpretations do not form a coherent whole, there is still value in juxtaposing them across multiple scales (Dobres 1999a:19) because it increases the potential for isolating previously unknown patterns of variability. Those patterns that differ from the norm may indicate contingency, agency, structural change, or all of these factors combined. A multi-scalar approach encourages researchers to examine technology within the cultural contexts in which it was made and used; it aims to stop the somnambulation of technology (Dobres 1995, 1999b; Dobres and Hoffman 1994, 1999).

Selecting an appropriate theoretical perspective to use in a multi-scalar approach is dependent on the scale of analysis, the data, and the research questions. Since more than one scale is examined and since different theories are more relevant to different scales and objects of study, theoretical plurality is favoured (Hodder 1999:12; McGlade and van der Leeuw 1997:9). The polemic debates in archaeological theory are well known; however, researchers increasingly recognize that different theories can offer complementary explanations for the same phenomena thus creating a fuller understanding of the past (Duke 1991; Hodder 1999; Kowalewski 1997; McGlade and van der Leeuw 1997; Torrence 2001). A multi-scalar approach facilitates the integration of diverse theoretical perspectives into a single analytical framework by stating explicitly the scale of analysis to which they pertain. If archaeologists begin to expose the structures that determine and constrain behavioural potentiality, they will find better ways to move beyond them in order to identify the social dynamics (i.e. processes) of past human activity (Marquardt 1992:108).

It is important to note that a multi-scalar analysis does not organize scales hierarchically where those at the top control and determine lower level phenomena (Crumley 1995:xiii). Rather, multi-scalar models recognize that chains of causation among different levels are non-linear (McGlade and van der Leeuw 1997:5-6); that is, interactions between macro and micro scales are recursive and change is just as likely to come from the bottom up as it is from the top down.

Multi-Scalar Analysis and Lithic Technology

Lithic technology is amenable to multi-scalar analysis because it is a reductive medium and reduction is a continuous process across space and time (Bradbury 1998; Bradbury and Carr 1999; Collins 1975; Gero 1989; Magne 1985). Each scar observed on the surface of a flake or artifact preserves a record of an individual's concerted action (Shott 1999:218; Sinclair 2000:197). Archaeologists study these scars to interpret the decisions made by toolmakers. As reduction proceeds, waste flakes generated as a byproduct of this process are typically left behind at a site, as are those implements that are no longer wanted or were lost. This material provides evidence indicating what actions were performed at a site and the decisions that led to them (see Wobst 2000:45). Because an entire reduction sequence often did not occur in a single locale (Andrefsky 1998; Larson 1994) lithic assemblages will vary within and between sites. This variation can be studied at the macro-scale to gain insights into broader behavioural systems including technological organization, mobility, resource procurement, and social networks. It can also be examined at the micro-level to assess social organization, the social relations of production, and agency. Examining lithic variability across multiple scales provides more realistic interpretations about what localized patterns mean in terms of cultural behaviour, especially micro-scale patterns, which are often treated as "noise" (Dobres 1999a; Hodder 2000).

Scales of Analysis for Southern Baffin Island

Both of the stated research problems have different spatial and temporal dimensions. To effectively explain the occurrence of lithic assemblage variability among them, I use a multi-scalar approach. The first problem, which focuses on identifying Pre-Dorset seasonal land-use strategies and patterns of resource exploitation, is addressed at the macro-scale since it requires that functional differences first be identified between inland and coastal sites, and then compared at the regional level. For consistent patterns to show up at this broad level, the actions resulting in their formation would have to be repeated over many years. The temporal dimension for this problem is therefore long-term.

Patterns of variability isolated at the macro-scale are interpreted using a technological organizational approach. This approach examines variability within and between assemblages in terms of the functional requirements of tool use and the organization of the overall cultural system (Amick 1994:1). Nelson (1991:57) defines technological organization as "the selection and integration of strategies for making, using, transporting, and discarding tools and the materials needed for their manufacture and maintenance." Choices concerning what technological strategies to use and when are directly conditioned by a group's economic and social needs, which in turn, are constrained by the physical structures present in the environment. The dominant physical structure affecting all populations living in the southern Baffin region is the environment. People must adapt to pronounced seasonal changes in weather and their effect on the terrestrial, marine, and lacustrine ecosystems. This seasonality affects the availability and distribution of subsistence resources, and the availability of lithic raw materials. The geological distribution of lithic raw material is also a physical structure impacting stone-tool using cultures in this region.

The second problem in this study considers how agency may have influenced what kinds of technological strategies the Pre-Dorset used and when. If Pre-Dorset social organization changed during the course of the seasonal round corresponding changes are expected in the social relations of production. By considering agency, variability can be used to understand how people interacted differently with one another in changing situational contexts throughout the year. Accordingly, patterns of variability are isolated at the micro-scale and are interpreted using an agent-centered approach (see p. 86-92). The temporal dimension for this problem is short-term since it focuses on site-specific activities and social interactions at the micro-scale; however, there is the potential for short-term activities to be consistently performed at the same sites, which would result in distinctive and recurrent patterns over the long-term.

Because lithic technological production is an inherently social activity, we can expect the social relations governing its practice to have demanded different degrees of conformity from individuals depending on a group's social organization and the tasks at hand (see Dobres 1995; Chapter 3). The degree of variability isolated within sites will reflect where individuals, through agency, conformed to these demands and where they chose to do "otherwise" (Brumfiel 2000; Clark 2000; Dobres 1995). The structures constraining Pre-Dorset behaviour in this context are sociohistorical and include the social relations of production and social organization. While the scales of analysis selected for this study are different and aim to examine two separate research problems, the physical and sociohistorical structures identified as constraining the behavioural potentiality of the Pre-Dorset are very much interconnected (see Figure 4.1).

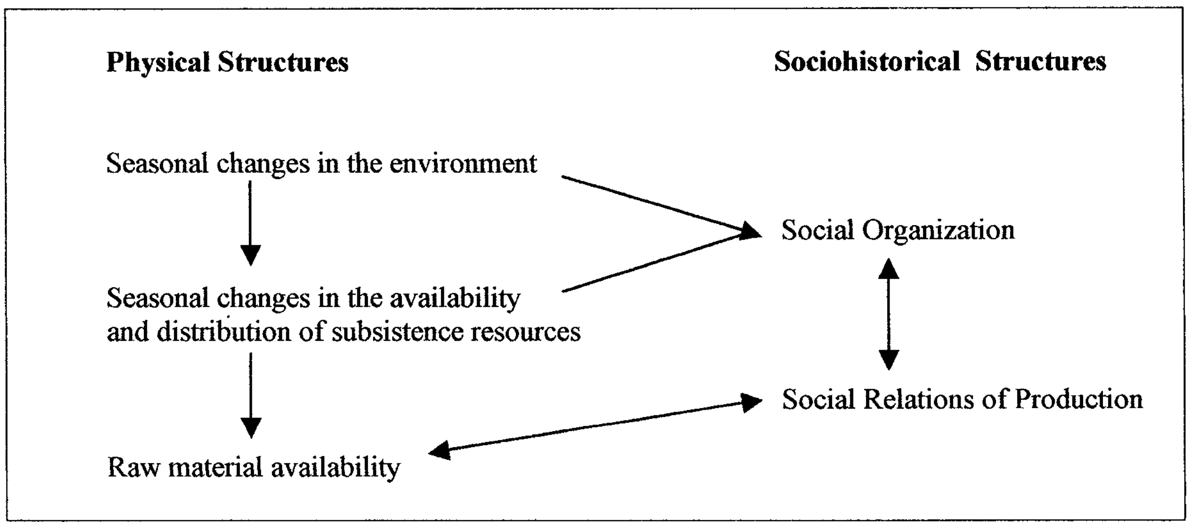


Figure 4.1 Interconnectedness of the physical and sociohistorical structures identified for the southern Baffin region.

Seasonal changes in the Arctic environment determine local climate patterns, which then affect when and where subsistence resources are available. They also determine when lithic raw material can be procured (i.e. when the ground is free of snow and ice). To accommodate these seasonal variations, the Pre-Dorset would have changed their social organization to facilitate mobility and to ensure adequate resources were available to sustain the group. Further organizational changes would be made to pursue different seasonally specific subsistence activities. For example, breathing hole sealing on the sea ice requires a different kind of task group than what is required for catching fish at a weir. The organization of the task group would be dependent on the risk involved in the activity (see Chapter 3). This, in turn, would determine the rigidity of the social relations governing the production of lithic technology. The higher the risk, the more rigid the relations, and the lower the degree of variability. Conversely, the lower the risk, the more relaxed the relations, and the greater potential for variability to occur. These occurrences are, however, further dependent on the geological distribution of lithic raw material. Raw material is a physical structure that can constrain technological behaviour independent of seasonal conditions. If raw material access was restricted, the social relations of production would be rigid so as to conserve existing toolstone resources through the intensive use of repair and maintenance activities. This would necessarily require a change in social organization as well since only expert knappers are capable of implementing these kinds of conservation strategies. In contrast, if raw material was abundant, the social relations of production would be more relaxed enabling a greater number of individuals to make tools, including novices. This structural interconnectedness is key to understanding agency.

Following Ahearn (2001:112) and Cannon (2003:2), agency is defined here as the "socio-culturally mediated, but individually motivated, capacity to act." How agency is played out is dependent upon the physical and sociohistorical structures that provide the "stage" on which individuals "act" (Barrett 2001:149). Structures and agency are interdependent (Hodder *et al.* 1995; Dobres 2000; Dobres and Hoffman 1999; Dornan 2002). Structures empower the agent because they facilitate action and they make possible actions that are socially comprehensible and regarded as legitimate by the agent and others (Barrett 2001:150). While structures provide meaning to individual actions and are understood by all agents in a culture, agents can act in ways, through agency, to manipulate and change structures (Cannon 2003; Dobres 2000). These actions generate more pronounced patterns of variation since one or more individuals may choose to push the boundaries of the established norm. Alternatively, agents can also act in ways that serve to maintain and reinforce existing structures (Cowgill 2000:57) resulting in the maintenance of the technological "status quo" and very little variation.

The distribution of these patterns among sites in a region can express how widely shared a particular strategy was for the production, use, and repair of different classes of artifacts; they can indicate how strict this strategy was adhered to and how much deviation from it was tolerated, favoured, or discouraged; they can isolate if deviation from the norm was particular to some artifact classes and not others; and they can determine if this deviation occurred more frequently at particular stages of the reduction continuum, and if it was "materially or socially strait-jacketed" at others (Dobres 2000:179). Understanding the significance of these patterns in terms of technological organization, site function, and individual agency would be extremely difficult without the use of multi-scalar analysis.

Research Hypotheses

Based on the information presented thus far, we know the Pre-Dorset were a highly mobile culture, they occupied sites in the inland and coastal regions of southern Baffin Island, they used a sophisticated, easily transportable lithic toolkit, and they likely experienced similar adaptive constraints as those observed for the Inuit in this Arctic environment. This section presents multiple working hypotheses and related test expectations constructed for this study to account for patterns of lithic assemblage variability attributable to Pre-Dorset seasonal land use patterns, resource exploitation strategies, and human agency.

Hypothesis One

This hypothesis states the Pre-Dorset followed a seasonal round moving between the coastal regions, where they wintered, to the inland proper, where they spent the summer and early fall. With the onset of winter, the Pre-Dorset moved back to the coast. The primary subsistence activity pursued during winter on the coast was sealing while during summer in the inland areas it was caribou hunting. Lithic raw materials were acquired during summer using an embedded strategy since people were already in the interior exploiting caribou. These patterns correspond to the traditional model of seasonal land use postulated for the Pre-Dorset culture. Accordingly, Shaymark, Tungatsivvik, and Davidson Point should all represent winter occupation sites while Sandy Point, Mosquito Ridge, and Mosquito Ridge West should all represent summer/early autumn occupation sites.

Hypothesis Two

This hypothesis states the Pre-Dorset followed a seasonal round moving from the outer coastal regions farther down the bay, where they wintered, to the coastal uplands in the spring. Groups remained in the coastal uplands for a short period of time before departing to the inland proper where they spent the remainder of the spring, the summer, and early autumn. With the onset of winter, the Pre-Dorset moved back towards the outer coastal regions. The primary subsistence activity pursued during winter on the coast was sealing. Migrating stocks of Arctic char and other available fish were exploited in the spring once the Pre-Dorset reached the coastal uplands. The main incentive for traveling to the inland proper was caribou hunting, particularly when herds were in decline and few animals were available in the coastal uplands. Lithic raw material was obtained using an embedded strategy since people were already in the interior hunting caribou. These patterns correspond to Stenton's (1989, 1991a, 1991b) interior lake model. Accordingly, Shaymark, Tungatsivvik, and Davidson Point should all represent temporary camps used as stopovers for groups preparing to travel inland. Sandy Point, Mosquito Ridge, and Mosquito Ridge West should all represent summer/early autumn occupation sites where caribou hunting was the principal activity, and lithic raw material extraction was secondary.

Hypothesis Three

This hypothesis states the Pre-Dorset followed a seasonal round moving from the outer coastal regions farther down the bay, where they wintered, to the coastal uplands where they spent the spring, summer, and early autumn. The primary subsistence activity pursued during winter on the coast was sealing. Once the Pre-Dorset reached the coastal uplands, they exploited fish stocks and nesting waterfowl, which were readily available in these locales throughout the warm season. Periodic trips departing from the coastal uplands to the inland proper were made in order to obtain critical resources, namely caribou and lithic raw materials. With the onset of winter, these groups departed from the coastal uplands and began their journey back to the outer coastal regions. These patterns correspond to Stenton's (1989, 1991a, 1991b) coastal upland model. Accordingly, Shaymark, Tungatsivvik, and Davidson Point should all represent warm season occupation sites while Sandy Point, Mosquito Ridge, and Mosquito Ridge West should all represent temporary extraction sites where caribou were hunted and processed, and where lithic raw materials were acquired.

Hypothesis Four

This hypothesis states the Pre-Dorset did not follow an established pattern of seasonal mobility moving between the inland and coastal regions. Instead, groups occupied these respective locales year round. These patterns do not conform to any known model of land use for Palaeo-Eskimo or Neo-Eskimo groups on southern Baffin Island. This is the null hypothesis.

Related Test Expectations

Based on these four hypotheses, Shaymark, Tungatsivvik, and Davidson Point may represent winter occupations, temporary spring camps, or warm season occupations (i.e. spring, summer, early autumn). Similarly, Sandy Point, Mosquito Ridge, and Mosquito Ridge West may represent warm season occupations, temporary extraction sites, or winter occupations. This section discusses the related test expectations for the proposed hypotheses. The coastal sites are addressed first followed by the inland sites.

Coastal Sites as Winter Occupations

If the coastal sites were occupied by the Pre-Dorset during the winter, lithic raw material stress is expected to be acute. Inland sources would be inaccessible given their distance from the coast, and snow and ice would restrict access to all sources including locally available, poor quality chert pebbles. To compensate, the Pre-Dorset would have heavily curated their lithic toolkits through the intense maintenance, repair, and rejuvenation of existing formal and informal tools. These activities produce late stage debitage that is small in size and weight, and exhibits advanced platform states and high dorsal scar counts. In instances of extreme raw material stress, toolmakers often resort to tool liquidation by means of bipolar reduction to generate usable flakes from exhausted or broken implements. This reduction strategy will obliterate the presence of these tools; however, high frequencies of shattered flakes and flakes with crushed platforms, secondary distal crushing, pronounced compression rings, and multiple or distal bulbs of percussion will indicate tool liquidation.

Formal tools discarded at these sites are expected to be exhausted or have little remaining utility and they should display uniform patterns of intense retouch and use. Higher frequencies of broken tools are also expected since some would have failed during repair and maintenance activities. Also, tools brought back to the site that broke during use would have been removed from hafts and discarded in the process of replacement resulting in higher frequencies of broken tool bases and hafting elements. Informal tools are expected to be more intensively retouched and used as well, which is a clear sign of raw material stress since typically, these kinds of tools are used and discarded without extensive modification or maintenance. There should be an inverse relationship between the frequency of debitage and tools recovered at these sites since tools would not have been made during the winter given the restricted access to new raw materials. Tools would have been brought into the sites in reduced forms, possibly as finished tools or as tool blanks and preforms. Accordingly, debitage associated with later stages in the overall reduction continuum is expected to dominate.

If sealing was the primary subsistence activity during the winter occupation of these sites, they were likely hunted at the floe edge, given its closer proximity to the head of Frobisher Bay during the Pre-Dorset period, and brought back to the camps on the coast. Group social organization would have been structured around this activity and because food stress is highest at this time of year, the task groups involved (i.e. hunters and processors) would have been rigidly maintained. The social relations of production are also expected to be rigid because subsistence activities were focused and raw material was in short supply. The need to conserve tools through maintenance and rejuvenation would necessarily demand that experts be involved since they are the ones possessing the skills needed to perform these tasks. This situation would further demand a high degree of conformity among toolmakers resulting in a low degree of assemblage variability both in terms of qualitative attributes associated with skill level and attributes reflecting choice of technological strategies and stage of reduction.

Attributes reflecting skill among debitage flakes include platform preparation, platform trimming, use of force loads, and flake termination states (see Shelley 1990). Experts typically invest more energy in preparing striking platforms and trimming overhang from previous flake detachments than do novices. They also have better control over the amount of force applied to detach flakes at different stages of reduction, which affects the termination states of flakes. When too much force is applied, it can result in snap and plunging terminations (i.e. outrepassé) while not enough force can yield hinge and step terminations. Precise applications of force result in feathered termination states indicating the complete and successful detachment of flakes. Of course, raw material quality (see Amick and Mauldin 1997) and post-occupational disturbance can further influence this attribute state, particularly if sites are subject to severe trampling by humans or animals (i.e. caribou) (see Prentiss and Romanski 1989). Attribute states reflecting choice of technological strategy and stage of reduction include flake size, weight, platform preparation, cortical cover, dorsal scar counts, eraillure scarring, platform lipping, compression rings, bulb of force, and secondary distal crushing (see Appendix A). If variability among these states is low, it indicates the consistent use of the same reduction strategies, and more focused technological and functional activities at a site.

In this case, if the coastal sites were occupied in winter and raw material access was severely restricted, the Pre-Dorset would focus on maintaining their existing toolkits through intensive repair and rejuvenation. This would result in the consistent production of lithic debitage associated with late stage reduction and maintenance; indicating only one segment of the reduction continuum is present. These situations do, however, provide an arena in which experts can demonstrate their skill and technical know-how in order to negotiate status within the group

(Dobres 1995). Consequently, stylistic embellishment (e.g. uniformity in flaking, edge serration, polish) that exceeds the functional requirements of tools used in sealing (i.e. endblades) is expected and should reflect the toolmakers' agency to use their skills for the purpose of negotiating their position with others in the group.

Coastal Sites: Temporary Spring Camps

If the coastal sites were temporary camps where the Pre-Dorset stopped briefly in the spring on their way to the inland proper, minimal occupational evidence is expected. Lithic artifact assemblages will be small with little evidence of tool production activities. Individuals may have repaired tools or retouched them in anticipation of using them on the inland journey. These activities would yield late stage debitage in small quantities. Since the occupation of these sites would have been ephemeral, it is unlikely the Pre-Dorset procured local chert pebbles in any large quantity to fashion new tools unless some implements had to be replaced. The debitage resulting from this activity should reflect the completion of an entire reduction continuum (i.e. from procurement to finished product) and the flakes from all stages will likely retain high cortical cover because the parent material consisted of small pebbles. Few discarded formal tools are expected in these sites since the Pre-Dorset would still be carrying a heavily curated toolkit at this stage of the seasonal round. If tools were discarded or lost during the brief occupation of these sites, they should also exhibit intense patterns of retouch and use from having been maintained throughout the winter.

The principal subsistence activity at this time of year was likely fishing. Fish are easily caught through holes in the sea ice and in nearby rivers and streams. Basking seals are also readily available on the melting sea ice. The social atmosphere in these camps was probably more relaxed since groups would have been eager to get to the inland areas. Furthermore, food stress would be reduced given the increased availability of other seasonal resources (i.e. fish and waterfowl). However, social organization within these groups will still be structured because of the planning required for an inland journey and the stress involved in finding caribou if numbers were low in the coastal uplands. The social relations of production were probably inconsequential at these sites since tool making would not have been a focus given their brief occupation.

Coastal Sites: Warm Season Occupations

If the coastal sites were occupied by the Pre-Dorset during the warm season (i.e. spring, summer, early autumn) the acquisition of lithic raw material would still be problematic. While snow and ice cover do not impose restrictions on access at this time of year, the geological distribution of this material resource in the southern Baffin region does. The chert pebbles available at the head of the bay are not desirable sources with which to replace a curated toolkit given their small size and inferior quality. Instead, the Pre-Dorset would have sought new raw material for "re-tooling" from more abundant and varied inland sources.

Raw material acquisition could be easily embedded in other inland activities, namely caribou hunting. Blanks, preforms, and cores would have been fashioned in the interior to facilitate transportation back to the main occupation sites on the coast. This permits more useable material(s) to be carried. Consequently, evidence of primary reduction and early stage tool production should not be found in the debitage assemblages from the coastal sites. This means larger, heavier cortical flakes with minimally modified platforms, eraillure scarring, pronounced bulbs of percussion and compression rings, and low dorsal scar counts will be absent in these sites. Instead, debitage assemblages should indicate a higher incidence of reduction strategies associated with the shaping and finishing of tool blanks and preforms (i.e. middle to latter stages of the reduction continuum).

While the Pre-Dorset undoubtedly preferred to use inland raw materials to replace their formal tools, local chert pebbles were still likely used for expedient tool production and use. This would result in the production of small flakes with extensive cortical cover. These flakes may also exhibit attributes associated with bipolar reduction since the small size of the pebbles makes them harder to work. Formal tools discarded at these sites should be curated but reasonable quantities of informal tools and utilized flakes are also expected since new supplies of raw material could be secured at this time of year, whether they were local pebbles or prepared cores brought from the interior.

Subsistence activities at these sites would have been diversified and social organization was probably flexible to accommodate this. Various task groups were likely formed to catch nesting waterfowl, collect eggs and berries, and to go fishing. These activities likely occurred close to the main camp. Other task groups would be formed to go inland to hunt caribou and collect raw materials. The social organization of these groups was likely more structured given the distances to be covered and the planning involved in organizing the logistics of travel and hunting. The overall size of the groups living in these camps is expected to vary since the people would have come and gone as they participated in various task groups. The warm season provides the best opportunities for individuals to travel and socialize with others and food is more abundant as well, which frees up more time for individuals to do other things. These factors would contribute to a more relaxed social atmosphere at these sites. Despite this, however, the social relations of production would have still remained somewhat structured.

Novice knappers have opportunity to engage in production when raw material is abundant because their reduction episodes are raw material wasteful. But since material is still restricted in abundance and quality at coastal sites even in the warm season, experts would have closely monitored novice activities through the controlled distribution of raw material. It is likely novices were given local pebbles or exhausted cores and tools on which to practice their techniques since they could bash away at these stones without jeopardizing the existing supply of better quality materials (see Pigeot 1990:138). The demands of conformity would be comparatively lower in these sites given the more relaxed social atmosphere, flexible social organization, and abundance of food resources. This means patterns of variability reflecting skill level should be higher since both novices and experts would have participated. Furthermore, experts were at greater liberty to do "otherwise" if they so decided, thus contributing additional variability in terms of qualitative attributes. Variability reflecting choice of technological strategy and stage of reduction is also expected to be somewhat more variable given the bipolar reduction and expedient use of local chert pebbles combined with the controlled reduction, shaping, and finishing of tool blanks and preforms transported to these sites in reduced states.

Inland Sites: Warm Season Occupations

Since raw material is abundant and easily accessible in the inland region during the warm season, these sites should exhibit evidence of raw material testing and significant quantities of early stage reduction debris. Moreover, because raw material had to be transported back to the coast, the Pre-Dorset would have engaged in the intense production of prepared cores, blanks, and preforms resulting in very large debitage assemblages with relatively fewer tools. New tools and preforms would be removed from these sites for further reduction and use elsewhere while old exhausted or near-exhausted tools would be discarded. The diversity of formal types left behind is expected to be highest at these sites since the old curated toolkits used by all members of the group would be transported to the interior and discarded in place of the new ones being fashioned.

Discarded formal tools should exhibit patterns of intense retouch and use; some may even show evidence of rejuvenation. However, late stage debitage associated with maintenance, repair, and rejuvenation activities will either be absent from these sites or present in very small amounts indicating these formal tools were not intensively worked here. Instead, they were brought to the sites in a reduced state and eventually thrown away. Relatively large numbers of rejected and broken preforms are also expected since some of them inevitably fail during production or have flaws that cannot be corrected. These implements will lack evidence of use-wear, extensive formal shaping, hafting, and finer retouch. Given the abundance of raw material, these preforms could be easily replaced. High frequencies of utilized flakes and minimally modified informal tools are expected. Again, because raw materials were abundant, the Pre-Dorset could afford to be wasteful in their consumption of this resource by making and using expedient tools.

Subsistence activities and patterns of social organization are expected to be the same as those predicted for warm season occupations at coastal sites since the diversity of resources available on the coast and inland at this time of year are roughly identical. Since preserved faunal remains were recovered from Mosquito Ridge and Mosquito Ridge West, a better understanding of what subsistence practices were pursued in the interior is possible. If these sites were occupied for the duration of the warm season, these remains should reflect a diversity of species including migratory waterfowl, fish, and caribou.

The social relations of production in these sites during the warm season are expected to be very relaxed. Food is abundant, larger groups of people are present and socializing, and there would be more free time available. As such, novices would have greater opportunity to engage in flintknapping and learn from experts, particularly since raw material is abundant. Novices could practice their skills on larger objective pieces while attempting to replicate the actions of experts. Experts would also have the time and means to try new things out. In other words, they could push the boundaries of the established norm by making tools with variable morphologies, flake patterns, stylistic treatments, and so forth. Variability reflecting skill level is expected to be higher in these sites in terms of qualitative attributes associated with skill since experts and novices would be involved in tool production. In contrast, variability attributed to the overall reduction strategies practiced at the sites is expected to remain low since the main objective would be to replace existing toolkits and secure an adequate supply of raw materials for later use in the seasonal round. Reduction strategies would focus on early and middle stage reduction, and the production of cores, blanks, and preforms.

However, those cores and preforms produced by novices are more likely to be discarded without use at these sites since the products of their knapping episodes more frequently possess flaws that cannot be corrected, making the implement unsalvageable. Among prepared cores, these flaws include stacked terminations below the striking platforms and on the front of the objective piece (Shelley 1990:188). These stacks form when repeated attempts at flake removal from the same location on the platform are unsuccessful (Shelley 1990:188). Bifaces made by novices also commonly display stacked terminations on their dorsal and ventral surfaces resulting from failed attempts at flake detachment. This results in an exaggerated triangular cross-section and sinuous edge morphology (Shelley 1990). These attribute states make it easy to distinguish cores and bifaces made by novices from those made by experts although sometimes experts will try to correct these mistakes so as not to waste available raw materials (Shelley 1990; Weedman 2002). This, unfortunately, can reduce the visibility of novice tool-making in the archaeological record.

Inland Sites: Temporary Extraction Sites

If the inland sites were used as temporary extraction sites for caribou hunting and raw material acquisition, these activities are expected to occur in relatively close proximity to one another given the abundance of these respective resources throughout the interior. To satisfy their tool using needs on the coast, the Pre-Dorset would have procured sufficient raw materials while in the interior and reduced them for easier transport back to the coast. Consequently, evidence of raw material testing, early stage reduction, and core, blank, and preform production is expected in high frequencies at these sites yielding large flake assemblages. However, the diversity of formal tool types deposited is expected to be lower because these special task groups would not have been carrying a complete toolkit since their activities were more focused on hunting. Furthermore, those other group members who differentially used and maintained these more diversified tools would not have accompanied the task group on this kind of trip.

Since caribou hunting would have been the principal activity at these sites, large quantities of hunting and processing tools are expected including microblades, utilized flakes, sideblades, and bifaces. Faunal remains should reflect a focused exploitation of caribou. However, if the animals were killed and processed at separate sites than those used for raw material acquisition, these processing tools should occur in notably lower frequencies. Tools found in association with raw material procurement activities may include only those types that needed to be replaced because of damage, failure, or exhaustion. Consequently, tool diversity should be even lower.

Social organization of these task groups would be structured since these individuals had to deal with the logistics of traveling long distances to get to the interior, and cooperative hunting demands it. By most accounts, these task groups typically consisted of men (see Binford 1978b; Stenton 1989, 1991a); however, among the Pre-Dorset, young women may have been included as well. Women play an integral role in seasonal subsistence activities in the Arctic and trips to the interior would provide opportunities for young people to meet, find potential mates, and arrange marriages. In a recent film on Inuit oral history and culture prior to European contact (Atanarjuat 2001), a scene depicted how a family dispatched their young son and a young woman from another camp to the interior to hunt caribou while the rest of the family remained on the coast to fish and hunt seals. The young woman equally participated in activities related to caribou hunting and processing. Both individuals were physically fit and able to make the trip to the interior, which resulted in the procurement of a valued resource at a time when activity scheduling was problematic for the larger social group. It also resulted in their marriage. While depicted in a contemporary movie, this scene does provide a vivid example of how flexible social organization was among the Inuit and how task groups could be easily formed to acquire resources at different times of the year. It also illustrates that these task groups comprised both men and women, and that the sole purpose of their trip was not just subsistence based.

Demands for conformity in tool production were likely relaxed in these sites during the warm season given the abundance of raw material. However, the social relations of production should still be structured. Relationships between expert flint knappers and apprentices are expected since young people likely accompanied expert hunters and toolmakers on these journeys to learn about the distribution and procurement of these critical resources. Since the time available to learn during these inland forays would be more limited, greater demands may have been placed on novices to succeed in their reduction attempts. Variability should be more pronounced in these sites in terms of qualitative attributes associated with skill level since novices and experts are participating. The demands of conformity placed on experts will be low, thus providing opportunities for them to do "otherwise." Variability attributed to the overall reduction strategies practiced should, however, remain low since the main objective would be to replace existing toolkits and to secure an adequate supply of raw materials for later use in the seasonal round. Reduction strategies should be focused on core reduction and the production of prepared cores, blanks, and preforms. These activities are more commonly associated with the early to middle stages of the reduction continuum. Again, cores and preforms made by novices should be present but are not expected to show any signs of use.

Inland Sites: Winter Occupations

If the inland sites were occupied during the winter, raw material access would be less problematic compared to coastal sites occupied at this time of year. While snow and ice cover on the ground would pose some restrictions, raw materials could be easily stockpiled for future use at or near winter sites in the interior. This would afford the Pre-Dorset a relatively reliable and abundant supply depending on the proximity of sites to these caches. Typically when a consistent supply of raw material is available to toolmakers, they selectively implement an expedient strategy since the need to mitigate future shortages through the production and conservation of curated tools is significantly reduced if not entirely eliminated (Andrefsky 1994a). However, the quality of the material also determines what strategy is used (Andrefsky 1994a, 1994b). If the Pre-Dorset elected to use an expedient technological strategy in response to a consistent supply of lithic raw materials, evidence of tool making is expected in all sites occupied during winter in this region. Informal tools should occur in high frequencies and exhibit minimal modification and use since they could be easily replaced with new tools once edges became dull or broken. Debitage should exhibit attributes associated with early to middle stage reduction. Fewer formal tools are expected as are fewer flakes associated with late stage finishing and repair. Those formal tools that are discarded will not exhibit the same degree of retouch, repair, and maintenance as those found in sites where raw material supplies were restricted. They should have remaining tool utility and lack evidence indicating intensive maintenance and rejuvenation.

Subsistence activities at these sites are expected to include caribou hunting and sealing given the presence of seals in Nettilling Lake. Accordingly, the faunal assemblage should reflect a focused exploitation of these species. Food stress would still be high at these sites during winter so social organization is expected to be rigid as a result. The social relations of production would likely still demand a high degree of conformity from toolmakers since tool failure during hunting at this time of year could spell dire consequences for the group. As a result, formal tools associated with this activity (i.e. endblades, sideblades) should display significant energy investment in production regardless of raw material abundance. These tools would demand greater reliability; thus their design and manufacture is of particular importance (Bleed 1986).

Some evidence of novice knapping is expected in these sites since material was more readily available. However, these reduction episodes would be separate from those where expert knappers were working since novices would not have the skills needed to meet the demands of conformity placed on experts in the group. Novices were likely spatially segregated from other activity areas where their actions would not interfere with the greater goings-on of the camp (see Pigeot 1990:138). This co-occurrence of different skill levels will result in more visible patterns of lithic assemblage variability at these sites in terms of qualitative attribute states. Patterns reflecting site activities are also expected to be more variable since new tools could be easily replaced given the stockpiling of raw material. Also, toolmakers would have used both curated and expedient strategies to make formal tools for hunting and informal tools for processing and other activities.

Coastal and Inland Sites: Occupied Year-Round

If the Pre-Dorset did not move across the landscape in accordance with seasonal changes in the environment and subsistence resource base, patterns of variability in sites located on the coast and inland will be pronounced especially if the same areas were re-occupied during different times of the year. Toolkits found in coastal sites would reflect the use of inferior local sources. Formal tools would be restricted in size, shape, and morphology because of the restrictions imposed by the package size and type of the locally available chert pebbles. Evidence of bipolar reduction is expected to be more common in these sites since it is the most effective reduction strategy for extracting utility out of these types of materials. If toolmakers acquired better quality stone through trade, the tools made from it would be heavily curated and maintained. In fact, the only evidence of these implements might exist in the debitage since it is unlikely these tools would be discarded with remaining utility; they would probably be liquidated in order to salvage every useable bit of them.

Toolkits found in inland sites are expected to exhibit the same range of variability as those described already; however, expediency would likely be more common given the opportunity to stockpile available raw materials. Subsistence activities and patterns of social organization would likely remain the same since similar seasonal subsistence resources are concurrently available in both regions and they both experience the similar seasonal changes in climate.

Conclusions

The four hypotheses and related test expectations presented in this chapter are summarized in Table 4.1 and each one will be evaluated against the data derived from my analysis of the lithic artifact assemblages included in this study. These results will provide a more comprehensive understanding of what patterned variation in Pre-Dorset lithic artifact assemblages means with regards to their overall cultural system and adaptive flexibility.

Chapter 6

Site Data and Analysis

This chapter presents the results of the analysis conducted on the lithic assemblages included in this study. A total of 24,474 lithic debitage and tool artifacts (see Table 6.1) from four coastal and three inland site components were examined. Descriptions of these data are first provided by component according to each maximal artifact category (i.e. debitage, used flakes, informal tools, formal tools, cores). Macro-scale and micro-scale interpretations are then provided for each site. Finally, comparisons are made among sites in each respective region. Direct comparisons between the coastal and inland regions are presented in Chapter 7. All of the attribute states discussed in this chapter, including raw material colours, are defined in Appendix A. Explanations of how these attributes are evaluated and/or measured are also provided. All of the metrical attribute summaries are presented in millimeters.

My interpretations of these lithic assemblages are based on a broad range of contextual information including site location, seasonal climatic changes, and the availability and distribution of subsistence and material resources in the southern Baffin region. Stenton's (1989) land use model, individual and group social interactions, and the basic requirements of reproductive fitness are equally important factors contributing to my interpretive base. Simply stated, my assessment of Pre-Dorset lifeways on southern Baffin Island integrates several sources of evidence that, when considered together, provide a technologically grounded, regionally specific, person-centered framework with which to understand how lithic assemblage variability is distributed among sites in the study area.

Table 6.1 Frequencies of lithic debitage and tool artifacts analyzed by site component.

	Debitage	Used flakes	Informal Tools	Burin Spalls	Burins	Bifaces	Scrapers	Microblades	Burin-like Tools	Cores	Totals
Shaymark	3583	62	153	476	208	137	14	434	1	23	5091
Davidson Point	943	18	43	30	15	29	8	27	0	10	1123
Tungatsivvik Area Q	314	4	2	11	8	6	3	6	0	5	359
Area D	295	2	9	3	6	3	0	4	0	2	324
Sandy Point	1176	10	19	6	16	18	3	16	0	13	1277
Mosquito Ridge Main Site	10762	13	47	90	24	38	2	210	0	19	11203
West	4866	19	34	37	23	31	5	73	0	7	5097
Totals	21939	128	307	653	300	263	35	768	1	77	24474

<u>Shaymark (KkDn-2)</u>

Debitage

The raw material types present at Shaymark are very homogeneous with 98.2% of the assemblage consisting of chert (see Table 6.2). Raw material quality is consistently poor (97.2%) while texture is slightly more variable with 83% recorded as fine-grained (see Table 6.3). Cortex is present on 19.8% of flakes (see Table 6.4). Raw material colour is variable with 37 shades recorded. Three colours dominate (5, 1, 10) accounting for 76.2% of all flakes; however, the remaining 23.8% indicates a variety of chert was worked despite the smaller amounts.

Table 6.2 Raw material types, Shaymark debitage.

	Raw Material Type				
	Chert	Chalcedony	Crystal-quartz	Quartzite	Slate
Debitage	3517	7	54	3	2
Percentage	98.1	0.2	1.5	0.1	0.1

Table 6.3 Raw material texture, Shaymark debitage.

	Raw Material Texture			
	Vitreous	Fine-grained	Coarse-grained	Very coarse-grained
Debitage	181	2975	342	85
Percentage	5.1	83.0	9.5	2.4

Table 6.4 Percentage of cortex cover, Shaymark debitage.

	Percentage of Cortex Cover				
	0	1-49%	50-99%	100%	Platform only
Debitage	2875	409	114	53	132
Percentage	80.2	11.4	3.2	1.5	3.7

The size grade distribution is unimodal (see Figure 6.1) with nearly 86% of the entire assemblage recorded in the two smallest size categories. Flake weights are also unimodal in distribution for specimens between 0.09 g and 1.1 g (see Figure 6.1). For flakes weighing 1.2 g and more, the distribution is more variable since these specimens are larger, their values are more extreme, and there are fewer of them. Mean flake weight is 0.22 g (see Table 6.5). The dorsal scar count distribution is unimodal with 55% of flakes having between 3 and 7 scars (see Figure 6.1).

Remnant striking platforms are present on 64.5% (N=2310) of flakes, and 50.0% of them display advanced states of preparation including multiple flake removals, faceting, grinding, and/or abrasion. Preparing striking platforms such as these require more time, effort, and a greater degree of skill (Whittacker 1994:100-105). In contrast, minimally modified platforms consist of single facets and/or cortical states, which may frequently exhibit evidence of excess force (i.e. crushing, shattering). These states require little if any effort, time, or skill to prepare (Whittacker 1994:100-105). Many of the flakes in this assemblage occur in the size 1 and 2 categories and display 3 or more dorsal scars (42.7%, N=987). There are also high frequencies of size 1 flakes with 3 or more dorsal scars that have single facet platforms. This platform state is more characteristic of early stage reduction; however, these small flakes were produced during late stage reduction given their higher dorsal scar counts, visible platform trimming, and narrow platform widths. If these small flakes are added to those with advanced platform states and high dorsal scar counts, the frequency of flakes associated with late stage reduction increases to 57.1% (N=1320).

Table 6.5 Mean flake weights (g) for Shaymark debitage, used flakes, and informal tools.

	N	X	R	S^2	S
Debitage	3583	0.22	3.71	0.09	0.31
Used flakes	62	1.06	6.2	1.33	1.15
Informal tools	153	0.78	5.9	0.56	0.75

Evidence of platform battering (20%, N=467) and trimming (21%, N=485) is relatively low. Interior surface lipping is present on 8.1% of flakes while 13.7% have eraillure scars. Secondary distal crushing is present on 10.7% of the assemblage and 82% (N=314) of flakes that have it are in the two smallest size grade categories, but few have extensive cortex indicating these flakes did not derive from the bipolar reduction of small chert pebbles. Bulbs of percussion (55%) and compression rings (79%) occur in moderate to high frequencies. Debitage completion indices and flake breakage types are summarized in Tables 6.6 and 6.7, respectively.

Table 6.6 Debitage completeness index, Shaymark assemblage.

	Debitage Completeness Index				
	Shatter	Medial/distal	Split	Proximal	Complete
Frequencies	220	1053	28	1843	439

Table 6.7 Breakage types and frequencies observed on Shaymark flake margins.

	Margin	**Feather**	**Step**	**Hinge**	**Outrepassé**	**Snap**	**Absent/Ind.**
Debitage	Distal	1011	183	180	29	1960	220
	Proximal	0	167	8	0	869	2539
	Right	2269	45	5	0	1044	220
	Left	2304	32	43	0	1024	220

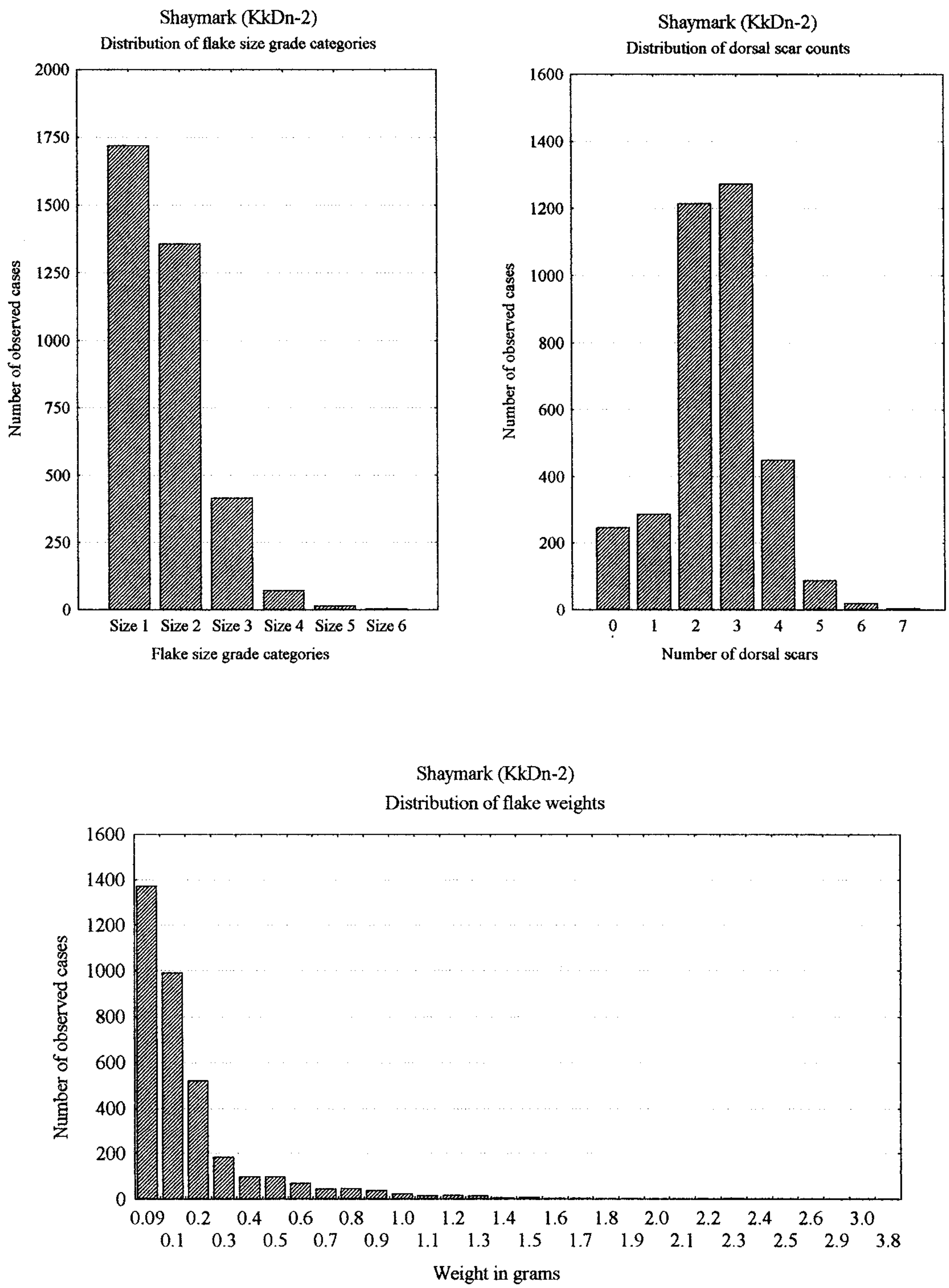


Figure 6.1 Distribution frequencies for Shaymark flake size grades, dorsal scar counts, and weights (g).

Used Flakes

There are 62 used flakes in this assemblage accounting for 4.1% of the artifact total. Raw material attributes mirror those observed for the debitage assemblage in terms of quality, texture, and colour (5, 1, 10). While cortex frequencies are slightly higher (25.8%, N=16) for this category nearly all the tools with it (N=13) have minimal amounts (i.e. 1-49%, platform only). These tools consist predominantly of moderate to large size flakes with more variable weights (see Table 6.5), and low to moderate dorsal scar counts. Remnant striking platforms are present on 66.1% (N=41) of these tools and most consist of minimally modified (N=15) or multifaceted (N=15) states. Platform battering is slightly higher than that recorded for the debitage (24.2%). Interior surface lipping is minimal (N=2) while eraillure scarring is more prevalent (19.4%). Bulbs of percussion (61.3%) and compression rings (98.4%) are common yet there is no evidence of secondary distal crushing. All tools display use-wear in the form of edge rounding and step fractures terminations, and were used on one (N=24), two (N=27), or three (N=11) margins. Proximal (43.5%) and complete (21%) flakes are most common as are feathered (43.6%) and snapped (35.5%) distal termination states.

Informal Tools: Retouched Flakes

There are 153 retouched flakes in this assemblage accounting for 10% of the artifact total. Most are made of chert (N=151) but two are of crystal-quartz. Raw material quality and texture are slightly more variable with higher frequencies of unflawed (4%) and vitreous (11.8%) toolstone. Despite this, however, the majority of these tools are made of fine-grained, poor quality chert with slightly higher cortex frequencies (23%). Raw material colours reflect those in the debitage assemblage with the same three colours accounting for 86% (N=131) of all variation.

The majority of flakes are moderate to large in size (N=115). Flake weights are more variable (see Table 6.5) and reflect the greater range of flake sizes represented in this category. Most tools have two to three dorsal scars (76.5%); however, there are a few (N=11) that have four or more scars indicating the objective pieces from which they were struck were in a more reduced state. Remnant striking platforms are present on 51.6% (N=79) of flakes and consist largely of minimally modified or cortical states (N=30) and multifaceted states (N=36). Platform battering (19%) is more common than platform trimming (8%). Frequencies of interior surface lipping (N=2) and secondary distal crushing (N=5) are minimal; however, eraillure scars (N=38) are more frequent. Bulbs of force are present on half the tools and compression rings are observed on nearly every one (N=144).

Most tools are retouched on their interior (N=25) or exterior (N=103) surfaces but some have it on both surfaces (N=25). The intensity of retouch is high for all margins. The mean Retouch Intensity Index (RII) for exterior surfaces is 2.14 ($R = 10.0$, $S^2 = 2.0$, $S = 1.4$) while the mean RII for interior surfaces is 1.82 ($R = 3.0$, $S^2 = 0.6$, $S = 0.78$). These edges are concave, convex, or straight, in form and 60% display evidence of use-wear. Intentional retouch on the non-working portion of the tool (i.e. flake scars that extend across the ventral and/or dorsal surfaces) is recorded on 22 specimens. Proximal (37.3%) and medial/distal (45.1%) flakes dominate this category, as do feathered (40%) and snapped (41.2%) distal states.

Informal Tools: Burin Spalls

There are 476 burin spalls in this assemblage accounting for 31.6% of the artifact total. While most of these artifacts are made of poor quality chert (99%), raw material texture and colour are more variable. Fine-grained toolstone (93%) does dominate but the occurrence of vitreous (5%) and coarse-grained materials (2%) indicates some diversity. Raw material colours are variable with 16 shades recorded; however, three of these (5, 10, 1) account for 81% of all frequencies. Cortex cover is low (4.6%, N=44). Secondary spalls (N=288) outnumber primary spalls (N=188), and most comprise complete (N=378) and proximal (N=49) sections.

Remnant striking platforms are present on 89% (N=423) of these spalls and include high frequencies (92%) of advanced states with multiple flake facets, grinding, or abrasion. Bulbs of percussion (80%) and compression rings (81%) are common. The degree of dorsal flaking is moderate to intense (64%) indicating the burins from which the spalls were struck were more intensely worked. Post-detachment modification and/or use is recorded on 100 spalls. Distal states include feathers terminations (N=184), hinges (N=89), steps (N=130) and snaps (N=73). Table 6.8 summarizes the metrical attributes for this category.

Table 6.8 Metrical attribute summaries for Shaymark burin spalls.

	N	X	R	S^2	S
Length	378	12.8	19.5	10.2	3.2
Width	476	3.3	6.0	0.7	0.84
Thickness	476	1.85	4.7	0.29	0.54
Weight	476	0.11	0.4	0.002	0.04

Formal Tools: Burins

There are 208 burins in this assemblage accounting for 13.8% of the artifact total. Most are made of poor quality, fine-grained chert (82.3%), and 21.2% of these have cortex. Thirteen raw material colours are recorded, of which three (1, 5, 10) account for 80.1% of all frequencies. This distribution mirrors that observed for the burin spalls and the debitage assemblage; however, the greater range of colours recorded for the spalls indicates some burins were brought to the site, used, resharpened, and then removed when the inhabitants left. Other raw material types represented include crystal-quartz (N=2), chalcedony (N=1), and quartzite (N=1).

Remnant striking platforms are present on 55% of these tools and of these, 41% (N=47) have multifaceted states while 38% (N=43) have minimally modified states. Evidence of platform battering (32%) and eraillure scars (35%) is moderate while bulbs of percussion (89%) and compression rings (41%) are more common. These attributes indicate the flakes on which these tools are made were detached using heavier force loads and/or hard percussors. Most burins (N=63) with indeterminable platforms have been so intensively modified that technological flake attributes are no longer visible.

These burins are largely complete (N=160) or near complete (N=4), and working edge orientations are predominantly obtuse (N=146) or perpendicular (N=37). Lateral margins are symmetrical for 61 burins and asymmetrical for 117. Many burins display hafting modifications in the form of side notching (N=91), corner notching (N=3) and lateral thinning (N=31); one burin is stemmed. Basal elements are straight (N=59), convex (N=87), concave (N=29), and bivectoral (N=6) in outline, and 91 are symmetrical in form. Table 6.9 summarizes the metrical attributes for this category. Measures of dispersion indicate a high degree of internal variation.

Table 6.9 Metrical attribute summaries for Shaymark burins.

	N	X	R	S^2	S
Length	166	20.9	25.2	19.3	4.4
Width	183	13.5	14.9	6.78	2.6
Thickness	208	11.85	22.4	25.25	5.02
Weight	208	1.23	6.0	0.51	0.71

Primary flake scars are unifacial on 63 burins and bifacial on 125; 20 burins show no post-detachment modification other than the spalled edge. Secondary flakes scars are unifacial on 65 burins and bifacial on 130. Of those burins with secondary flaking, 54 have continuous patterns. The intensity of flaking on 80% of these burins is classified as moderate to high indicating many of them were heavily worked and maintained during their use-lives. Evidence of polish or grinding is recorded on 35% of these tools and occurs on ventral and/or dorsal surfaces (72.2%) suggesting it may have resulted from the tools' movement in the haft during use. Basal modification is noted on 103 burins and consists of unifacial (N=58) or bifacial (N=43) thinning.

Burins possessing a single primary working edge total 72.6% while 21.6% have two working edges, and 1% have three. The working edges of these tools have been spalled numerous times with some exhibiting 10-11 scars (N=3). The mean number of scars is 3.68 ($R = 10$, $S^2 = 4.87$, $S = 2.21$), which is high indicating these burins were intensively used and maintained. Ten burins appear to have been made on discarded scraping tools although the rejuvenation of these implements is restricted to merely spalling one margin to generate a sharp working edge.

Formal Tools: Burin-like-tools

A single burin-like tool is included in this assemblage. These tools are typically thought of as diagnostic indicators for Dorset culture but Maxwell (1985:94) states they are found on occasion in Pre-Dorset sites. This tool is made of poor quality, opaque white chalcedony and is missing its basal element. It is 12mm wide, 4 mm thick, and weighs 1.5 g. Intense grinding and polish are present on the dorsal and ventral surfaces, and along the primary working edge. The tool bit is square and conforms to what Maxwell (1985:92) describes as the Dorset burin-like type. Side notching is observed on the left laterodistal end. The proximal end and right lateral margin of the tool are rough and unfinished; however, this is likely attributable to the large inclusions present in these areas. None of the margins are fractured.

Formal Tools: Bifaces

Bifaces make up 9% (N=137) of the artifact total in this assemblage. Most are made of poor quality, vitreous or fine-grained chert (N=121) but two are unflawed, vitreous crystal-quartz. Cortex is present on 13 tools. Fourteen raw material colours are recorded and three of them (5, 1, 10) account for 83% of all frequencies. While these three colours are present in the debitage assemblage in varying amounts, the other 11 colours for this artifact category have relatively few recorded flakes indicating these bifaces were not made or intensively worked at the site.

Few of these artifacts are complete (N=15) (see Table 6.10). Among those bifaces that can be oriented (N=70), the blade elements on 31 are symmetrically straight (N=24) or convex (N=7) while 39 are asymmetrical. Blade cross-sections are biplano (N=43), plano-convex (N=34), and biconvex (N=26). Only three bifaces have plano-triangular cross-sections. These tools also have stacked fractures on their dorsal or ventral surfaces from repeated failed attempts to thin them. It should be noted, however, that these three bifaces are all fragments whose edges are only slightly sinuous suggesting that they broke as toolmakers attempted to remove these stacks while the tools were being worked. Among the rest of the bifaces in this assemblage, few (N=18) display stacked fractures or very sinuous edges (N=1). Therefore, it is unlikely these tools are the products of low skill. Table 6.11 summarizes the metrical attributes for this category.

Table 6.10 Completeness Index for the Shaymark bifaces.

	Indeterminable	**Complete**	**Tip missing**	**Tip, blade element missing**	**Basal, haft elements missing**	**Tip, basal, haft elements missing**	**Longitudinal split**	**Blade, basal, haft elements missing**	**Bifacial edge**	**Tip, basal elements missing**	**Basal element missing**	**Tip, blade, basal elements missing**	**Lateral margin(s) missing**
Count	21	15	15	22	24	8	2	14	5	2	7	1	1

Table 6.11 Metrical attribute summaries for the Shaymark bifaces.

	N	X	R	S^2	S
Length	18	25.3	39.0	114.15	10.68
Width	93	13.9	40.2	24.5	5.0
Thickness	129	3.1	6.4	1.7	1.3
Weight	137	0.71	5.01	0.7	0.84

Hafting modifications are recorded on ten bifaces: seven are side notched, two are stemmed, and one is pointed. Basal elements are straight (N=9), convex (N=27), concave (N=16), or triangulo-concave (N=2), and 19 are symmetrical in outline. Primary flake scars are unifacial on four tools and bifacial on 133. Secondary flake scars are unifacial on six tools and bifacial on 131. Of those bifaces with secondary flaking, only 34 (28.1%) have continuous patterns. The degree of flaking on these artifacts is moderate to high for 82.5% (N=107), indicating they were heavily worked.

Edge serration is recorded on 22 bifaces. Evidence of polish is present on seven tools and is variously located on the lateral margins (N=2), and on the ventral and/or dorsal surfaces (N=5). Basal elements are modified on 48 bifaces, five of which are thinned unifacially and 43 are thinned bifacially. Evidence of use-wear is high (87%) on those bifaces with intact blade elements and consists of edge rounding (N=26), step fracturing (N=4), and these combined states (N=31). Four bifaces are rejuvenated. Table 6.12 summarizes the breakage patterns for these tools.

Table 6.12 Breakage patterns for the Shaymark bifaces.

	Margin	Feather	Step	Hinge	Snap	Absent/Ind.
Biface	Distal	63	5	0	43	26
	Proximal	0	6	0	52	79
	Right	108	0	0	3	26
	Left	108	2	0	1	26

Formal Tools: Scrapers

There are 14 scrapers in this assemblage accounting for 1% of the artifact total. Twelve are made of poor quality chert with vitreous, fine-, and coarse-grained textures. Two other scrapers are made of poor quality, vitreous crystal-quartz. Cortex is present on half of these artifacts. Raw material colour is variable with ten different types recorded; however, all of them mirror those observed for the debitage and flake tool categories. Most of these scrapers are complete (N=10) or near complete (N=2). Lateral margins are symmetrical on four tools and asymmetrical on nine. There is some variation in the location on the scraping edge: one is right lateral, one is right laterodistal, five are distal, and six are left laterodistal. The shapes of these edges are straight (N=2), concave (N=5), or convex (N=6). Scraping edge symmetry is variable and includes the following states: symmetrical (N=7), asymmetrical (N=3), symmetrical expanding (N=1), and asymmetrical contracting (N=2). Typologically, one is an expanding end scraper, four typical endscrapers, five concave sidescrapers, and two are sidescrapers.

Side notching is present on five tools. Basal element outlines are either straight, convex, concave, or bivectoral, and five are symmetrical in form. Table 6.13 summarizes the metrical attributes for this category. Primary flaking is unifacial on 12 scrapers and bifacial on one. Secondary flaking is unifacial and discontinuous on 11, and bifacial and continuous on one. One scraper has polish on its distal end. The basal elements on two scrapers are unifacially thinned.

Table 6.13 Metrical attribute summaries for Shaymark scrapers.

	N	X	R	S^2	S
Length	10	25.05	18.0	26.32	5.13
Width	14	15.7	17.4	22.45	4.74
Thickness	14	5.15	4.3	1.25	1.12
Weight	14	2.05	3.6	1.14	1.07

The mean edge angle is 62° (R = 9.0, S^2 = 14.8, S = 3.84). Remnant spurs are recorded on the working edges of four scrapers; however, all of these tools are complete indicating they were likely discarded by expert toolmakers before they broke. Less experienced toolmakers continue to use scrapers with spurs because they do not have the skill to remove them from the working edge. Eventually these tools break and end up fragmented in the site assemblage with the spurs still visible on the working edge (see Weedman 2002). The exterior surfaces on these tools are heavily retouched as indicated by the mean value for the RII, which is 3.93 (R = 3.2, S2 = 0.86, S = 0.93). All scrapers with intact working edges have use-wear in the form of edge rounding and step fracture terminations. None of these tools are rejuvenated.

Formal Tools: Microblades

There are 434 microblades in this assemblage accounting for 28.8% of the artifact total. Most are made of poor quality, fine-grained (80.5%) or vitreous (N=8%) chert, and minimal amounts of cortex are present on 7.8% of these tools. Other raw materials include vitreous crystal-quartz (N=29) and chalcedony (N=5). Raw material colours are variable with 24 shades recorded; however, five colours (5, 1, 10, 4, 27) account for 87.6% of all frequencies indicating some cores were reduced more intensively than others. Only four of these colours are reflected among the cores in this assemblage, which means that comparatively high frequencies (N=82) of these microblades were struck from cores that were removed from the site for further use.

Less than half (43.1%) of these microblades are complete (N=38) or near complete (N=149) (see Table 6.14). Remnant striking platforms are present on 47.2% of these tools and 56.6% of them have advanced states of preparation including multiple flake facets, grinding, and/or abrasion. Evidence of platform trimming (32.2%) is moderate. There are also moderate frequencies of microblades with minimally modified, crushed, and cortical platforms, evidence of platform battering (N=65), and eraillure scars (N=79), which indicates the use of heavier force loads or hard hammer percussors during detachment. Bulbs of percussion (N=182) and compression rings (N=391) occur in high frequencies. Table 6.15 summarizes the metrical attributes for this category.

Lateral margins are straight and symmetrical on 271 microblades while 149 are asymmetrical. Side notching is present on 27 microblades and two are stemmed. Single dorsal arrises are recorded on 154 tools, 239 have two arrises, and 35 have three. Of those microblades with multiple arrises, 36% are parallel indicating the cores from which they were struck were highly standardized. Polish is observed on only 3 microblades and is located on the proximal, right, and left margins suggesting movement of these tools in their hafts resulted in this attribute state. Two microblades are modified on their proximal ends to thin the bulb of percussion.

Table 6.14 Completeness index for Shaymark microblades.

	Complete	Proximal section	Medial section	Distal section	Proximal/ medial	Medial/ distal	Split
Count	38	20	169	8	149	50	0

Table 6.15 Metrical attribute summaries for Shaymark microblades.

	N	X	R	S^2	S
Length	38	18.34	20.7	26.2	5.12
Width	419	7.3	15.7	3.57	1.9
Thickness	434	7.05	16.3	5.23	2.3
Weight	434	0.24	1.41	0.03	0.17

Retouch is observed on 22% of these tools and is variously located on interior surfaces (N=14), exterior surfaces (N=72), or on both surfaces (N=9). The degree of retouch on interior and exterior surfaces is near identical with mean RII values of 1.52 ($R = 3.23$, $S^2 = 0.7$, $S = 0.83$) and 1.53 ($R = 4.23$, $S^2 = 0.66$, $S = 0.81$), respectively. Evidence of use-wear is high with 130 tools displaying edge rounding and 254 with edge rounding and step fracture terminations. Seven microblades show evidence of rejuvenation, which is limited to edge spalling.

Cores

Cores and core fragments make up 1.5% (N=23) of the artifact total in this assemblage. Raw material types include chert (N=17), crystal-quartz (N=3), and chalcedony (N=1). Raw material quality is consistently poor (91.3%) but texture is more variable with 34.8% of cores recorded as vitreous toolstone. Cortex is recorded on 11 fragments but the extent of its coverage is minimal. Five raw material colours are recorded and reflect those observed for the microblades, debitage, and flake tool categories with the same three colours accounting for 73.9% of all frequencies (5, 10, 1). Mean core weight is 2.24 g ($R = 9.2$, $S^2 = 4.7$, $S = 2.17$). Chipped striking platforms are recorded on 81% of these artifacts. Direction of force application is unidirectional for 11 and multidirectional for 12 indicating a mixture of standard and generalized technologies. The mean number of flakes scars observed on these cores is 5.2 ($R = 12$, $S^2 = 7.8$, $S = 2.8$). Stacked terminations below the striking platform occur in relatively low frequencies (26.1%). Four cores exhibiting this state are unidirectional, fragmented, have high dorsal scar counts (i.e. 4 to 6), and evidence of secondary distal crushing indicating they were intensively worked standardized cores. One core fragment is rejuvenated and is spalled on a single margin.

Macro-Scale Interpretations: Shaymark (KkDn-2)

The principal lithic technological activities pursued at this site include late stage tool finishing and tool maintenance. Poor quality, fine-grained chert is the dominant raw material; however, there are also small amounts of good quality, vitreous chert and crystal-quartz. These materials were conserved since the majority of these flakes are in the smallest size grade category. The high frequencies of small, non-cortical flakes with low weights, advanced platforms states, high dorsal scar counts, interior surface lipping, and platform trimming indicate toolmakers were focused on late stage tool production and maintenance activities. Comparatively few moderate to large flakes are included in this assemblage (14%) demonstrating new tools were not being made from start to finish at this site. A considerable number (N=143) of these larger flakes display multi-faceted striking platforms, lack cortex, and have moderate dorsal scar counts suggesting they were removed from prepared cores that were brought to the site ready for use.

The distributions for flake size grades, dorsal scar counts, and weights between 0.09 and 1.1 g are all unimodal and points to the use of a single reduction strategy (Ahler 1989b:205). Unimodal distributions for these attribute states represent the gradual progression of a lithic reduction continuum from start to finish. The actual stages of reduction completed at a site will, however, influence the way these distributions curve. For example, if core reduction were the dominant activity, the distribution for flake size would peak among the larger size grade categories. Similarly, weights would peak among the heavier values, and scars among the lower values. These combined states reflect the predominance of large, heavy flakes with low dorsal scars that are associated with this stage of reduction. In contrast, if late stage tool production were the dominant activity, like it is at Shaymark, these distributions would still be unimodal but the curves would shift towards the smallest values for each attribute state. As the reduction continuum progresses, small flakes with low weights and high dorsal scars substantially increase in frequency (Ahler 1989a:90). When mixed technological strategies are used (e.g. bipolar reduction and tool maintenance), distributions are bimodal or multimodal, which indicates certain stages in the reduction continuum are not present in the assemblage (i.e. they were not completed at the site).

The Percent Type calculations for Shaymark indicate 87.1% of the assemblage derives from tool production activities while 19% is from core reduction. These figures total 106.1% and are slightly over the expected range of error, which is 100% ± 5. However, Carr and Bradbury (2001:139) state they have recorded errors of up to ± 15% when using these equations and are not entirely clear as to what causes them. Despite this slightly higher range of error for Shaymark the other lines of evidence generated in this analysis indicate these figures are actually representative of the technological activities pursued at the site; toolmakers were more intensively focused on late stage tool finishing and maintenance than they were on core reduction. The Sullivan and Rozen (1985) method further supports this interpretation with medial/distal and proximal flakes (82%, N=2924) outnumbering complete flakes and shatter (18%, N=659). The flake-to-tool ratio is extremely low at 3:1 and further confirms the predominance of late stage tool finishing and tool maintenance activities at this site. This is the lowest value for all the sites included in this study and clearly illustrates new tools were not being made to replace lost tool utility at Shaymark.

Toolmakers do not appear to have exploited local chert pebbles for tool production at Shaymark. If they had used them, high frequencies of small cortical flakes exhibiting attributes associated with bipolar reduction (i.e. evidence of secondary distal crushing, shattered or crushed platform states) would be expected since pebbles are harder to work given their small package size. Those flakes in the assemblage that do have cortex appear to have been struck from prepared cores that still had remnant cortex on them. If cores are procured from distant sources, intuitively it makes sense to reduce them as much as possible so as to make them easier to carry. Logically, this would include the complete removal of cortex since this exterior surface has no utility in tool production and presents extra mass that must be transported. However, when raw material is procured, toolmakers must assess the total utility of a source, and package size will determine to what extent a cobble or nodule is processed for transport (Beck *et al.* 2002:490).

When raw material sources are limited in availability, quality, and size, as they are in the southern Baffin region, much of what is considered waste (i.e. primary reduction flakes) is in fact useable material that can be modified into expedient tools and blanks (Eltson 1992:787). Therefore, nodules will invariably undergo some reduction to facilitate transport but varying amounts of cortex cover may be left on them since the removal of this exterior surface in its entirety could negatively affect the overall utility of the toolstone. In other words, if too much workable material is removed from a nodule, it will limit the number of potential tools (whether formal or informal) that can be made from it. When raw material procurement costs increase due to geological or climatic restrictions, considerations such as these become even more important.

In the Shaymark assemblage, those artifacts with the highest cortex frequencies include used flakes, informal tools, burins, and scrapers. The presence of cortex on these tools will not affect their function; thus flakes struck from a prepared core that retains cortex can be used to make these implements and this helps to increase the utility of raw material sources. However, if the intended products to be manufactured from a cobble include bifaces or microblades, the presence of cortex on their surfaces will affect their functionality since this trait constitutes a considerable flaw in the quality of the material and may increase the likelihood of production failure or failure during use. Thus, the cobbles selected to produce these tool types tend to be more intensively reduced in the field since there is no point in carrying the excess weight associated with unusable material in these contexts (see Beck *et al.* 2002:490).

Nearly every used flake and informal tool included in this assemblage was discarded with remaining utility. This, combined with the comparatively high frequency of these expedient types, indicates toolmakers at Shaymark were not experiencing raw material stress. Informal tools are, however, intensively worked as indicated by the mean RII values and the presence of retouch on the non-working margins on 22 tools. But only 60% of these tools display use-wear suggesting this post-detachment modification may be non-functional. All flake tools appear to have been struck from prepared cores using heavy percussors given the higher frequencies of eraillure scars, bulbs of percussion, and compression rings recorded. The presence of 12 generalized cores that display the same raw material traits as these artifact categories and have evidence of crushing and battering on their platforms supports this inference. These objective pieces were likely the source of these informal types.

Burins and burin spalls dominate the tool frequencies in this assemblage, and this strongly suggests the site occupants were intensively working organic materials. The recovered scrapers were also likely used in these activities given their steeper edge angles, the location of their scraping edges (i.e. lateral margins), and the predominance of step-fractured use-wear on their working edges. Maxwell (1984:361; 1985:95) states sidescrapers were used to shape and plane hard organics, which further points to an emphasis on organic tool production. The high frequency of secondary spalls indicates burins were intensively used and resharpened, and the presence of numerous exhausted burins and primary spalls suggests new burins were fashioned to replace those that were discarded. This is the only tool category that appears to have had lost tool utility replaced through the production of new tools. However, since burins are easily made on flake blanks struck from cores, they can be quickly replaced with minimal effort provided raw materials are available.

The difference in raw material colours between the spall and burin categories indicates toolmakers were using certain tools at the site and then removing them for future use somewhere else. The degree of variability in burin morphology and flaking patterns is very pronounced in this assemblage. The metrical attribute states for this category exhibit a high degree of internal variation (see Table 6.9), and the intensity of flaking is high to moderate for 80% of the sample. Many burins also display a high incidence of hafting modifications and polish, which attest to a greater investment of time and energy in their manufacture and maintenance. In contrast, however, there several burins that consist of minimally modified flakes. To some extent these differences can be explained by the fact certain tools were intensively curated while others were made for expedient use. But, several tools display intense retouch on their non-working margins (i.e. across the dorsal and ventral surfaces), all of which seems to exceed the functional requirements of this type. This retouch does not appear to be related to hafting since it is located on tool margins that would have extended beyond where they haft would have covered. It is possible this embellishment had greater significance in the realm of organic tool production than it did in lithic tool production since burins are used to engrave, groove, scrape, and carve hard organic materials (see Maxwell 1984, 1985).

Microblades make up a large part of this assemblage indicating activities associated with processing meat and hides, and/or sewing were also of importance at Shaymark. Many of these tools display evidence of use-wear, which suggests the highly fragmented nature of this assemblage is the result of tool failure during use. If these tools were broken intentionally for use as composite tools, the incidence of use-wear would be notably lower since it seems unlikely microblades would be made first to perform cutting activities and then be broken for use as a sideblade or inset tool of some kind. Many of these implements were struck from highly standardized chert microblade cores and the near absence of these types in the core assemblage indicates the objective pieces from which these blades were struck were removed from the site. In fact, few microblade cores were recovered from Shaymark further suggesting toolmakers took these valuable raw material sources with them when they left.

The bifaces in this assemblage consist of heavily curated tools and those that were rejected during late stage finishing due to failure and/or production errors that could not be corrected. Some tools were refurbished given the presence of several bifacial edge fragments, and the relatively high number of biface tips also indicates tools failed during maintenance and/or late stage finishing. When bifaces break during use, the tips are lost away from camp (Binford 1979), thus their presence in this assemblage indicates these tools failed while being worked at the site. The assemblage also includes bifaces that broke during use and the basal and haft elements of these tools were returned to the site in their hafts where they were then removed in anticipation of replacement. The debitage assemblage indicates new bifaces were not being manufactured at Shaymark; therefore, bifaces used to replace broken and curated specimens must have consisted of preforms that were brought to the site and then finished. Several of the complete bifaces that were discarded exhibit significant energy investment in their production and maintenance given their uniform flaking patterns, intense edge retouch, serrated edges, polish, hafting modifications, and symmetrical morphologies. It is clear that highly skilled individuals made these tools.

Based on this discussion, the occupants at Shaymark were not experiencing raw material stress. There is no evidence of bipolar liquidation in the debitage assemblage or among the formal tool categories, and tool rejuvenation is limited to edge spalling on discarded tools and tool fragments. Lithic raw material appears to have been readily accessible to toolmakers in the form of generalized flake cores, microblade cores, and tool blanks and preforms. It is highly unlikely this material was acquired from coastal sources given their limited nature. Therefore, it must have come from sources in the interior. Task groups could have gone inland early in the warm season to gear-up and to secure a supply of toolstone to bring back to the coast for future use. Since curated formal types were being replaced, it would make sense for toolmakers to select better quality material procured from inland sources to do this even if poor quality, small sized chert pebbles were abundant near this coastal site. This selectivity follows Andrefsky's (1994a) predicted pattern of toolstone utilization.

While raw material was available, toolmakers at Shaymark were not making new formal tools. In fact, they were not replacing lost tool utility to any notable extent, which accounts for the small debitage assemblage and the extremely low flake-to-tool ratio. Instead, site activities appear to have focused on organic tool production and processing activities as indicated by the high frequencies of burins, burin spalls, microblades, scrapers, and the single burin-like tool, all of which total 75% of tool assemblage. Organic tool production would have involved making items such as harpoon heads, fore shafts, knife handles, lances, and needles while processing activities likely entailed cutting up Arctic char and caribou, or cutting hides for use in sewing. The absence of raw material stress and the site's location suggest a warm season occupation for Shaymark. Maxwell's (1976) inferences about the seasonality of these tool types further support this. The sheer size of the Shaymark site area suggests the Pre-Dorset came back here on multiple occasions, and the consistency in lithic reduction strategies and tool types indicates the same activities were pursued here each time.

Micro-Scale Interpretations: Shaymark (KkDn-2)

Micro-scale patterns of variation in this assemblage indicate novices were not actively engaged in tool production activities. Less than 1% of the debitage flakes display minimally modified or crushed platforms, battering, and step or hinge fractures. Furthermore, scrapers, bifaces, and prepared cores do not exhibit attribute states indicative of novice skill. Since the main activities at this site appear to have focused on organic tool production, the time and attention of expert toolmakers would necessarily be directed more towards working these materials than making new lithic tools. However, most of the lithic tools that were worked consist of implements used to scrape, groove, and shape antler, ivory, and bone, which further supports the interpretation that organic tool production was the primary focus. Therefore, if experts were not intensively working a wide variety of stone tools, novices would not be either.

Two other factors that would limit novice flint knapping activities include the availability of lithic raw material and a more structured social arena. While stone was available in the form of prepared cores, tool blanks, and preforms, novices would not have had free access to use this material since their reduction episodes are so wasteful that they would rapidly consume these stores. Traveling inland to acquire toolstone certainly required considerable time and energy, and if Shaymark were occupied in the late summer/early fall, the time available to renew this supply would have been restricted given the competing demands placed on individuals at this time of year in anticipation of winter. Therefore, in order to maintain this supply, the rate at which raw materials were consumed would have been closely monitored. Novices could have used local pebbles to knap but the debitage assemblage indicates they did not.

There is evidence that the social relations of production at Shaymark were more rigidly structured. The debitage assemblage provides the strongest evidence that experts were the ones engaged in tool production activities given the high frequency of small size flakes with advanced platform states, high dorsal scar counts, and platform trimming. It is obvious toolmakers were investing more time and effort in preparing these flakes for detachment, and that the objects being worked were either heavily curated and/or in the latter stages of reduction. Expert toolmakers have the necessary skills to produce and maintain curated formal tools and the assemblage from this site consists predominantly of these types. Based on the location of Shaymark, its distance from available toolstone sources, the time of year it was occupied, and the nature of the activities pursued there, it is not surprising that experts were the ones engaged in reduction activities.

There are also several informal tools that display retouch on their non-working margins, and the high incidence of heavily retouched tools that were never used suggests toolmakers may have been working them for the sake of doing so. The presence of 100 burin spall tools further illustrates the presence of high technological skill among toolmakers since many of these implements have been spalled and/or flaked for reuse, and working objects this small is difficult even if the retouch is purely functional.

A large number of burins and several scrapers also display intense retouch on their non-working margins but these tools were likely made at another location under different organizational circumstances since the debitage assemblage indicates few, if any, new tools were made from start to finish at this site. Despite this, it suggests that in certain social situations the lithic tool types used in organic tool production were embellished, by means of intense flaking and shaping, to such an extent that it exceeded their functional requirements. Toolmakers may have been negotiating status at Shaymark using their technical skill in an organic medium rather than a lithic one. But because burins, scrapers, and spalls are integral for working hard organics, these lithic tools may have also been intensively worked, shaped, and polished since they form a vital component of the organic technological arena in which these people were engaged. In other words, when the Pre-Dorset were making organic implements, like harpoon heads, and the social stakes were high it would make sense for experts to utilize an impressive set of lithic tools in an effort to gain additional status or influence within the group. A beautifully made burin hafted in an ornately carved handle might be just the thing to one-up someone else.

The greater diversity in formal tool types and the seemingly more rigid social structure suggests the entire social group was present at Shaymark. Perhaps Shaymark represents a location where small family units separated throughout the summer came to prepare for the onset of winter and their journey back down the coast. By late summer, the subsistence resources available near the site (i.e. char and caribou) are optimal and would provide the Pre-Dorset with a reliable supply of food while they pursued other activities including organic and lithic tool production, and sewing new clothes and bedding. However, a secure supply of food likely did not create an overly relaxed social atmosphere since all members in this extended social group would have been involved in preparing for the onset of winter and the journey back down the coast. Activity scheduling would have been highly structured given the demands of balancing all of these tasks. Furthermore, the rejoining of groups that had remained separate throughout the summer would necessarily change the social atmosphere and structure at the site.

Had this site been used as a special function site (e.g. hunting, resource extraction), I would expect to find a lower degree of toolkit diversity. Since special function sites are designed to focus on a narrow range of specialized activities, the toolkits associated with them typically comprise a limited range of more specialized implements that are ideally suited to perform these tasks (Andrefsky 1998:201-202). For example, in a hunting camp, one might expect to find a high frequency of bifaces, expedient tools used for cutting, some late stage debitage resulting from tool maintenance activities, and little else (see Binford 1978b:330). The attention of the occupants would have been directed towards a specific activity and their toolkit would be organized to meet the demands it required. Frequently these specialized camps lack dwelling structures since they are not occupied for an extended period of time, and the occupants frequently consist of only one segment of the population (i.e. men) (Binford 1978b:330). Effectively, a specialized camp exhibiting low toolkit diversity is commonly associated with organized task groups comprising a select number of individuals from the larger social group who are dispatched to perform particular tasks (Binford 1980:9-10). In contrast, larger sites yielding more functionally diverse toolkits are interpreted as reflecting the presence of more generalized camps or residences where the larger social group lived and performed a broader range of activities (Binford 1980:9). A greater diversity in formal types implies more people (i.e. different genders, ages, physical states) are present at a site and are doing different things.

Davidson Point (KkDn-31)

Debitage

Raw material type frequencies recorded for the Davidson Point assemblage are homogeneous with 96.8% of the assemblage consisting of chert; however, there are small amounts of exotic toolstones present (see Table 6.16). Raw material quality is poor (98.3%) and fine-grained textures dominate (88.5%) (see Table 6.17). Cortex frequencies are very low (9.7%) (see Table 6.18). While 19 different colours are recorded, six of them (1, 5, 10, 27, 6, 4) account for 94.8% of all flakes indicating some raw material types were worked more intensively than others.

Table 6.16 Raw material types, Davidson Point debitage.

	Raw Material Type				
	Chert	Chalcedony	Crystal-quartz	Quartzite	Ramah chert
Debitage	913	6	12	11	1
Percentage	96.8	0.6	1.3	1.2	0.1

Table 6.17 Raw material texture, Davidson Point debitage.

	Raw Material Texture			
	Vitreous	Fine-grained	Coarse-grained	Very coarse-grained
Debitage	19	835	68	21
Percentage	2.0	88.6	7.2	2.2

Table 6.18 Percentage of cortex cover, Davidson Point debitage.

	Percentage of Cortex Cover				
	0	1-49%	50-99%	100%	Platform only
Debitage	852	44	18	15	14
Percentage	90.2	4.7	2.0	1.6	1.5

The size grade distribution is unimodal (see Figure 6.2) with 81.2% of the assemblage recorded in the two smallest categories. Distributions for flake weight and dorsal scar count are more varied, however (see Figure 6.2). Flake weights are unimodal in distribution from 0.09 g to

0.7 g after which the values are more extreme given the presence of several large flakes. The mean flake weight is 0.32 g (see Table 6.19). The distribution of dorsal scar counts is bimodal and peaks at 3 scars and 0 scars. While 54.8% of the assemblage has 3 or more dorsal scars, the high frequency of flakes with 0 scars can be attributed to the amount of shatter (8.8%) and flakes (N=15) possessing 100% cortical cover present in this assemblage.

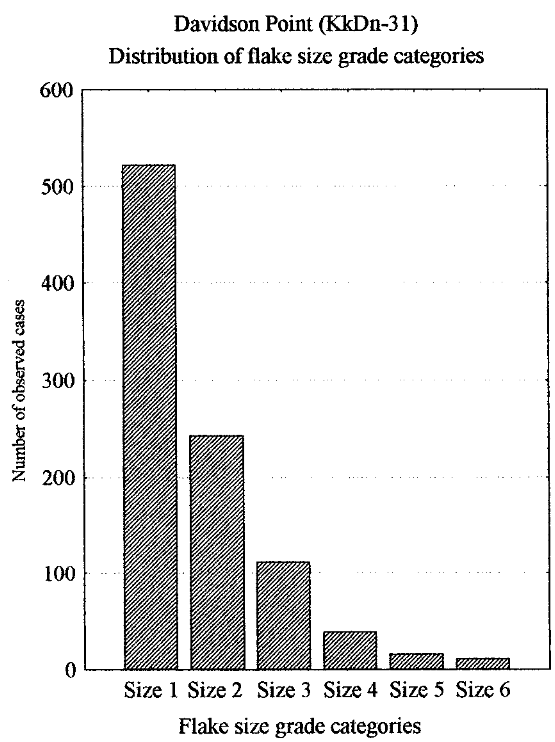
Table 6.19 Mean flake weights (g) for Davidson Point debitage, used flakes, and informal tools.

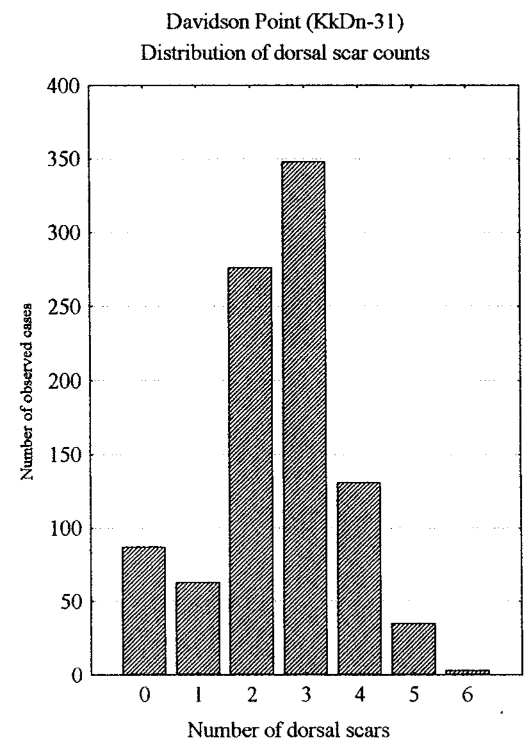
	N	X	R	S^2	S
Debitage	943	0.32	27.6	1.36	1.2
Used flakes	18	1.92	6.5	2.64	1.6
Informal tools	43	1.80	7.5	3.11	1.8

Remnant striking platforms are recorded on 54% (N=509) of flakes and 60.3% of them display advanced states including multiple flake removals, faceting, grinding and/or abrasion. Many of these flakes (58%) are recorded in the smallest size grade categories and display high dorsal scar counts (i.e. ≥3), which indicate late stage reduction. Evidence of platform battering (24%, N=124) and trimming (18%, N=91) is relatively low. Interior surface lipping is observed on 12.5% of flakes while eraillure scars are less frequent (6.5%). Bulbs of percussion are moderate (39.2%) and compression rings occur in significant numbers (83.5%). Debitage completion indices and flake breakage types are summarized in Tables 6.20 and 6.21, respectively.

Table 6.20 Debitage completeness index, Davidson Point debitage assemblage.

	Debitage Completeness Index				
	Shatter	Medial/distal	Split	Proximal	Complete
Frequencies	81	354	8	379	121





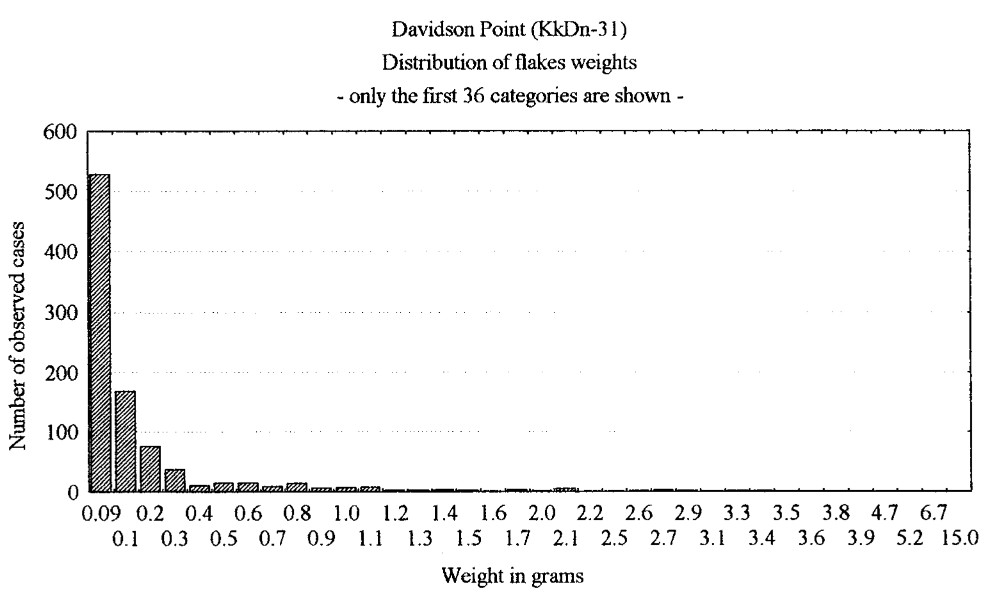


Figure 6.2 Distribution frequencies for Davidson Point flake size grade, dorsal scar counts, and weight (g).

Table 6.21 Breakage types and frequencies for the Davidson Point debitage assemblage.

	Margin	Feather	Step	Hinge	Outrepassé	Snap	Absent/Ind.
Debitage	Distal	271	62	32	4	493	81
	Proximal	0	64	0	0	284	595
	Right	607	12	0	0	242	82
	Left	614	14	1	0	231	83

Used Flakes

There are 18 used flakes in this assemblage accounting for 10% of the artifact total. Raw material attributes mirror those observed for the debitage assemblage. All of these tools are made of poor quality chert, most of which (N=16) is fine-grained in texture. Five raw material colours are recorded and all mirror those observed in the debitage; however, one colour (5) accounts for 67% of all frequencies. Cortex cover is notably higher (27.8%) for this category. These tools consist mostly of large flakes with more variable weights (see Table 6.19), and low to moderate dorsal scar counts. Remnant striking platforms are present on only 44.4% (N=8) of these tools and half display minimally modified, crushed, and cortical states; the other half display multiple flake facets. Platform battering (N=3), eraillure scars (N=3), and evidence of secondary distal crushing (N=1) are minimal. Compression rings are present on every flake while bulbs of percussion occur in moderate frequencies (39%). Like the debitage assemblage, this low frequency of percussion bulbs can be attributed to the high number of medial/distal flakes (N=10) in this category, which lack both remnant platforms and bulbs. Types of use-wear observed include edge rounding (N=2), and edge rounding and step fractures (N=16). These tools were used on one (N=9), two (N=6) or three (N=3) margins. Proximal (N=6) and complete (N=2) flake frequencies are relatively low while snap fractures (N=10) and feathers (N=5) dominate distal terminations.

Informal Tools: Retouched Flakes

There are 43 retouched flakes in this assemblage accounting for 24% of the artifact total. One tool is made of crystal-quartz while the rest are of poor-quality chert. Most of this toolstone is fine-grained (77%) but some vitreous (7%) and coarse gained materials (16%) are also present. Raw material colours reflect those observed for the debitage assemblage; however, two colours (5, 1) dominate this category accounting for 75% of all frequencies. Cortex frequencies are higher with 27.9% (N=12) retaining this attribute.

Most tools consist of moderate to large size flakes but a surprising number of them (N=13) are in the largest size grade category. Flake weights are more variable (see Table 6.19) because of this size distribution. Dorsal scar counts are moderate with 79% of flakes exhibiting two or three scars. Remnant striking platforms are present on 60% (N=26) of flakes and 54% of them display minimally modified states with evidence of crushing, shatter, or cortex. Those tools with platforms displaying multiple flake facets are in the larger size grade categories. Evidence of platform battering (N=9), platform trimming (N=4), and eraillure scarring (N=7) is moderate while interior surface lipping (N=3) and secondary distal crushing (N=1) is minimal. Bulbs of percussion are present on half the sample and compression rings are on nearly every tool (N=40).

Most tools in this sample are retouched on their exterior surfaces (N=28) but some have retouch on their interior surfaces (N=7) or both surfaces (N=8). Retouch Intensity Indices are comparatively high and indicate exterior surfaces (RII= 1.97) are more heavily worked than interior surfaces (RII=1.81). The shape of these retouched edges are either concave, convex, or straight and 65% display some use-wear. Six of these artifacts have intentional retouch on the non-working portion of the tool. This category includes proximal (N=13), medial/distal (N=16), and complete flakes (N=14). Distal states include feathers (N=21) and snap fractures (N=17).

Informal Tools: Burin Spalls

There are 30 burin spalls in this assemblage accounting for 16.7% of the artifact total. All of them are made of poor quality, fine-grained chert, and lack cortex cover. Four raw material colours are recorded (1, 5, 10, 2) and two of them account for 73% of all frequencies (5, 1). Nine are primary spalls while 21 are secondary, and all but three consist of complete (N=24) and proximal (N=3) sections. Remnant striking platforms are present on 90% (N=27) of these artifacts and include high frequencies (93%) of advanced states with multiple flake facets, grinding, or abrasion. Bulbs of percussion (80%) and compression rings (90%) occur in high frequencies. While the degree of dorsal flaking is variable on some spalls, a greater proportion of them (63%) exhibit moderate to intense flaking. Eight spalls display post-detachment modification. Table 6.22 summarizes the metrical attributes for this artifact category. Distal states include feathers (N=11), hinges (N=7), and step (N=6) and snap (N=6) fractures.

Table 6.22 Metrical attribute summaries for Davidson Point burin spalls.

	N	X	R	S^2	S
Length	24	13.5	11.7	8.0	2.82
Width	30	3.36	3.5	0.68	0.82
Thickness	30	1.59	1.7	0.15	0.39
Weight	30	0.12	0.21	0.003	0.05

Formal Tools: Burins

Burins make up 8.3% (N=15) of the artifact total in this assemblage. All are made of poor quality chert and most are fine-grained in texture (87%). Four raw material colours are recorded, all of which reflect those present in the debitage assemblage and burin spall category (1, 5, 10, 33). Cortex frequencies are relatively high with 40% retaining this attribute. Remnant striking platforms are present on seven burins, of which five have minimally modified and/or cortical states. Despite this, however, evidence of attributes associated with early stage reduction and use of heavier force loads is minimal. Six burins are so extensively modified that the striking platform and other technological attributes are no longer discernible.

Most burins are complete (N=12), and working edge orientations are obtuse (N=12), arcing (N=1), or perpendicular (N=1). Lateral margins are symmetrical for five burins and asymmetrical for nine. Hafting modifications are present on eight tools: four are side notched and four are laterally thinned. Basal elements are straight, convex, or concave, and six are symmetrical in outline. Table 6.23 summarizes the metrical attributes for this category. The measures of dispersion indicate there is some degree of internal variation but it is not overly pronounced

Table 6.23 Metrical attribute summaries for Davidson Point burins.

	N	X	R	S^2	S
Length	13	21.6	10.8	10.8	3.3
Width	14	13.5	10.8	9.4	3.1
Thickness	15	4.6	4.0	1.3	1.2
Weight	15	1.3	1.8	0.3	0.5

Primary and secondary flake scars are unifacial on four burins and bifacial on ten; one burin is unmodified other than the spalling edge. Of those burins with secondary flaking, seven are continuous in distribution while seven are discontinuous. The intensity of flaking on 87% (N=13) of these burins is moderate to intense. Evidence of polish is moderate to high (40%) and is located on the distal, dorsal, and/or ventral surfaces. Basal element modification is noted on eight burins and consists of unifacial (N=2) or bifacial (N=6) thinning.

Most of these burins have a single working edge (N=11) although two have multiple edges (i.e. two). These working edges have been spalled numerous times with some exhibiting between seven to ten scars (N=3). The mean number of scars is 4.2 ($R = 9.0$, $S^2 = 7.46$, $S = 2.73$), which is high indicating these burins were intensively used. One burin is made on a rejuvenated microblade fragment.

Formal Tools: Bifaces

Bifaces make up 16% (N=29) of the artifact total in this assemblage. All but one are made of poor quality, fine- to coarse-grained chert. The remaining biface is poor quality, vitreous crystal-quartz. Cortex is present on two tools. Five raw material colours are recorded and three of them account for 90% of all frequencies (5, 1, 10). The two remaining colours (18, 27) are not well represented in the debitage indicating these bifaces were not worked intensively at the site. It is possible, however, that post-depositional processes and site context created this pattern.

Nearly half of these tools are complete (see Table 6.24). Among those bifaces that can be oriented, the blade elements on seven are symmetrically straight (N=3) and convex (N=4) while 13 are asymmetrical. Blade cross-sections are variable and include plano-convex (N=12), biplano (N=6), and biconvex (N=4). Two bifaces display evidence of low skill level. They have bi-triangular cross-sections, stacked fractures, and very sinuous edges. Among the other bifaces in this assemblage, evidence of stacked fractures (N=8) and sinuous edges (N=6) occurs in moderate frequencies; however, the co-occurrence of these attributes is limited to the two tools already described. Table 6.25 summarizes the metrical attributes for this category. The measures of dispersion indicate pronounced variation in the lengths and widths of these tools.

Hafting modifications are recorded on 12 bifaces: eight are side notched, three are pointed, and one is laterally thinned. Basal element outlines are variable and include convex (N=8), straight (N=4), bivectoral (N=4), concave (N=1), and triangulo-concave (N=2). Of these, six are symmetrical and 12 are asymmetrical. Primary flake scars are unifacial on two tools and bifacial on 27. Secondary flake scars are absent on one, unifacial on one, and bifacial on 27. Of those bifaces with secondary flake scars, seven have continuous patterns while 21 are discontinuous. The degree of flaking observed on these bifaces is moderate (N=14) to high (N=9) for 79.3%.

Table 6.24 Completeness index for the Davidson Point bifaces.

	Indeterminate	Complete	Tip missing	Tip, blade element missing	Basal, haft elements missing	Tip, basal, haft elements missing	Longitudinal split	Blade, basal, haft elements missing	Bifacial edge	Basal element missing
Count	3	14	1	3	3	1	1	1	1	1

Table 6.25 Metrical attribute summaries for the Davidson Point bifaces.

	N	X	R	S^2	S
Length	15	29.7	20.7	41.6	6.5
Width	21	16.1	15.6	23.5	4.8
Thickness	25	4.2	5.7	2.1	1.4
Weight	29	1.7	5.2	1.8	1.3

One biface has serrated edges. Polish is also recorded on one tool and is located on its dorsal surface. Basal element modification is present on 13 tools and consists of unifacial (N=6) and bifacial (N=7) thinning. Evidence of use-wear on the blade element of these tools is fairly high and consists of edge rounding (N=5), step fracturing (N=5), and a combination of these states (N=12). Two bifaces are spalled along their lateral margins indicating some rejuvenation. Breakage patterns are summarized in Table 6.26

Table 6.26 Breakage patterns for the Davidson Point bifaces.

	Margin	Feather	Step	Hinge	Snap	Absent/Ind.
Biface	Distal	20	1	0	4	4
	Proximal	1	0	0	6	22
	Right	25	0	0	0	4
	Left	22	1	0	2	4

Formal Tools: Scrapers

There are eight scrapers in this assemblage accounting for 4.4% of the artifact count. All are made of poor quality, fine-grained chert, and two have minimal cortex cover. Five raw material colours are recorded but one of them (1) accounts for 50% of all frequencies. These tools are complete (N=7) or near complete (N=1). Lateral margins are symmetrical on three scrapers and asymmetrical on five. Scraping edges are located on the following margins: distal (N=6), right laterodistal (N=1), and left lateral (N=1). The edges are straight, concave, and convex. Five are symmetrical in outline, two are asymmetrical, and two are symmetrical expanding. There five are endscrapers, one expanding endscraper, one concave sidescraper, and one sidescraper.

Side notching is present on two tools. Basal element outlines are straight or convex, and five are asymmetrical in form. Table 6.27 summarizes the metrical attributes for this category. The measures of dispersion indicate pronounced morphological variation in this artifact category. Primary and secondary flake scars are bifacial and discontinuous on six tools while one scraper exhibits only unifacial primary flaking. None of these tools are polished. Three scrapers have modified basal elements, which consist of unifacial (N=1) or bifacial (N=2) thinning.

The mean edge angle is 66° ($R = 20.0$, $S^2 = 43.3$, $S = 6.6$). Spurs are recorded on the working edges of four scrapers, all of which are complete specimens. Moderate to intense retouch is present on the exterior surface of each tool, as indicated by the mean figure for the Retouch

Intensity Index, which is 2.71 ($R = 3.25$, $S^2 = 1.06$, $S = 1.03$). All scrapers are used and have edge rounding (N=1) or edge rounding and step fracturing (N=7). None of these tools are rejuvenated.

Table 6.27 Metrical attribute summaries for Davidson Point scrapers.

	N	X	R	S^2	S
Length	7	33.85	33.6	129.1	11.4
Width	8	21.3	16.2	27.5	5.2
Thickness	8	6.73	4.1	1.57	1.25
Weight	8	4.54	6.7	3.54	1.88

Formal Tools: Microblades

There are 27 microblades in this assemblage accounting for 15% of the artifact total. These tools are made of poor quality, fine- or coarse-grained chert (N=22), or unflawed, vitreous crystal quartz (N=5). Cortex is absent. Five raw material colours are recorded and three of them (5, 1, 4) account for 93% of all frequencies. It is important to note one of these colours (1), accounting for nine microblades, is not observed among the cores in this assemblage. This colour of toolstone is, however, present in high frequencies in the debitage assemblage suggesting a core of this material or some other objective piece was worked and subsequently removed from the site. Only 48% of all microblades are complete (N=2) or near complete (N=11) (see Table 6.28).

Remnant striking platforms are present on 63% (N=17) of these tools and 65% of them have advanced states including multiple flake facets and grinding. Platform trimming is high (59%) indicating toolmakers with better skills prepared and detached many of these tools for use. Few tools exhibit traits associated with heavier force loads including platform battering and eraillure scars. Bulbs of percussion (N=17) and compression rings are fairly common (N=25), however. Table 6.29 summarizes the metrical attributes for this category.

Table 6.28 Completeness index for Davidson Point microblades.

	Complete	Proximal section	Medial section	Distal section	Proximal medial
Count	2	3	9	2	11

Table 6.29 Metrical attribute summaries for Davidson Point microblades.

	N	X	R	S^2	S
Length	2	15.8	1.6	1.3	1.1
Width	26	7.5	8.2	4.6	2.1
Thickness	27	2.1	2.6	0.5	0.7
Weight	27	0.3	0.9	0.1	0.3

Lateral margins are straight and symmetrical on 17 microblades and asymmetrical on nine. Side notching is observed on one tool. Ten microblades have single dorsal arrises, 16 have two arrises, and one has three. Of those microblades with multiple arrises, nine are parallel indicating the cores from which they were struck were highly standardized. None of these tools are polished and none are modified on their proximal ends to facilitate hafting. Retouch is observed on only four tools. Two display minimal retouch (RII = 0.8) on their interior surfaces while two have been heavily worked (RII = 2.1) on their exterior surface. Evidence of use-wear is high with 15 tools displaying edge rounding and six with edge rounding and step fracture terminations. One microblade shows evidence of rejuvenation.

Cores

There are ten cores in this assemblage accounting for 5.6% of the artifact total. Raw material types include chert (N=8) and crystal-quartz (N=2). Raw material quality is poor (90%) and fine-grained toolstones dominate (N=8). Three raw material colours are recorded (5, 4, 12) but one type (5) accounts for 90% of all frequencies. Cortex is present on half of these artifacts although the coverage is minimal (i.e. 1-49%). Mean core weight is 4.28 g (R = 13.5, S^2 = 26.7, S

= 5.18) and the measures of dispersion indicate high internal variation. Seven cores are complete while three are recorded as fragments. Chipped platform states are present on 80% of these artifacts and 40% have stacked terminations below the platform. Direction of force application is unidirectional for four and multidirectional for six indicating a slightly higher frequency of generalized core technology. The mean number of flake scars is 5.0 ($R = 4.0$, $S^2 = 3.33$, $S = 1.83$) and evidence of secondary distal crushing is high (80%).

Macro-Scale Interpretations: Davidson Point (KkDn-31)

The principle lithic technological activities pursued at this site include late stage tool finishing and limited core reduction. Chert is the dominant raw material; however, small amounts of exotic types indicate the Pre-Dorset were exploiting a more diverse range of toolstone even if they were not intensively working this material in this location. The high frequencies of non-cortical, small size flakes with low weights, advanced platform states, high dorsal scar counts, and interior surface lipping indicate toolmakers were focusing on late stage tool production. Smaller frequencies of moderate to large flakes with minimally modified, crushed or shattered platforms, eraillure scars, and secondary distal crushing indicates some core reduction also occurred. But, many of these large flakes have variable cortex cover, if any at all, suggesting primary stage reduction of these objective pieces occurred at another location, likely outside the site area.

Flake size grade distributions are unimodal with small flakes dominating the overall frequencies. This is expected since late stage reduction invariably produces more flakes in this size range than any other stage in the reduction continuum, particularly when bifaces are being worked (Deller and Ellis 1992). In contrast, the bimodal distribution for dorsal scar count and the multi-modal distribution for flakes weighing more than 0.4 g indicate the use of mixed reduction strategies. Small size flakes associated with late stage tool finishing typically exhibit high dorsal scar counts and low weights while core reduction produces moderate to large flakes (depending on the size of the parent material) with low scar counts and more variable weights. Core reduction also produces flake shatter, which consists of blocky fragments that cannot be oriented because they lack visible interior surfaces (Sullivan and Rozen 1985). Shatter makes up 8% of all frequencies in this assemblage, thus contributing to the higher frequency of flakes exhibiting zero dorsal scars.

The Percent Type calculations for Davidson Point indicate 55.4% of the assemblage derives from tool production activities while 48.5% is from core reduction. These figures total 103.9% and are within the expected range of error. This breakdown of technological activities is not entirely consistent with the attribute analysis, which indicates late stage reduction activities were more intensively pursued at this site than core reduction. This discrepancy may be an artifact of the site's disturbed context or the recovery methods used, since the excavated fill was not screened. The Sullivan and Rozen (1985) method supports the interpretation that tool production activities were more intensively pursued since medial/distal and proximal flakes (78.4%, N=739) clearly outnumber complete flakes and shatter (21.6%, N=204). The flake-to-tool ratio is comparatively low at 5.9:1 and indicates tool production activities were focused on late stage finishing rather than complete reduction sequences. If new tools were being made from start to finish, the ratio would be considerably higher.

The used flake and informal tool categories closely mirror the debitage assemblage in terms of raw material type, quality, and texture, but cortex frequencies are moderately higher among these tools. Despite this, however, the extent of coverage is still limited with most implements having 1-49% cortex remaining or cortex on just the platform. This further suggests the raw materials brought to this site were already in a reduced state, like those observed at

Shaymark. Moreover, many of these flakes have multi-faceted striking platforms; moderate dorsal scar counts, and lack evidence associated the use of heavy force loads indicating they were detached from prepared cores with better skill. The remains of six generalized cores that display chipped platforms and high scar counts further support this; these objective pieces may have been the source of these flake tools. The informal tools are more intensively worked given their higher RIIs and the presence of retouch on the non-working margins of six tools. This greater investment of effort is to be expected if these flakes were struck from prepared cores that could not be easily replaced given the types of local materials available. Still, these tools were discarded with remaining utility indicating raw material stress was not acute.

Most burins in this assemblage are intensively worked and heavily used. However, given the lower frequencies of burin spalls compared to the total number of spall scars recorded for the burins, many tools appear to have been brought to the site in a finished state. The presence of 21 secondary spalls indicates some were sharpened again in this location, used, and then discarded. The presence of nine intensively flaked primary spalls also indicates several new burins were fashioned likely to replace those that were near exhaustion and abandoned.

The frequency of scrapers in this assemblage is comparatively high. Four of these tools are heavily worked, used, and maintained as indicated by the high RII recorded for their scraping edges and the presence of retouch on their non-working margins. This retouch is not related to the hafting requirements of the tool. These scrapers are finely worked across their dorsal surfaces in areas that would have extended beyond the end of the haft (see Figure D.10). This additional flaking does not appear to have a functional purpose since it occurs on those areas of the tool that do not come into direct contact with the object being worked. The four remaining tools stand in sharp contrast, having been haphazardly fashioned on oversized flakes. These tools are not retouched across their dorsal surfaces and lack any extensive shaping. Attributes associated with low skill are recorded on two of these scrapers and include stacked fractures and spurs along the working edge. One of these crude specimens is snapped across its medial section and appears to have failed at the juncture where the tool extends beyond the haft. This kind of breakage is consistent with novice skill (Weedman 2002:739-741) since novices tend to place too much pressure on the handle during scraping activities causing the tool to fail.

Most of the bifaces included in this assemblage consist of rejected preforms and expediently made cutting implements. Of those bifaces that were rejected, most display production errors that could not be corrected while others simply failed during finishing. Only three bifaces are heavily curated and display symmetrical morphologies, intense flaking, and evidence of use. These tools are also complete suggesting they were removed from their hafts and discarded in anticipation of new replacements being prepared.

Nearly all of the microblades with intact striking platforms display advanced states of preparation, symmetrical morphologies, and multiple dorsal arrises indicating the cores from which they were struck were highly standardized and the toolmakers that detached them were skilled. However, comparatively few of them are used and retouched. It is possible these tools were being intentionally broken and inserted into harpoon and/or lance shafts as composite tools (see Andrefsky 1998:Fig. 2.15). This would account for the highly fragmented nature of this category and the low incidence of use-wear. The limited number of fragmented microblade cores in this assemblage suggests the objective pieces from which these blades were struck were removed from the site for future use.

Raw material stress was not a factor at Davidson Point given the proportion of used flakes, informal tools, and expedient formal types in this assemblage that were made for immediate use during the occupation and then discarded. The presence of numerous rejected and failed bifacial tools in various stages of finishing further suggests the occupants had a secure supply of toolstone since none of these specimens display evidence of rejuvenation or liquidation. In other words, these items were not being salvaged, which implies toolmakers were being "choosy" about the quality of their finished product. The intact nature of the curated formal tools discarded at the site strongly suggests the Pre-Dorset were gearing-up in response to new replacements being prepared. Many of these discarded curated tools have remaining utility, which again points to an absence of raw material stress.

The Pre-Dorset at Davidson Point were not using local chert pebbles for tool production of any kind. This is not unexpected since toolmakers appear to have had a readily accessible supply of toolstone in the form of generalized flake cores, microblade cores, and prepared blanks and tool preforms. These objective pieces appear to have been brought to the site in a prepared state given the absence of early stage reduction debris, the low frequencies of cortex, and the smaller overall size of the debitage assemblage. The larger size of this material and its consistent fine-grained texture would necessarily lead toolmakers to select it for tool production over the inferior quality and size of the local pebbles. This pattern of toolstone utilization conforms to Andrefsky's (1994a) model (see Chapter 3).

There is a limited amount of tool rejuvenation recorded in this assemblage; however, it does not involve the salvaging and reworking of old tools into new implements. Rather, rejuvenation is limited to edge spalling. The margins on two bifaces, eight burin spalls, one microblade, and one tool fragment have been spalled and/or minimally modified to generate sharp edges for engraving activities. Several flake gravers are also present in the informal tool category. This evidence combined with the high frequency of burins, burin spalls, and scrapers in this assemblage suggests organic materials were worked at the site in addition to lithic tools.

The proximity of Davidson Point to the Sylvia Grinnell River makes the site an ideal place to exploit Arctic Char. In fact, Davidson Point and Shaymark are very similar in terms of how the sites are positioned to take advantage of this resource. They are also at roughly the same elevation a.s.l., which loosely suggests they may have been contemporaneous occupations. Given the absence of raw material stress in this assemblage and the site's strategic positioning near the river, Davidson Point is deemed to be a warm season site. The ideal time of occupation would be in the late summer and/or early autumn since this is when the char return to the inland lakes and rivers; this is also when their fat stores are most rich. Large quantities of fish can be caught with relatively minimal effort thus providing a stable and predictable food supply. Caribou are also optimal during this season and readily available in this area. The nature of the raw material supply strongly suggests toolmakers acquired their toolstone from non-coastal sources. It is likely task groups were sent inland to procure lithic raw materials and bring them back to the coast. These journeys may have occurred early in the warm season given the distances to be traveled and the need to renew the heavily curated toolkits these people used throughout the winter season. This would further support the inference Davidson Point was a warm season site and that the time of occupation was likely late summer/early fall.

Davidson Point: Micro-Scale Interpretations

Micro-scale patterns of variation in this assemblage are somewhat contradictory. There is little evidence of novice knapping in the debitage assemblage with only 10 flakes exhibiting minimally modified or crushed platforms, battering, and step or hinge fractures. Yet there are two bifaces that have triangular cross-sections, sinuous edges, and stacked fractures. The lack of debitage associated with low skill may be an artifact of the site's disturbed context or it may indicate novices simply were not intensely participating in tool production activities. It is also possible expert knappers were closely monitoring novice activities and restricting the amount of toolstone they were given to work (see Pigeot 1990), thus accounting for the lower frequencies of novice products in the assemblage.

While raw materials appear to have been readily available in the form of prepared objective pieces, it is unlikely novices were permitted to freely use them since their activities would rapidly consume this material and renewing the supply involves significant investments of time and energy, particularly when it is procured from inland sources. Novices could have exploited local pebbles but seemingly did not. Evidence indicating the social relations of production were more rigid at this site may account for this.

Like Shaymark, the debitage assemblage from Davidson Point indicates experts were engaged in lithic reduction activities given the high frequencies of small flakes with prepared striking platforms, evidence of platform trimming, and high dorsal scar counts. Some curated tools were being maintained and repaired while new tools were being finished from blanks and preforms brought to the site ready-made. These kinds of activities necessarily demand better skill to perform them successfully so as to reduce the amount of failure, and subsequent raw material waste. The striking platforms on many of the microblades further indicate greater care and attention was taken to detach these tools from highly standardized, prepared cores. Given the skill required to make and maintain microblade cores (Clark 1987; Parry and Kelly 1987), it is certain experts proficient in flint knapping were working them. The presence of six informal tools and three scrapers that display retouch on their non-working margins also suggest some toolmakers were finishing certain tools to an extent that exceeded their functional requirements (see p. 180). In other words, individuals appear to have been embellishing these objects. This kind of embellishment may have had some kind of social significance whether it was used to negotiate status, to clearly state one's cultural identity, or to gain a reputation as a skillful craftsperson (see Dobres 1995:40-41; Duke 1991:164-167).

The greater diversity in formal tool types and the more rigid social structure suggest the entire social group is present at this site. If Davidson Point represents a late summer/early autumn occupation, this location, like Shaymark, would be ideal for task groups or extended family units to reunite. The Pre-Dorset could remain in this area to prepare for winter and their journey back to the outer coastal regions. Raw material sources would be secure given the renewed supplies brought from inland sources, and the rich and reliable supply of char available from the river would provide people with an easily acquired food source. In seasons where caribou herds were stable, adequate numbers could be secured and processed in this coastal area as well. Effectively, subsistence resources available in this coastal upland area during the late summer and autumn are abundant and would provide people with a stable food supply while they pursued other activities in preparation for winter.

Activity scheduling was likely highly structured at this time of year given the demands of balancing all of these tasks. This would necessarily impose limitations on the amount of tool production that could be performed further supporting the inference the lithic raw materials worked at this site were acquired at another location (likely inland) and brought to Davidson Point primarily for late stage finishing. Activity scheduling also creates a more structured realm of tool production, which inevitably restricts the participation of novices. This would further account for the limited evidence of novice activities at this site.

Given the size of Shaymark, it is possible Davidson Point covers an equally large area. The principal Pre-Dorset component at Davidson Point might be located south of the Thule winter houses, as Park believes, or it might be located above the Thule occupation in the vicinity of the numerous recorded tent rings. During a surface survey of these dwelling structures, Stenton observed lithic debitage and a microblade lying amidst them (Stenton 2003, person communication). This provides some indication that these features were used by the Palaeo-

Eskimos; however, subsurface testing is needed to further verify this. That said, I do believe the similarities between this site and Shaymark provide strong evidence indicating the Pre-Dorset came to the shores of the Sylvia Grinnell River during warm season. While at these sites, these people focused their attention on late stage lithic tool reduction activities and the intense production of organic implements. They also likely took advantage of the local late summer char runs and hunted caribou.

Tungatsivvik (KkDo-3): Area Q

Debitage

Raw material types are slightly variable in this component but chert (93%) still dominates the overall frequencies (see Table 6.30). Raw material quality and texture are only marginally better (see Table 6.31). Cortex is recorded on 18.5% (N=58) of flakes (see Table 6.32) and of these, 62% are in the two smallest size grade categories indicating toolmakers were likely exploiting small locally available chert pebbles. Thirteen raw material colours are recorded and seven (10, 6, 1, 5, 4, 22, 11) of them account for 97.5% of all frequencies. The remaining six colours have five or fewer flakes each indicating the cores or tools from which they derive were not heavily worked here.

The size grade distribution is unimodal (see Figure 6.3) with 79% of the assemblage recorded in the two smallest categories. Distributions for flake weight and dorsal scar count are more variable, however (see Figure 6.3). Flake weights are unimodal from 0.09 g to 0.6 g after which they are more extreme. The mean flake weight is 0.25 g (see Table 6.33) and the measures of dispersion indicate some internal variation; however, this is attributable to the presence of several large flakes. The majority of the flakes in this assemblage (91%) weigh between 0.09 g and 0.6 g. The distribution of dorsal scar counts is bimodal and peaks at three scars and zero scars (see Figure 6.3). Flakes possessing three or more dorsal scars total 47.6% while those with zero scars total 12.7%. Those flakes with higher scar counts indicate later stage reduction while those with zero scars can be attributed to a higher incidence of flake shatter (12.1%).

Table 6.30 Raw material types, Area Q, Tungatsivvik

	Raw Material Type					
	Chert	Chalcedony	Crystal-quartz	Quartzite	Slate	Ramah chert
Debitage	292	1	11	6	2	2
Percentage	93.0	0.3	3.5	2.0	0.6	0.6

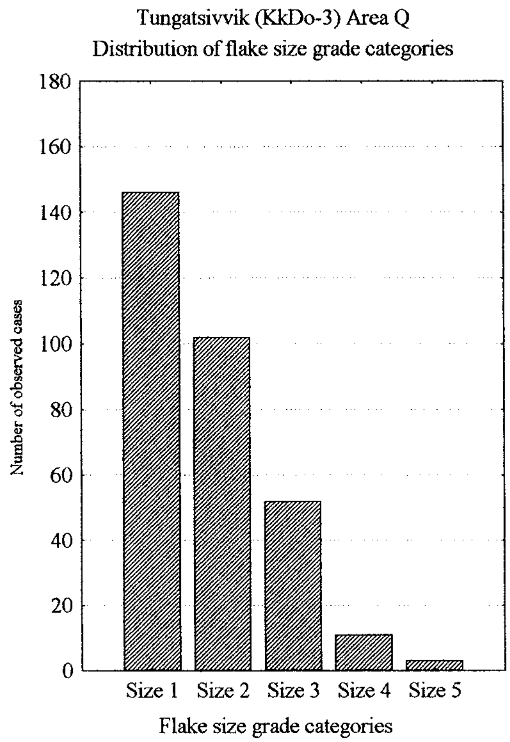
Table 6.31 Raw material texture, Area Q, Tungatsivvik

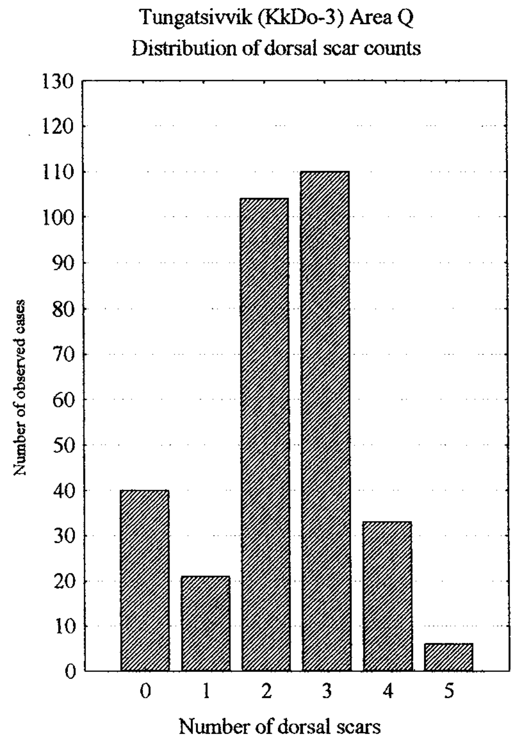
	Raw Material Texture			
	Vitreous	Fine-grained	Coarse-grained	Very coarse-grained
Debitage	11	267	25	11
Percentage	3.5	85.0	8.0	3.5

Table 6.32 Percentage of cortex cover, Area Q, Tungatsivvik

	Percentage of Cortex Cover				
	0	1-49%	50-99%	100%	Platform only
Debitage	256	30	10	11	7
Percentage	81.5	9.6	3.2	3.5	2.2

Remnant striking platforms are present on 59.9% (N=188) of flakes and 46.3% of them display advanced states including multiple flake removals, faceting, grinding and/or abrasion. These flakes also have high dorsal scar counts and are in the two smallest size grade categories indicating late stage reduction. Evidence of platform battering (N= 64), eraillure scars (N=40), and secondary distal crushing (N=34) is moderate while platform trimming (N=6) and interior surface lipping (N=17) is low. Bulbs of percussion and compression rings are recorded for 55.7% and 75.5% of flakes, respectively. Debitage completion indices and flake breakage patterns are summarized in Tables 6.34 and 6.35, respectively.





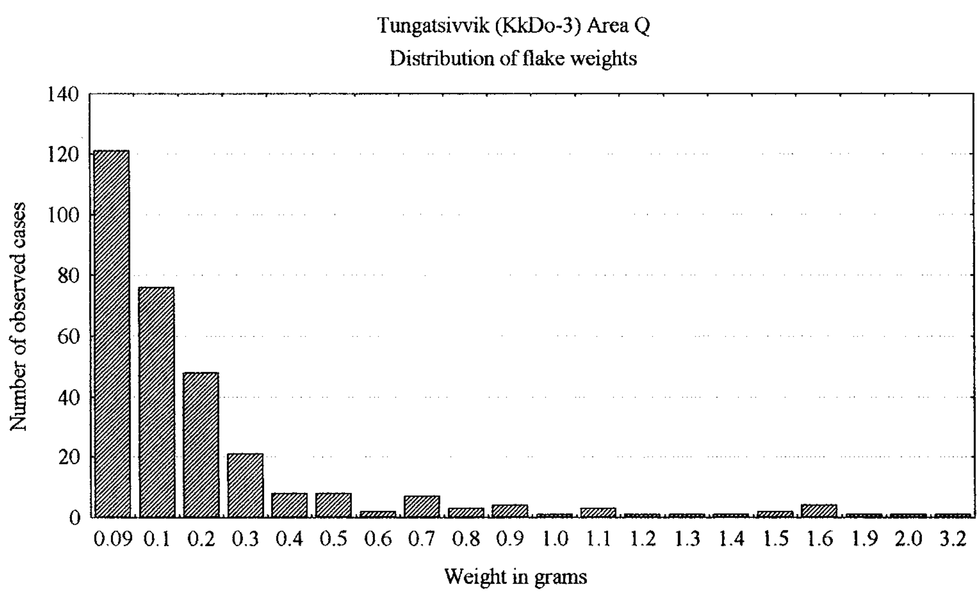


Figure 6.3 Frequency distributions for Area Q flake size grade categories, dorsal scar count, and weight (g).

Table 6.33 Mean flake weights (g) for Area Q debitage, used flakes, and informal tools.

	N	X	R	S^2	S
Debitage	314	0.25	3.1	0.13	0.62
Used flakes	4	0.56	0.2	0.01	0.1
Informal tools	2	1.55	0.1	0.01	0.07

Table 6.34 Debitage completeness index, Area Q, Tungatsivvik

	Debitage Completeness Index				
	Shatter	Medial/distal	Split	Proximal	Complete
Frequencies	38	89	2	137	48

Table 6.35 Breakage types and frequencies observed on flake margins, Area Q, Tungatsivvik

	Margin	**Feather**	**Step**	**Hinge**	**Outrepassé**	**Snap**	**Absent/Ind.**
Debitage	Distal	96	22	20	2	136	38
	Proximal	0	18	1	0	68	227
	Right	185	5	1	0	85	38
	Left	189	3	1	0	83	38

Informal Tools: Used Flakes

There are four used flakes in this assemblage accounting for 8.9% of the artifact total. These tools are made of poor quality, fine-grained chert, they lack cortex, and their colours mirror those that dominate the frequencies observed in the debitage assemblage. The size grade distribution is even with all four tools consisting of size three flakes. Tool weights are fairly homogeneous (see Table 6.33) and dorsal scars are low to moderate.

Remnant striking platforms are present on three flakes and include single (N=1) and multiple flake facets (N=2). Platform battering is minimal (N=1) and none of these tools have evidence of interior surface lipping, eraillure scars, or secondary distal crushing. Compression rings are present on every tool while bulbs of percussion are observed on half. All tools display use-wear in the form of edge rounding and step fracture terminations, and were used on one (N=1), two (N=2), or three (N=1) margins.

Informal Tools: Retouched Flakes

There are two retouched flakes in this assemblage accounting for 4.4% of the artifact total. Both tools are made of poor quality, fine-grained chert, and minimal cortex cover is present on one tool. Raw material colours are consistent with those observed for the debitage assemblage. Both tools consist of moderate size flakes with heavier weights (see Table 6.33) and low to moderate dorsal scar counts (i.e. two and three). Both tools lack striking platforms and there is no evidence of secondary distal crushing. They do, however, have compression rings. One tool is retouched on its interior surface (RII=2.08) while the other is retouched on its exterior surface (RII = 2.10). The shapes of these retouched edges are straight and concave, respectively, and only one tool displays evidence of use-wear. Both tools consist of medial/distal flakes; one has a feathered distal termination while the other is hinged.

Informal Tools: Burin Spalls

There are 11 burin spalls in this assemblage accounting for 24.4% of the artifact total. All are made of poor quality, fine-grained chert, and none have cortex. Raw material colours are consistent with those observed in the debitage assemblage (10, 1, 5, 6) but one colour dominates the overall frequencies (1). Five are primary spalls while the remaining six are secondary, and all but one are complete (N=9) and proximal (N=1) sections. Remnant striking platforms consist largely of advanced states (N=9) and include multiple flake facets, and grinding or abrasion. Bulbs of percussion are common (82%) and compression rings are present on every spall. The degree of flaking is moderate to intense on seven specimens. Two spalls exhibit post-detachment modification and use. Table 6.63 summarizes the metrical attributes for this category. Distal states include feathers (N=5), hinges (N=1), and step (N= 4) and snap (N=1) fractures.

Table 6.36 Metrical attribute summaries for Area Q burin spalls, Tungatsivvik.

	N	X	R	S^2	S
Length	9	14.7	9.3	9.4	3.1
Width	11	3.18	1.9	0.38	0.62
Thickness	11	1.81	1.9	0.33	0.58
Weight	11	0.13	0.11	0.002	0.05

Formal Tools: Burins

Burins make up 17.8% (N=8) of the artifact count in this assemblage. All are made of poor quality, fine-grained chert, and five have cortex. Six raw material colours are recorded (1, 10, 5, 6, 33, 40); however, only three of them are represented in the spall sample indicating some burins were abandoned at the site without being resharpened and used while others were resharpened, used, and then removed. Five burins are made from the same coloured chert that dominates the debitage assemblage suggesting these tools were not only used at the site but that they were also made here. Remnant striking platforms are present on half of these tools and all are minimally modified, crushed, or cortical states. Additional evidence including eraillure scars (N=3), bulbs of percussion (N=4), and compression rings (N=4) suggests the flakes on which these tools are made were produced during early stage reduction and selectively removed from the debitage for further use. Four burins recorded as having indeterminable striking platforms have been so extensively modified that technological flake attribute states are not discernible.

All of these burins are complete and have obtuse working edges. Lateral margins are asymmetrical on seven tools and symmetrical on one. Two burins are laterally thinned to facilitate hafting. Basal elements outlines are straight (N=3), convex (N=3), concave (N=1), and bivectoral (N=1), and two are symmetrical while six are asymmetrical. Table 6.37 summarizes the metrical attributes for this category. Measures of dispersion indicate a comparatively lower degree of morphological variability for the burins in this assemblage.

Table 6.37 Metrical attribute summaries for Area Q burins.

	N	X	R	S^2	S
Length	8	21.85	8.9	12.8	3.58
Width	8	14.4	3.1	1.41	1.2
Thickness	8	5.1	1.5	0.24	0.49
Weight	8	1.7	1.8	0.32	0.56

Primary flake scars are unifacial on three burins and bifacial on five. Secondary flake scars are recorded for seven burins, three of which are unifacial and four are bifacial. Of those burins with secondary flake scars, two are continuous in distribution while five are discontinuous. The degree of flaking on 75% of these tools is moderate to intense indicating some were more heavily worked and maintained than others. Polish is present on four burins and is located on the ventral (N=1) and dorsal (N=3) surfaces. Basal element modification is observed on only two specimens and includes unifacial grinding and bifacial thinning, respectively. Six burins have one working edge, one has two of them, and one burin is a preform that has yet to be spalled. The working edges on most of these tools have been intensively resharpened as indicated by the mean number of scars, which is 4.5 ($R = 9.0$, $S^2 = 7.14$, $S = 2.67$). None of these tools are rejuvenated.

Formal Tools: Bifaces

Bifaces make up 13.3% (N=6) of the artifact count in this assemblage. All are made of fine-grained chert and lack cortex. Raw material quality is poor for five and unflawed for one. Four raw material colours are recorded (10, 1, 6, 5) and all are recorded in the debitage assemblage. Three bifaces are complete and one is broken through its medial section but both sections were recovered. Two bifacial edges are present indicating some tools were repaired or maintained at the site. The remaining biface consists of a fragment that cannot be oriented. All complete bifaces have convex symmetrical blade element outlines. Blade cross-sections are plano-convex (N=1) and biplano (N=2). Edge sinuosity is very low with three edges recorded as straight and one as slightly sinuous. The tip section of the snapped biface has stacked fractures. This tool appears to have broken as a result of too much pressure being applied to its center in an effort to remove the stack. Table 6.38 summarizes the metrical attributes for this artifact category.

Table 6.38 Metrical attribute summaries for the Area Q bifaces.

	N	X	R	S^2	S
Length	3	28.7	24.7	155.4	12.5
Width	4	14.3	10.1	20.1	4.5
Thickness	4	3.4	1.9	0.8	0.9
Weight	6	1.0	3.6	1.7	1.3

Hafting modifications are recorded on three bifaces: one is side notched, one is stemmed, and one is pointed. Basal element outlines are discernible on all three tools and are convex (N=2), and bivectoral (N=1). Basal symmetry is assessed on three tools with two recorded as symmetrical and one as asymmetrical. Primary and secondary flake scars are bifacial on all tools. Secondary flake scars are continuous for three bifaces and discontinuous for one. The degree of flaking observed is moderate for one tool and intense for three. All bifaces have serrated edges. Evidence of polish and rejuvenation are absent. Three bifaces are bifacially thinned to facilitate hafting. Only one tool exhibits use-wear on its blade element in the form of edge rounding and step fractures. It is possible the other tools were used as well but given their heavily curated state, it appears as though they were repaired or sharpened in anticipation of reuse, thus obliterating any evidence of edge rounding or step fracturing (see Flenniken and Raymond 1987; Michie 1973). Moreover, the reapplication of serrations to the blade elements of these tools would further complicate efforts to identify use-wear (see Michie 1973).

Formal Tools: Scrapers

There are three scrapers in this assemblage accounting for 6.7% of the artifact total. All are made of poor quality, fine-grained chert, and one has minimal cortex. Each tool is a different colour but all three are represented in the debitage and flake tool categories (2, 6, 10). All scrapers are complete and have asymmetrical lateral margins. Scraping edges locations are distal (N=2) and right laterodistal. The shapes of these edges are straight, convex, and concave, and they are symmetrical, asymmetrical, and symmetrical expanding. Typologically, one is a "thumbnail" endscraper, one is an expanding endscraper, and one is an endscraper with a second working edge that is concave and lateral. None of these tools are hafted. Basal element outlines are straight (N=2) or convex (N=2), and all are asymmetrical. Table 6.39 summarizes the metrical attributes for this category. Measures of dispersion indicate a high degree of variability for tool width. However, this can be explained by the presence of a large expanding endscraper in the assemblage (see Figure D.12).

Table 6.39 Metrical attribute summaries for Area Q scrapers.

	N	X	R	S^2	S
Length	3	24.3	6.0	9.75	3.12
Width	3	21.3	14.3	55.6	7.45
Thickness	3	6.1	2.6	1.85	1.36
Weight	3	2.83	2.4	1.45	1.21

Primary flaking is unifacial on two scrapers and bifacial on one. Secondary flaking is unifacial and discontinuous on all tools. There is no evidence of polish. The basal element on one scraper has been bifacially thinned. The mean edge angle is 62° ($R = 7.0$, $S^2 = 16.3$, $S = 4.0$). Spurs are present on the working edges of two scrapers, both of which are complete. All of these tools display moderate to intense retouch on their exterior surfaces. The mean figure for the

Retouch Intensity Index is 3.30 ($R = 0.8$, $S^2 = 0.19$, $S = 0.44$) indicating these tools were intensively worked, used, and maintained. Use-wear is present on every scraper and consists of edge rounding and step fracture terminations. None of these tools are rejuvenated.

Formal Tools: Microblades

There are six microblades in this assemblage accounting for 13.3% of the artifact count. Five are made of poor quality, fine-grained chert and one is made of unflawed, vitreous crystal-quartz. One tool has minimal cortex. Four raw material colours are recorded and three (1, 4, 5) reflect those observed debitage and core categories. Table 6.40 summarizes the metrical attributes for this category.

Table 6.40 Metrical attribute summaries for Area Q microblades.

	N	X	R	S^2	S
Length	0	0	0	0	0
Width	6	7.5	3.0	2.0	1.4
Thickness	6	1.9	1.2	0.2	0.5
Weight	6	0.15	0.11	0.004	0.06

Only one microblade has a visible striking platform and it is unprepared and cortical. Three tools are medial sections and one is a proximal/medial section. The microblade with the intact platform has a bulb of percussion and all four fragments have compression rings. Lateral margins are straight, convex, or concave. Margin symmetry is symmetrical for three tools, asymmetrical for two, and one is indeterminable. None of these microblades are hafted, polished, rejuvenated, retouched, or modified on their proximal ends. Two of them do display evidence of use-wear in the form of edge rounding and step fracturing.

Cores

There are five cores in this assemblage accounting for 11.1% of the artifact total. Four are made of poor quality, fine-grained chert while one is unflawed, vitreous crystal-quartz. Four are core fragments while one is a complete specimen. Only the complete core retains evidence of cortex; however, it is minimal. Raw material colours (1, 4, 5, 22) reflect those observed for the debitage and flake tool categories. Mean core weight is 9.7 g ($R = 24.7$, $S^2 = 141.7$, $S = 11.9$). Striking platforms are prepared on two cores, and prepared and cortical on another. The crystal-quartz fragment consists of the distal end of a core that was likely removed to generate a fresh striking platform surface on the remnant core. Stacked termination states are absent on these tools and secondary distal crushing is present on only two fragments. Three cores have unidirectional force applications indicating a high degree of standardization in their preparation and maintenance while the remaining two cores are generalized with multidirectional flake scars. The mean number of flake scars is 5.7 ($R = 7.0$, $S^2 = 14.3$, $S = 3.8$), which is high indicating these cores were intensively worked.

Area Q: Macro-Scale Interpretations

The principal lithic technological activities pursued in this area of the site include late stage reduction and tool maintenance, and bipolar reduction of small chert pebbles. Chert is the dominant raw material type in this assemblage; however, lower frequencies of exotic toolstones indicate the Pre-Dorset were exploiting a more diverse range of materials. These materials are only present in small amounts in the debitage, which demonstrates toolmakers were conserving them through maintenance activities. In other words, the Pre-Dorset used these materials to make formal artifacts and then heavily curated them since good quality toolstone appears to be a rare commodity in the southern Baffin region. This pattern of raw material utilization is consistent with Andrefsky's (1994a) model (see Chapter 3).

High frequencies of uncortical, small chert flakes displaying advanced platform states and high dorsal scar counts indicates late stage reduction and maintenance of formal artifacts made of this material also occurred. In addition to these activities, toolmakers were exploiting local chert pebbles given the presence of numerous small and moderate size cortical flakes with evidence of platform crushing, battering, diffuse bulbs of percussion, compression rings, and secondary distal crushing. There is also a comparatively high incidence of flake shatter. These combined attribute states identify the use of a bipolar reduction strategy.

Flake size grade distributions are unimodal with small flakes dominating the overall frequencies. This is expected since the small package size of the local pebbles would necessarily yield small to moderate flakes, as would late stage reduction and maintenance activities. The bimodal distributions for dorsal scar count and flake weights further supports the interpretation of mixed technological strategies since late stage reduction would yield small flakes with high scar counts while bipolar reduction would yield small angular flakes and fragments with more variable weights and low or indeterminable dorsal scars.

The Percent Type calculations for Area Q indicate 69% of the assemblage derives from tool production activities while 33.5% is from core reduction. These figures total 102.5% and are within the expected range of error. This breakdown of technological activities is consistent with the other lines of evidence generated in this analysis and indicates attention was more focused on late stage tool production than on the exploitation of local chert pebbles. The Sullivan and Rozen (1985) method also supports the interpretation that tool production was the dominant activity with medial/distal and proximal flakes (72.6%, N=228) outnumbering complete flakes and shatter (27.4%, N=86). These values are similar to those recorded for the Percent Type approach. The flake-to-tool ratio is 9:1 and demonstrates some lost utility was being replaced. The use of local chert pebbles to manufacture some expedient tools contributes to this slightly higher value.

The used flakes and informal tools in this assemblage all mirror the debitage in terms of raw material types, texture, and quality; however, they lack cortex, evidence of secondary distal crushing, and display few attribute states associated with the use of heavy force loads. These flakes appear to have been removed from prepared cores given their moderate sizes, weights, and platform states. But their low dorsal scar counts indicates these cores were not in an advanced state of reduction; in other words, they had remaining utility. The two discarded generalized cores in this assemblage were likely the sources of these flake tools since they share the same raw material traits and are not entirely exhausted. Despite this apparent lack of raw material stress, the RIIs for the informal tools are high indicating they were more intensively worked and maintained.

The burins and scrapers in this assemblage are, however, made on flakes derived from local chert pebbles. These tools have the same raw material attributes as those observed in the debitage, they display attributes associated with early stage reduction and heavy force loads, and they have high cortex frequencies. These tools were intensively used as indicated by the recorded mean number of spall scars and RII values for the scrapers. Burins and burin spalls dominate the overall tool frequencies indicating the activities for which they are used were intensively pursued here. Since the Pre-Dorset were conserving their better quality toolstone during their occupation of the site, it is logical that they would use available local sources to satisfy their immediate technological needs, particularly if these activities were localized within the site area.

Microblades in this assemblage display a high degree of standardization and the comparatively low frequencies of these artifacts, particularly microblade cores, suggest they were intensively conserved. This is demonstrated by the recovery of the basal section of the crystal-quartz microblade core, which was removed to produce a new striking platform. The unflawed, vitreous quality of this core would be of considerable value in terms of toolstone utility; therefore, it is not surprising it was heavily curated. The bifaces in this assemblage are also highly standardized and display advanced states of manufacture, which indicate considerable investments of time and energy in their production and maintenance. It appears the tips on two of the complete tools were damaged from use or during maintenance activities, thus resulting in their discard. A third biface snapped across its medial section as a result of too much pressure being applied to the tip in an effort to remove a series of stacked fractures. These fractures are not attributed to low skill given the fine flaking, straight edges, and serrations observed on this tool.

A limited amount of faunal material was recovered from Area Q; however, these remains are very meager and do not offer any insights on subsistence activities. There is some evidence indicating the presence of a structural feature at the site, which consists of an elliptical boulder tent ring measuring roughly 2 m x 2.5 m (Milne 2003). There is a hearth-like feature inside this structure. Nearly all of the artifacts were recovered from inside this tent ring perimeter and the presence of micro-debitage around the speculative hearth area indicates it likely served as a focal point for tool production activities (Milne 2003).

While the distribution of artifacts inside the structure loosely suggests a cold season occupation, the lithic evidence does not support this. There are no signs of acute raw material stress in this assemblage. Certainly conservation strategies were employed to extend the use-lives of formal tools made of better quality materials, but discarded formal and informal tools were not being liquidated and none of them are rejuvenated. A number of large flakes in the debitage were not removed for further modification and use, and those that were had considerable utility remaining when they were abandoned. Perhaps most importantly, the exploitation of local chert pebbles to manufacture expedient tools indicates access to these sources was not restricted by snow and ice. Therefore, this site is interpreted as a warm season occupation. Tool production and use activities were likely concentrated inside this dwelling because the Pre-Dorset were seeking refuge from mosquitoes or perhaps inclement weather. It is equally possible lithic reduction activities occurred outside this dwelling as well; however, testing in the surrounding areas was not done to verify this. If artifacts and debitage were located outside the excavated units at Area Q, they would provide further support that this is a warm season site since people would have worked outside where there is sufficient space and light.

While this assemblage is not as large as those recovered at Shaymark and Davidson Point, it is bigger than what would be expected had the occupants just stopped through on their way inland. The site appears to have been used by a small group of people and the presence of a structure, the procurement of local chert sources for tool manufacture, and late stage tool reduction and maintenance activities all indicate they stayed here for more than a brief period during the warm season. Area Q is not at all ideal for a winter occupation since the available surface area on which to camp is limited, meaning few other tents could be established close by, and the hummocky ice at the head of the Inlet is not at all favourable for sealing (Boas 1964; Jacobs and Stenton 1985). Pre-Dorset hunters would have had to travel down the bay to reach the floe edge in order to procure these animals. It is possible the Pre-Dorset hunted caribou throughout the year in this area since these animals are available. Caribou would provide an important subsistence alternative to seals but the need for blubber, as a source of fuel, and waterproof skins, with which to make clothing and tents, would still require the exploitation of seals. These activities could be more easily pursued in the outer coastal regions rather than from the coastal upland areas, as indicated by historic land use patterns (Boas 1964; Stenton 1989). Therefore, I do not believe Area Q represents a cold season occupation.

Area Q: Micro-Scale Interpretations

Micro-scale patterns of variation in this assemblage indicate novice flint knappers were not engaged in tool production. Only 6 debitage flakes display minimally modified platforms, battering, and step or hinge fractures, and none of the informal or formal tools can be credited to novice skill. All of the recovered artifacts have been worked and maintained by skilled knappers; however, the social relations of production do not appear to have been rigid.

The expedient formal types made from local materials display considerable morphological variability suggesting the demands for conformity at this site were low or inconsequential. These tools were not extensively worked as indicated by the low intensity of flaking, formal shaping, and retouch. In fact, the technological attributes of the original flakes from which these tools are made are still plainly visible on most specimens. None of these tools display retouch that extends across their non-working margins (i.e. dorsal/ventral surfaces) indicating little time was being invested in finishing these tools. All of the finely made curated formal tools included in this assemblage appear to have been manufactured somewhere else under different organizational conditions. These factors combined suggest a more relaxed social atmosphere at Area Q. But because toolmakers were conserving their existing supply of better quality raw material and formal tools, novices still would not have had the opportunity to participate in technological activities given their knapping episodes are so costly in terms of raw material consumption. It is possible novices could have reduced local chert pebbles, but the debitage indicates they did not since evidence of low skill is virtually absent. The formal tool categories do not display evidence of novice tool working either.

The smaller size of this occupation and the more relaxed social relations of production imply the entire social group was not present. This, combined with the fact this is a warm season site located in the coastal uplands of Frobisher Bay, suggests the people who were here comprised the remainder of the social group that was left behind when specially organized task groups ventured inland to acquire subsistence and lithic resources. This would also explain the low incidence of novice flint knapping since those individuals of age who could make the journey would have accompanied the task group, particularly if it afforded them the opportunity to learn tool making in a setting where raw material is abundant. Additionally, it provides an explanation as to why the Area Q occupants were still using a heavily curated toolkit and exploiting local pebbles for limited tool production. They were likely doing this because their raw material supply had yet to be renewed, which further supports the inference task groups left the coast to venture inland to acquire new lithic resources.

Based on Stenton's (1989, 1991a, 1991b) model, men made up the inland task groups and those individuals who remained in the coastal uplands when these task groups departed for the interior included pregnant women, women with young children, and the elderly. Likewise McGhee (1979:55) and Binford (1978b:330) respectively state men of various ages made up Independence I and Nunamiut hunting task groups who occupied distant camps leaving women and the rest of the social group behind at separate residential sites. This kind of social organization around long distance hunting forays is also observed among subarctic hunter-gatherers (see Brumbach and Jarvenpa 1997). Based on this pattern of task group social organization observed for both archaeological and historic high latitude hunter-gatherer cultures, it is entirely reasonable to assume the Pre-Dorset on southern Baffin Island followed a similar pattern where men and women were separated into different task groups at specific times of the year to pursue highly scheduled tasks (i.e. caribou hunting, lithic raw material acquisition). As Stenton (1989) notes, the distance inland is considerable and the journey to get there arduous; therefore, it would make sense that those individuals remaining in the Pre-Dorset coastal upland camps would also include pregnant women, women with young children, and the elderly. It is possible that certain men in the social group may have remained at these coastal camps as well if they were injured or sick, and could not or would not make the journey inland.

What is important to note here is those individuals who remained at Area Q were capable toolmakers. Since women would have comprised a significant portion of this social group, it is highly probable they were the ones who made, used, and maintained many of the recovered artifacts. While there are recognized difficulties with assigning gender to specific lithic tool types (see Gero 1991:176; Reinhardt 2002:147), Sassaman (1998:169) explains it is not necessary to identify the actual individual men and women engaged in lithic activities per se; rather, it is more important to recognize that variability in an assemblage can be attributed to the actions of both men and women.

Women's toolmaking activities are documented ethnohistorically and ethnographically (e.g. Gould 1977; Hamilton 1980; Hayden 1977; Holmes 1919; Roth 1924). Archaeologists have identified female knappers in prehistoric contexts as well (e.g. Flenniken 1981; Gero 1991; Greaves 1999). As Gero (1991:170) notes, it is "inconceivable" that women would sit and wait for men to make tools and useable flakes for them. Given the range of tasks women perform, some of which include processing carcasses, preparing hides, cutting sinew, and sewing, they would have required "ready access to efficient working edges and they must have manufactured them as needed" (Gero 1991:170). Those individuals who use certain types of tools in their daily activities are likely to be those who are primarily engaged in their manufacture and maintenance (Conkey 1991:78). In instances when male task groups are away for extended periods of time, it would have been necessary for women to be able to make and maintain their own toolkits. In these circumstances, "it would be most inefficient" for them to rely on men for their technological needs (Gero 1991:170).

Among the subarctic Chipewyan, women who stay behind at residential sites (while men are away on long distance hunting forays) make up their own all-female hunting groups (Brumbach and Jarvenpa 1997:423-426). The distances these women travel while out hunting range from one kilometer to several kilometers, round-trip. Generally, resource acquisition is organized within the context of day trips with the groups returning to the main camp once hunting is completed. The women pursue small game like rabbits, beavers, and muskrat, and they also fish. These catches are normally brought back to the main site for processing since the small size of these animals makes them easy to transport (Brumbach and Jarvenpa 1997:423). Through these hunting activities, the women gain a keen sense of the abundance and distribution of resources that exist near their camps, and while the male task groups are away, the women are responsible for procuring what they need on a daily basis. It would make sense that the Pre-Dorset women at Area Q would have pursued similar subsistence activities and been as equally aware of their surroundings and resources, including the availability and location of lithic raw materials.

Sassaman (1998:167) believes women likely sought out and reduced lithic raw materials for their own tool using needs. In many cases, these materials constituted local sources; however, women did participate in long-distance procurement activities (Gero 1991:171-172). In his study of the lithic assemblage from the Hoko River site on the Northwest Coast of British Columbia, Flenniken (1981:113) found that most of the tools made by women consisted of locally available poor quality, heavily flawed vein quartz that was quarried from a source not more than 500 meters away. The women at the site used a bipolar reduction strategy to extract utility from these otherwise inferior sources of toolstone. The resulting flakes and core fragments were then used as expedient implements for cutting and processing activities performed within the immediate site area. Flenniken (1981:110) states that the culture groups occupying the Northwest Coast would have been familiar with various reduction strategies and that they selectively implemented them depending on the availability of different raw material types. For example, the recovery of a vitreous crystal-quartz microblade at the Hoko River site demonstrates toolmakers did use a standardized technological strategy when better quality toolstone was available (see Flenniken 1981:108-109). This single blade displays greater energy investment in core preparation and maintenance, and in platform preparation and blade detachment. This curated reduction strategy stands in sharp contrast to the expedient bipolar reduction and use of the inferior vein quartz that was readily available near this site.

Based on this discussion, I do not believe it is unreasonable to think that those individuals at Area Q who were exploiting local chert pebbles and reducing them using a bipolar strategy to make expedient lithic tools were women. Nor do I think it unreasonable to believe that women were also the ones repairing and maintaining the recovered curated formal types. While archaeologists more frequently associate women with an expedient technological strategy (e.g. Flenniken 1981; Gero 1991; Sassaman 1998), since their tool using activities are confined within the residential site area and do not require the same design considerations as a more mobile toolkit, women have been observed to make and maintain curated formal types, including bifaces (e.g. Sellers 1866). As Gero (1991:176) states, " there are no compelling biological, historical, sociological, ethnographic, ethnohistorical, or experimental reasons why women could not have made – and good reason to think they probably *did* make – all kinds of stone tools, in all kinds of lithic materials, for a variety of uses and contexts." If the women at Area Q were capable of reducing local chert pebbles, they would have been equally capable of working with the better quality toolstone found at the site since the attributes of this kind of material make it easier and more predictable to knap (Goodyear 1989).

It is possible elderly members of this social group made some of the tools recovered from Area Q; however, Weedman's (2002:738-739) recent study on stone toolmakers in Ethiopia found that the diminished hand-eye coordination individuals experience with age seriously compromised the ability of more elderly knappers to apply the necessary pressure and precision required to successfully work stone tools. It is possible adult males who remained in these camps, for whatever reason, made some of these tools as well. However, it is highly unlikely men were responsible for all of the reduction activities that occurred. To attribute tool production activities to men without considering the activities of women denies women a role in this technological realm, and, according to Sassaman (1998:168), the grounds on which this is done are entirely unfounded. Women were not only mentally and physically capable of working stone, but in some instances they did so in equally significant amounts as many men (Gero 1991:168, 170, 175). While it is certainly not new to acknowledge that women were proficient flint knappers in prehistory it is something that has yet to be thoroughly considered by Arctic archaeologists for the early Palaeo-Eskimos.

Tungatsivvik (KkDo-3): Area D

Debitage

Raw material types are extremely homogeneous with 98.6% of all flakes consisting of chert (see Table 6.41). Most of this material is poor-quality and fine-grained in texture (see Table 6.42) and 16.5% of these flakes have cortex (see Table 6.43). While raw material colour is variable with 18 shades recorded, a single colour (5) accounts for 48.7% (N=141) of all frequencies. An additional 46.1% of flakes are distributed among 6 other colours. The 11 remaining colours have fewer than 5 flakes each indicating the objective pieces from which they were struck were not intensively worked in this location.

Table 6.41 Raw material types, Area D, Tungatsivvik

	Raw Material Type		
	Chert	Quartzite	Jadeite
Debitage	291	3	1
Percentage	98.6	1.0	0.4

Table 6.42 Raw material texture, Area D, Tungatsivvik

	Raw Material Texture			
	Vitreous	Fine-grained	Coarse-grained	Very coarse-grained
Debitage	1	256	36	2
Percentage	0.3	86.8	12.2	0.7

Table 6.43 Percentage of cortex cover, Area D, Tungatsivvik

	Percentage of Cortex Cover				
	0	1-49%	50-99%	100%	Platform only
Debitage	247	24	16	3	5
Percentage	83.7	8.1	5.5	1.0	1.7

Remnant striking platforms are present on 56.9% (N=168) of flakes and 57% of them display advanced states including multiple flake facets, grinding, and/or abrasion. Many of these flakes (50.6%) also display three or more dorsal scars and are in the two smallest size grade categories indicating late stage reduction. Evidence of platform battering (N=27), platform trimming (N=20), and interior surface lipping (N=24) is relatively low while eraillure scars (N=32) and secondary distal crushing (N=38) occur in slightly higher frequencies. Bulbs of percussion and compression rings are recorded for 50.8% and 82% of flakes, respectively. Debitage completion indices and flake breakage types are summarized in Tables 6.45 and 6.46, respectively.

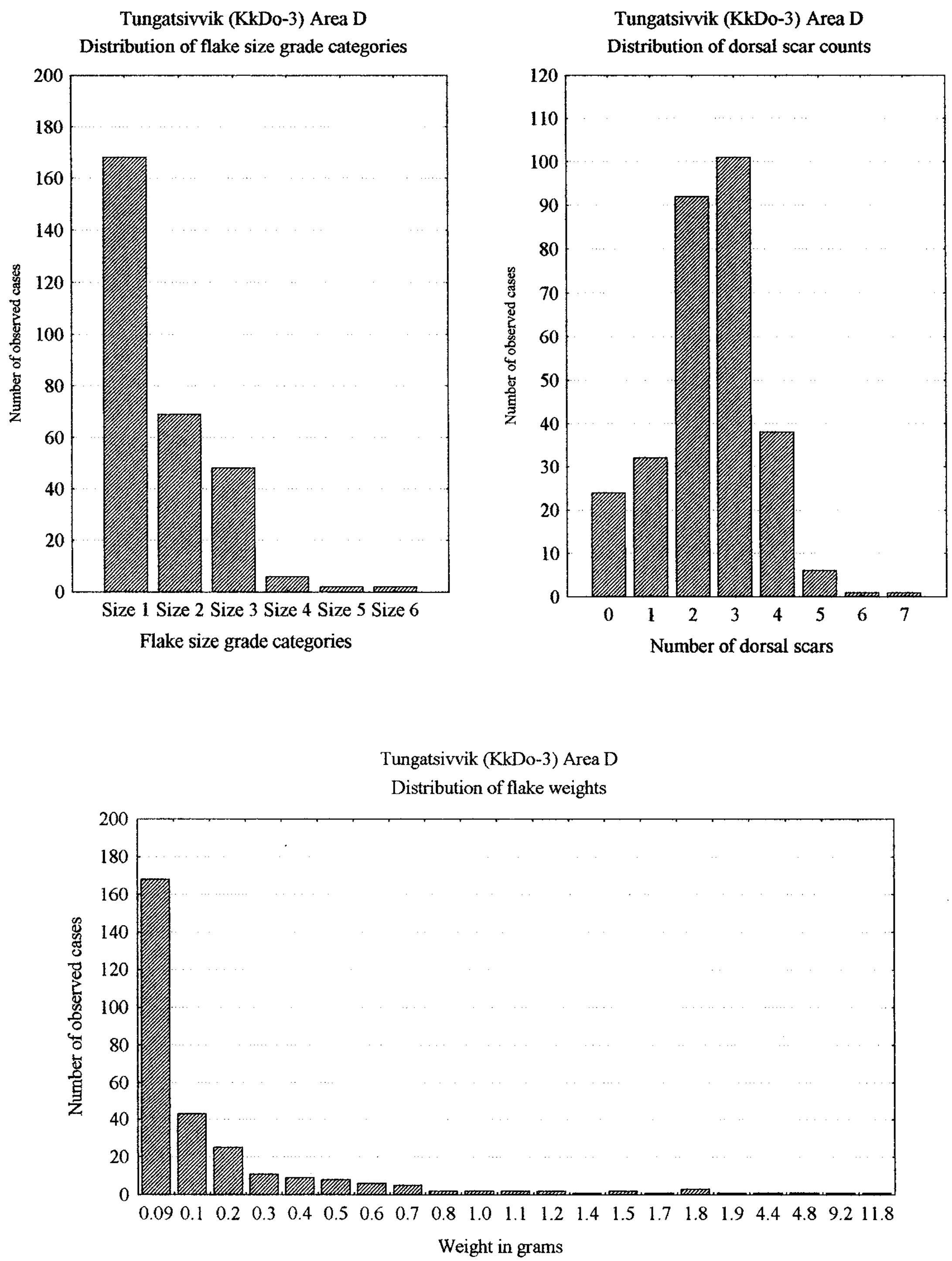


Figure 6.4 Frequency distributions for Area D flake size grade categories, dorsal scar counts, and weights (g).

Table 6.44 Mean flake weights (g) for Area D debitage, used flakes, and informal tools.

	N	X	R	S^2	S
Debitage	295	0.32	11.7	0.95	0.98
Used flakes	2	1.75	0.5	0.13	0.35
Informal tools	9	0.79	1.8	0.52	0.72

Table 6.45 Debitage completeness index, Area D, Tungatsivvik.

	Debitage Completeness Index				
	Shatter	Medial/distal	Split	Proximal	Complete
Frequencies	23	104	3	123	42

Table 6.46 Breakage types and frequencies observed on flake margins, Area D, Tungatsivvik.

	Margin	**Feather**	**Step**	**Hinge**	**Outrepassé**	**Snap**	**Absent/Ind.**
Debitage	Distal	109	21	23	2	117	23
	Proximal	0	18	3	0	82	192
	Right	194	5	0	0	75	23
	Left	193	4	0	0	75	23

Informal Tools: Used Flakes

There are two used flakes in this assemblage accounting for 6.8% of the artifact total. Both tools are made of poor quality, fine-grained chert, and one has cortex. Raw material colours mirror the two dominant colour types represented in the debitage assemblage (5, 1). Both tools consist of large flakes with heavy weights (see Table 6.44) and moderate to high dorsal scar counts. One platform has multiple facets while the other is crushed, and platform overhang on both tools has been trimmed. Neither tool displays evidence of interior surface lipping or secondary distal crushing. An eraillure scar is recorded on the larger of the two flakes, and both of them possess bulbs of percussion and compression rings. These tools have use-wear in the form of edge rounding and step fracture terminations, which is present on the distal and left lateral margin on one tool, and the distal end only on the second tool. Both have feathered distal states but one tool is classified as a proximal flake since its left lateral margin is snapped.

Informal Tools: Retouched Flakes

There are nine retouched tools in this assemblage accounting for 31% of the artifact total. All are made of poor quality, fine-grained chert, and two retain cortex cover. Raw material colours reflect those observed for the debitage assemblage with little variation noted (5, 43, 10, 1, 2). Flakes are moderate to large in size, have moderately variable weights (see Table 6.44), and low to moderate dorsal scar counts. Remnant striking platforms are present on only four tools and include cortical, single flake facet, single flake facet with crushing, and multiple flake facets. Platform battering (N=1) is minimal while evidence of interior surface lipping, eraillure scars, and secondary distal crushing is entirely absent. Bulbs of percussion (N=2) are minimal but compression rings are recorded for every specimen.

Most tools display evidence of retouch on their exterior surfaces (N=7), but one is worked on its interior surface while another is worked on both surfaces. The degree of retouch on these tools is low to moderate as indicated by the mean values for the Retouch Intensity Index, which are 1.35 for interior surfaces and 1.40 for exterior surfaces. The shapes of these retouched edges are largely convex or straight, and only four tools display use-wear. None of these implements exhibit intentional retouch on the non-working portion of the tool (i.e. dorsal and/or ventral surfaces). Proximal (N=3) and medial/distal (N= 5) flakes dominate as do snap (N=5) and feathered (N=4) distal termination states.

Informal Tools: Burin Spalls

Burin spalls make up 10.3% (N=3) of the artifact total in this assemblage. All are complete specimens made of poor quality, fine-grained chert, and lack cortex. Raw material colours reflect those observed in the debitage sample (2, 5, 10). There is one primary spall and two secondary spalls. Striking platforms include multiple (N=2) and single (N=1) flake facets, and all three have bulbs of percussion and compression rings. The degree of flaking on these spalls is moderate to intense and none are reused. Metrical attributes are summarized in Table 6.47. Distal states include one step fracture, one snap fracture, and one hinge.

Table 6.47 Metrical attributes summaries for Area D, Tungatsivvik burin spalls.

	N	X	R	S^2	S
Length	3	10.4	4.2	5.7	2.4
Width	3	2.87	1.0	0.3	0.55
Thickness	3	1.63	0.5	0.06	0.25
Weight	3	0.09	0.01	0.0003	0.006

Formal Tools: Burins

There are six burins in this assemblage accounting for 20.7% of the artifact total. All are made of poor quality, fine-grained chert, and only one has cortex. Five raw material colours are recorded (1, 2, 9, 10, 27) but only two are represented among the burin spalls indicating three of these burins were brought to the site and abandoned without being resharpened. Remnant striking platforms are visible on 4 tools and two have more advanced states while the other two are minimally modified. Additional evidence of platform battering (N=1), eraillure scars (N=1), bulbs of percussion (N=3), and compression rings (N=3) suggests several of the flakes on which these tools are made were produced during early stage reduction using heavier force loads.

Five burins are complete and have obtuse working edges while one burin is missing its working edge. Lateral margins are asymmetrical for five tools and symmetrical for one. Three burins display hafting modifications in the form of side notching, corner notching, and lateral thinning. Basal element outlines are straight, convex, or concave, and 5 are asymmetrical while only one is symmetrical. Table 6.48 summarizes the metrical attributes for this category. Measures of dispersion indicate a higher degree of variability in tool length and width.

Table 6.48 Metrical attribute summaries for Area D burins.

	N	X	R	S^2	S
Length	5	22.44	11.7	20.41	4.52
Width	6	15.72	5.5	4.91	2.22
Thickness	6	5.08	2.6	1.00	1.00
Weight	6	1.97	1.3	0.25	0.50

Primary flake scars are unifacial on two burins and bifacial on four. Secondary flake scars are recorded on five burins, and two are unifacial while three are bifacial. Of those burins with secondary flake scars, two are continuous in distribution and 3 are discontinuous. The degree of flaking is moderate to intense on five tools. Polish is present on two burins and is located on the ventral and distal areas of one, and on the ventral and dorsal areas of the other. Basal element modification is observed on four tools and consists of unifacial (N=2) and bifacial (N=2) thinning, respectively. Four burins have a single working edge while two burins have two locations. The working edges on most of these tools have been resharpened many times as indicated by the mean number of scars, which is 5.7 ($R = 5.0$, $S^2 = 3.47$, $S = 1.86$). None of these burins are rejuvenated.

Formal Tools: Bifaces

Bifaces make up 10.3% (N=3) of the artifact total in this assemblage. All are made of poor quality, fine-grained chert, and one has minimal cortex. Three raw material colours are recorded (1, 5, 10) and all mirror those observed in the debitage assemblage. None of these tools are complete: one cannot be oriented, one is missing its tip, and one is missing its basal and hafting elements. The two tools that can be oriented both have asymmetrical blade elements and one is a bifacially worked flake knife. Blade cross-sections are plano-convex and biplano. Edge sinuosity is low with one biface having straight edges and the other having slightly sinuous edges. There are no stacked fractures. Table 6.49 summarizes the metrical attributes for this category.

Table 6.49 Metrical attribute summaries for Area D bifaces.

	N	X	R	S^2	S
Length	0	0	0	0	0
Width	2	15.1	2.4	2.9	1.7
Thickness	2	2.9	2.4	2.9	1.7
Weight	3	0.7	1.5	0.6	0.8

Only one biface is side notched and its basal element is asymmetrically convex. Primary and secondary scars are bifacial on all tools and all exhibit discontinuous patterns of secondary flaking. The degree of flaking observed on these bifaces is low (N=1) to moderate (N=2). Edge serration is discernible on the indeterminable biface fragment. None of these tools exhibit evidence of polish, basal element modification, use-wear, or rejuvenation. All of these bifaces have snapped termination states.

Formal Tools: Microblades

There are four microblades in this assemblage accounting for 13.8% of the artifact total. All are made of poor quality chert. Two are fine-grained with no cortex and two are coarse-grained and have cortex. Three raw material colours are recorded (1, 5, 53) and all reflect those observed among the cores and debitage in this assemblage. Remnant striking platforms are present on three tools and include two minimally modified states and one more advanced state. Interestingly, the microblade with the advanced platform has the only evidence of battering, eraillure scarring, and a bulb of percussion indicating it was removed with heavier force. Table 6.50 summarizes the metrical attributes for these tools.

Table 6.50 Metrical attribute summaries for Area D microblades.

	N	X	R	S^2	S
Length	2	19.4	0.4	0.08	0.28
Width	4	8.93	4.4	4.0	2.0
Thickness	4	2.65	2.5	1.24	1.12
Weight	4	0.45	0.61	0.07	0.26

Lateral margins are straight and symmetrical on two microblades while two are asymmetrical. Side notching is observed on one tool. All microblades have one dorsal arris suggesting the cores from which they were struck were not extensively worked or used. Evidence of polish and proximal end modification is absent. One microblade is moderately retouched (RII=1.65) on its exterior surface and three exhibit evidence of use-wear in the form of edge rounding and step fracturing. None of these tools are rejuvenated.

Cores

There are two cores in this assemblage accounting for 6.9% of the artifact total. Both are made of poor quality, fine-grained chert, with some cortex cover. One core is complete and one is fragmented. These cores have different raw material colours (1, 53) but they are consistent with those observed in the debitage, flake tool, and microblade categories. Mean core weight is high at 10.45 g ($R = 2.7$, $S^2 = 3.65$, $S = 1.91$) indicating both artifacts are large in size. Prepared striking platforms are recorded for both specimens and they lack evidence of platform battering. These cores exhibit multi-directional force applications indicating a more generalized technological strategy. The mean scar count is 5.0 ($R = 6.0$, $S^2 = 18.0$, $S = 4.24$) and there is pronounced variation since one core is more intensively worked than the other. There is no evidence of secondary distal crushing or secondary use of these artifacts.

Area D: Macro-Scale Interpretations

The principal lithic technological activities pursued in this area of the site include late stage tool finishing and maintenance, and limited bipolar reduction of small chert pebbles. The high frequency of small size flakes with low weight values, advanced platform states, and high dorsal scar counts indicate the objective pieces worked in this area were already in an advanced state of reduction, and consisted of curated tools that were modified and/or repaired in anticipation of reuse. The homogeneity in raw material type, quality, and texture in the debitage assemblage indicates these tools were made of fine-grained chert, so if the Pre-Dorset were carrying implements made of better quality or exotic toolstones they did not work them here. There is also evidence local chert pebbles were exploited using a bipolar reduction strategy as indicated by the low to moderate frequencies of flakes with cortex, crushed or shattered platforms, secondary distal crushing, diffuse bulbs of percussion, and compression rings.

While the attribute analysis indicates the use of mixed technological strategies in this assemblage, the unimodal distributions for flake size grades, dorsal scar counts, and weights do not. The package size of the local chert pebbles can account for these distributions in the size grade and weight categories since small parent materials necessarily yield smaller flakes with lower weight values. So the combination of late stage reduction and the exploitation of small pebbles will produce high frequencies in the smallest categories for these states, which are reflected in the distributions. Furthermore, if bipolar reduction were a secondary activity to the repair and maintenance of curated implements, fewer pieces of shatter and crushed flakes would result meaning lower frequencies of flakes exhibiting low dorsal scar counts (i.e. 0-2). Conversely, the greater emphasis on tool repair and maintenance would yield higher frequencies of flakes with three or more dorsal scars. These combined patterns will result in a unimodal distribution for this attribute state. It is also important to note that if local pebbles were procured to replace broken or exhausted tools, the production of these items will yield debitage indicating a complete reduction sequence from procurement to finished product. These activities do contribute to the unimodal distributions observed.

The Percent Type approach calculations for Area D indicate 61.7% of the assemblage derives from tool production activities while 42.9% of it is from core reduction. These figures total 104.6% and are within the expected range of error. This breakdown of technological activities is consistent with the other attribute states observed for the debitage assemblage and indicates attention was more focused on late stage reduction and tool maintenance than the exploitation of local chert pebbles. The Sullivan and Rozen (1985) method also supports the interpretation that tool production was the dominant activity with medial/distal and proximal flakes (78%, N=230) outnumbering complete flakes and shatter (22%, N=65). The flake-to-tool ratio is 11:1 suggesting some tool utility was being replaced.

It is important to note that the context of this component may be disturbed since Area D is located in close proximity to several Thule semi-subterranean winter houses. Because the Thule used cut sod blocks to insulate the roofs of their winter houses, the Thule occupants at Tungatsivvik may have cut through this original Pre-Dorset component. Palaeo-Eskimo artifacts were recovered in all of these nearby Thule structures indicating some lithic artifacts were displaced from their original depositional locations. This could also account for the low frequency and diversity formal tools in this assemblage.

There are few utilized flakes and informal tools but those that are present all consist of moderate to large flakes. There are no scrapers present and biface frequencies are low. The unidentifiable biface fragment likely derives from a tool that was repaired at the site; the bifacial flake knife appears to have been made here, used, and discarded; and the broken biface appears to have simply failed while being worked. The microblades are also fragmented and display a lower degree of standardization given their single arrises and variable margin symmetries. The fact two of these tools are made on coarse-grained chert and retain cortex suggests the core from which they were struck might have been made from local material and was subsequently removed from the site. Several heavily curated burins were discarded at Area D. These tools display more intense flaking patterns, hafting modifications, and were heavily used as indicated by the higher number of spall scars recorded. The presence of two crude, minimally modified flake burins indicates some of these tools were also expediently made on flakes removed from the debitage.

The low diversity of informal and formal types in this toolkit, and the nature and intensity of the tool production activities practiced at Area D indicates this occupation was an ephemeral one. Moreover, the absence of structural features and faunal remains suggests the occupants were just passing through. It is unlikely the Pre-Dorset were hunting while at Area D given the absence of endblades and sideblades (or fragments of them), and the low occurrence of processing tools. And, the debitage assemblage demonstrates they were not here to make new tools either. The Pre-Dorset do appear to have been renewing some tool utility through the exploitation of local chert sources. Given the access to these materials, Area D is interpreted as a warm season occupation. If the Pre-Dorset were here in the winter, their tool reduction and use strategies would be intensely focused on conservation, rejuvenation, and even liquidation since raw material stress would be acute. And, the diversity of formal tool types would be higher since people would likely have stayed here longer, particularly if the entire social group were present. The absence of these reduction and use strategies in the Area D assemblage further supports the inference the site was occupied during the warm season.

Based on these interpretations, Area D is deemed to represent a temporary warm season camp where the Pre-Dorset stopped over in the coastal uplands to repair their toolkit before departing for the interior. Given the distances to be traveled inland and the need to be prepared for this journey, the Pre-Dorset would still require the use of their curated toolkit. These factors explain why there are so few deposited curated tools at Area D and why tool maintenance activities were so focused during this brief occupation.

Area D: Micro-Scale Interpretations

Micro-scale patterns of variation indicate novice flint knappers were not engaged in tool production. Only three flakes display minimally modified platforms, battering, and step or hinge fractures, and none of the informal and formal tools can be credited to novice skill. However, this lack of participation is not a result of factors relating to group social organization. The social relations of production were not rigid during this occupation since many of the tools recovered from Area D were made haphazardly on minimally modified flakes. There is no indication toolmakers were demonstrating their "technical know-how" (Dobres 1995:40) since none of the recovered types are embellished (i.e. intensively retouched). The absence of novice knapping episodes and a relaxed social atmosphere further support the interpretation this occupation was a temporary camp for the Pre-Dorset where they have stopped over, most likely to prepare for an inland journey.

Sandy Point (LlDv-10)

Debitage

Raw material types are extremely homogeneous with 99.6% of the assemblage consisting of chert (see Table 6.51). Raw material quality is poor (99.7%) and fine-grained toolstones dominate (84.5%) (see Table 6.52). Cortical cover is notably high and 35% of all flakes possess this attribute state (see Table 6.53). Raw material colour is variable with 30 recorded shades. While five colours (5, 1, 8, 2, 10) account for 85% of all frequencies, the remaining 25 indicate a more diverse range of chert was worked at the site. Many of these different coloured flakes are classified in the moderate to large size grade categories (i.e. 3 to 6) and have extensive cortex indicating the parent materials from which they were struck consisted of local chert nodules.

The size grade distribution is unimodal (see Figure 6.5) and peaks among the size two flakes. The distribution for flake weight is unimodal from 0.09 g to 1.0 g (see Figure 6.5). For flakes weighing more than 1.0 g, the distribution is more variable since there are proportionately more large flakes in this assemblage. The mean flake weight is 0.45 g (see Table 6.54) and the measures of dispersion indicate there is variability present in the assemblage but that it is consistently distributed. If only a few large flakes were affecting these figures the variance and standard deviation would be higher. Dorsal scar counts peak among the lower values with 65.6% of all flakes possessing between zero and two scars. It should be noted that these values are not bolstered by a higher frequency of shatter; rather, they reflect the prevalence of early stage reduction at this site, particularly of local chert nodules.

Table 6.51 Raw material types, Sandy Point debitage.

	Raw Material Type		
	Chert	Chalcedony	Crystal-quartz
Debitage	1171	4	1
Percentage	99.6	0.3	0.1

Table 6.52 Raw material texture, Sandy Point debitage.

	Raw Material Texture			
	Vitreous	Fine-grained	Coarse-grained	Very coarse-grained
Debitage	6	993	165	12
Percentage	0.5	84.4	14.1	1.0

Table 6.53 Percentage of cortex cover, Sandy Point debitage.

	Percentage of Cortex Cover				
	0	1-49%	50-99%	100%	Platform only
Debitage	769	164	90	93	60
Percentage	65.4	13.9	7.7	7.9	5.1

Table 6.54 Mean flake weights (g) for Sandy Point debitage, used flakes, and informal tools.

	N	X	R	S^2	S
Debitage	1176	0.5	9.0	0.6	0.8
Used flakes	10	1.1	1.7	0.3	0.5
Informal tools	19	2.3	9.6	5.8	2.4

Remnant striking platforms are present on 63.3% (N=744) of all flakes and 72.3% of them are associated with early stage reduction and the use of heavier force loads. Single flake facets, evidence of crushing and shatter, and/or extensive cortical cover characterize these platform states. Many of these flakes also possess low dorsal scar counts and moderate to extensive cortical cover further indicating the presence of early stage reduction. Evidence of platform battering is high (32.8%) and the flakes on which it occurs clearly exhibit evidence attributable to low skill level and the use of excessive force loads. Only 25.6% (N=190) of the debitage displays more advanced states of platform preparation including multiple flake removals or abrasion/grinding. However, 30.5% (N=58) of these advanced states occur on moderate to large size flakes and are, therefore, not associated with late stage reduction or tool finishing.

Interior surface lipping (3.6%) and secondary distal crushing (6.6%) are minimal while eraillure scarring (17.3%), bulbs of percussion (57.5%), and compression rings (83.9%) occur in notably higher frequencies. Debitage completion indices and flake breakage patterns are summarized in Tables 6.55 and 6.56, respectively. It is important to note that flakes with hinges, step fractures, and outrepassé terminations also possess evidence of platform battering and use of heavy force loads further indicating the presence of low skill level in this assemblage. If those flakes with snap fractures, platform battering, and minimally modified and crushed platform states are also considered, this evidence is accounts for 23.5% of all flakes.

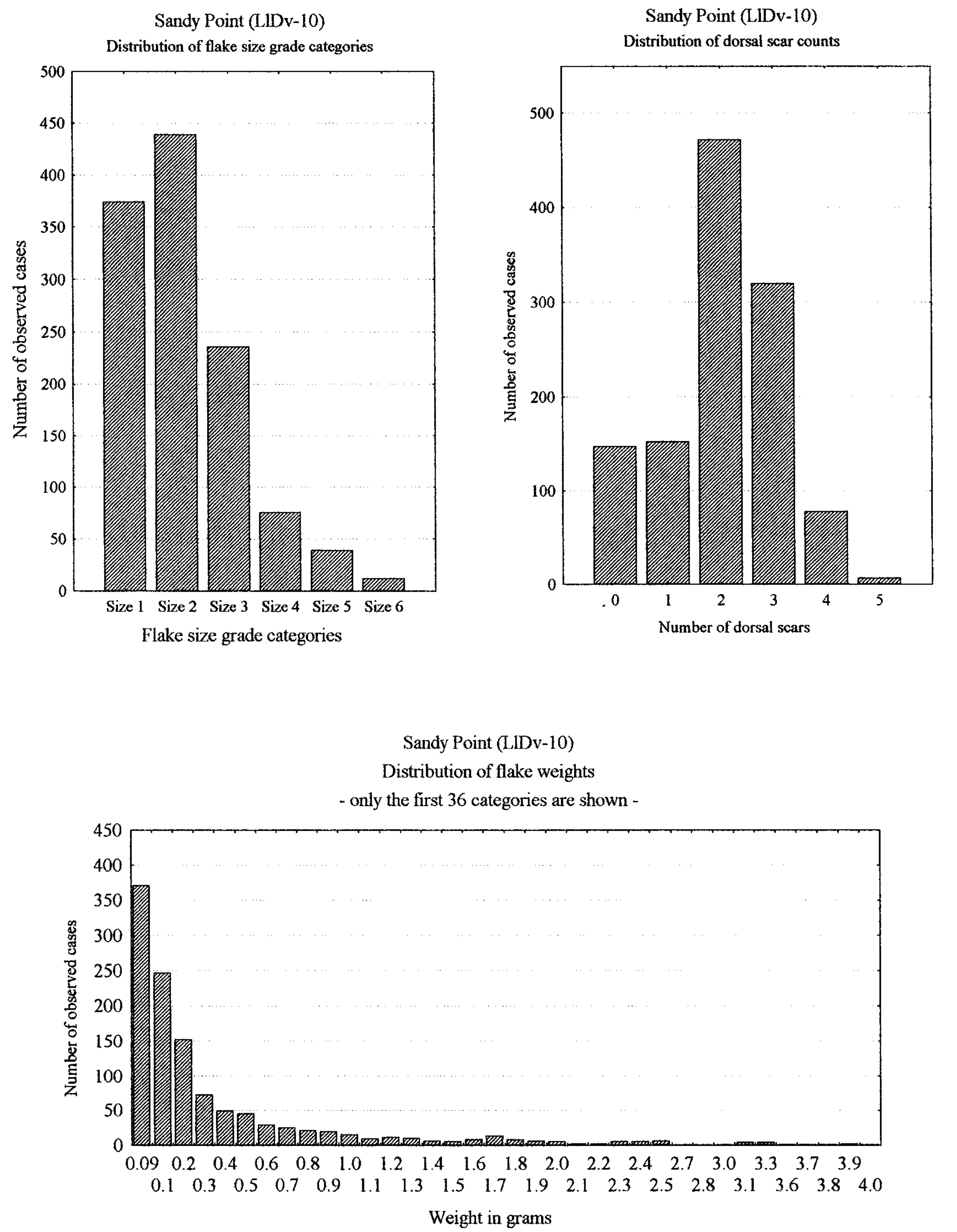


Figure 6.5 Frequency distributions for Sandy Point flake size grade categories, dorsal scar counts, and weights (g).

Table 6.55 Debitage completeness index, Sandy Point assemblage.

	Debitage Completeness Index				
	Shatter	Medial/distal	Split	Proximal	Complete
Frequencies	84	348	3	537	204

Table. 6.56 Breakage types and frequencies observed on flake margins, Sandy Point assemblage.

	Margin	**Feather**	**Step**	**Hinge**	**Outrepassé**	**Snap**	**Absent/Ind.**
Debitage	Distal	436	95	48	11	502	84
	Proximal	0	62	2	0	276	836
	Right	803	19	2	0	268	84
	Left	817	15	3	0	257	84

Informal Tools: Used Flakes

Used flakes make up 10% (N=10) of the artifact count in this assemblage. All are made of poor quality, fine-grained chert, and 50% have cortex cover. The five raw material colours represented in this category mirror those that dominate the overall frequencies present in the debitage assemblage. All of these tools consist of moderate to large size flakes with low to moderate dorsal scar counts, and variable flake weights (see Table 6.54). Striking platforms are present on eight tools and include multi-faceted and minimally modified states that are crushed and have cortex. Platform battering is present on three tools and eraillure scarring is observed on four. There is no evidence of interior surface lipping or secondary distal crushing. Compression rings are present on every tool while bulbs of percussion are observed on eight of them. All tools display evidence of use-wear in the form of edge rounding and step fracture terminations, and were used on one (N=3) or both (N=7) lateral margins. Four flakes are proximal sections and four are complete. Snap fractures (N=4) and feathers (N=5) dominate the distal termination states.

Informal Tools: Retouched Flakes

Retouched flakes make up 19% (N=19) of the artifact total in this assemblage. Most are made of poor quality, fine-grained chert (N=17), but two are made of flawed, vitreous chalcedony. Cortex cover is high (42%) and raw material colours are variable, like those observed for the debitage assemblage. These tools consist of moderate to large flakes, with highly variable weights (see Table 6.54), and low dorsal scar counts. Remnant striking platforms are present on 52.6% (N=10) of flakes and 80% of them are minimally modified with evidence of crushing and cortex. Platform battering (N=1) and secondary distal crushing (N=1) is minimal. Eraillure scarring (N=5) and bulbs of percussion (N=9) are more common, and compression rings are present on every tool.

Most tools are retouched on their exterior surfaces (N=15), but three are modified on their interior surfaces, and one is retouched on both. The intensity of retouch is notably higher on the exterior surfaces (RII=1.98) while retouch on the interior surfaces is much lower (RII=1.13). The shapes of these edges are straight or concave, and 81.3% of them have use-wear. Only one tool exhibits evidence of intentional retouch on the non-working portion of the tool. Proximal (N=8) and medial/distal (N=2) flakes dominate this category as do feather (N=9) and snap fracture (N=4) distal termination states.

Informal Tools: Burin Spalls

There are six burin spalls in this assemblage accounting for 6% of the artifact total. All are made of poor quality chert and lack evidence of cortex. Raw material textures are fine and coarse- grained. Colours are distributed among three categories and are identical to those recorded for the burins. All but one spall are primary, and all are complete (N=3) or proximal (N=3) sections. Striking platforms have multiple flake facets, and bulbs of percussion (N=5) and compression rings (N=4) are common. The degree of dorsal flaking observed is moderate to high and only one spall exhibits post-detachment modification and use. Table 6.57 summarizes the metrical attributes for this category. Distal states include one feathered termination, one step fracture, and one hinge.

Table 6.57 Metrical attribute summaries for Sandy Point burin spalls.

	N	X	R	S^2	S
Length	3	15.7	10.2	26.1	5.11
Width	6	3.43	1.2	0.37	0.61
Thickness	6	2.13	0.9	0.22	0.47
Weight	6	0.16	0.11	0.004	0.06

Formal Tools: Burins

There are 16 burins in this assemblage accounting for 16% of the total artifact count. Most are made of poor quality, fine-grained chert (87.5%), and six have cortex. Seven raw material colours are recorded but four of them are not represented in the burin spall category. These colours (3, 10, 25, 30) are not well represented in the debitage assemblage either indicating tools made from these materials were brought to the site in a finished state and abandoned without being resharpened or modified.

Remnant striking platforms are present on 11 tools and most consist of minimally modified and/or cortical states. Additional evidence of platform battering (N=3), eraillure scars (N=4), bulbs of percussion (N=10), and compression rings (N=12) indicate some of the flakes on which these tools are made were produced during early stage reduction, detached using heavier force loads, and selectively removed from the debitage. Three burins recorded as having indeterminable platforms are so extensively modified that these attribute states are no longer discernible.

Most burins are complete (N=13) or near complete (N=2), and one is missing its working edge. Working edge orientations are obtuse (N=9), arcing (N=2), and perpendicular (N=4).

Lateral margins are symmetrical on nine tools and asymmetrical on five. Six burins are laterally thinned to facilitate hafting. Basal element outlines are straight (N=4), convex (N=7), concave (N=2), and bivectoral (N=1), and five are symmetrical in form while nine are asymmetrical. Table 6.58 summarizes the metrical attributes for this category. Measures of dispersion indicate a greater degree of recorded variability for tool length.

Table 6.58 Metrical attribute summaries for Sandy Point burins.

	N	X	R	S^2	S
Length	13	23.25	15.4	19.4	4.4
Width	14	14.21	5.6	2.7	1.64
Thickness	16	4.43	3.1	0.70	0.84
Weight	16	1.54	2.5	0.60	0.77

Primary flake scars are unifacial for 4 tools and bifacial for 11; one burin shows no evidence of post-detachment modification other than its spalled edge. Secondary flake scars are unifacial on 5 burins and bifacial on 10. Of those burins with secondary flake scars, 7 have discontinuous patterns while 8 are continuous. The degree of flaking observed is moderate on 9 tools and intense on 6. Polish is present on 6 burins and is located on the distal and dorsal areas. Basal element modification is recorded on 6 tools and consists of unifacial thinning. Most burins have one working edge (N=14) but one has two locations. These tools have not been used intensively as indicated by the mean number of spall scars, which is 2.19 ($R = 6.0$, $S^2 = 3.1$, $S = 1.76$). There is no evidence of rejuvenation.

Formal Tools: Bifaces

Bifaces make up 18% (N=18) of the artifact count in this assemblage. All but two bifaces are made of poor-quality, fine-grained chert, and three have minimal cortex. Two bifaces are vitreous crystal-quartz, one of which is of unflawed toolstone. Six raw material colours are recorded; however, only two (1, 5) are represented in any notable frequency in the debitage assemblage. Bifaces made of the four remaining colours (4, 13, 40, 53) appear to have been brought to the site finished and then abandoned.

Only four bifaces are complete (see Table 6.59). For those bifaces with intact blade elements, three have symmetrically straight (N=2) and convex (N=1) margins while five are asymmetrical. Blade element cross-sections are plano-convex (N=5), biplano (N=3), and biconvex (N=4). Five bifaces have straight edges while eight are slightly sinuous, and two are moderately sinuous. Stacked fractures are recorded on four tools, three of which are complete, have slight to moderately sinuous edges, and lack use-wear. This combination of attributes indicates these bifaces were preforms that could not be successfully thinned and were thus abandoned. Table 6.60 summarizes the metrical attributes for this category.

Table 6.59 Completeness Index for the Sandy Point bifaces.

	Indeterminate	Complete	Tip missing	Tip, blade missing	Basal, haft missing	Blade, basal, haft missing
Count	2	4	1	7	3	1

Table 6.60 Metrical attribute summaries for Sandy Point bifaces.

	N	X	R	S^2	S
Length	5	35.2	25.7	111.2	10.6
Width	14	19.0	15.6	29.6	5.4
Thickness	18	4.3	5.9	1.7	1.3
Weight	18	2.0	5.2	2.4	1.5

Three bifaces are corner notched and one is side notched. Basal elements are straight (N=2), convex (N=8), or concave (N=2), and three are symmetrical in form while nine are asymmetrical. Primary and secondary flake scars are bifacial on all but one tool. This specimen was recovered from the mainland beach zone and has been so heavily water polished by wave action that flake scars are no longer discernible. Of those bifaces with secondary flake scars, four are continuous in distribution while 13 are discontinuous. The degree of flaking observed on these tools is recorded as low (N=2), moderate (N=8), and intense (N=7). One crystal-quartz biface is serrated and one chert biface is polished on its dorsal surface. The basal elements on two bifaces are thinned unifacially while seven are thinned bifacially. Only six bifaces have use-wear, which consists of edge rounding and step fracturing. None of these tools are rejuvenated.

Formal Tools: Scrapers

There are three scrapers in this assemblage accounting for 3% of the artifact total. Two are made of chert and one is of chalcedony. Raw material quality is poor and texture is fine-grained for all. Two scrapers have minimal cortex. Raw material colour is variable and two of the three recorded colours (53, 57) are not present in the debitage. The third colour (40) has only five recorded debitage flakes indicating all of these scrapers were brought to the site in a finished state and abandoned. All are complete specimens, and two have symmetrical lateral margins while one is asymmetrical in form. The scraping edges are all located on the distal end and are straight (N=1) or convex (N=2) in shape. Scraping edge symmetry is asymmetrical (N=1) or symmetrical expanding (N=2). Typologically, one is a typical endscraper and two are expanding endscrapers.

One scraper is side notched. Basal elements are straight (N=2) and convex (N=1), and two are symmetrical in form. Table 6.61 summarizes the metrical attributes for this category. Primary and secondary flake scars are bifacial and discontinuous on two tools while the other displays only unifacial primary flake scars. None of these scrapers are polished or exhibit evidence of basal element modification.

Mean edge angle is 67° (R = 3.0, S^2 = 2.3, S = 1.5). Spurs are present on the working edges of two scrapers. All of these tools display moderate to intense retouch on their exterior surfaces as indicated by the mean figure for the Retouch Intensity Index, which is 2.33 (R = 0.3, S^2 = 0.02, S = 0.15). All scrapers exhibit heavy use-wear in the form of edge rounding and step fracture terminations. None of these tools are rejuvenated.

Table 6.61 Metrical attribute summaries for Sandy Point scrapers.

	N	X	R	S^2	S
Length	3	23.0	10.5	27.8	5.3
Width	3	20.9	7.5	17.6	4.2
Thickness	3	6.4	2.2	1.3	1.2
Weight	3	3.4	1.5	0.6	0.8

Formal Tools: Microblades

Microblades make up 16% (N=16) of the artifact total in this assemblage. All are made of poor quality, fine-grained chert, and three have cortex. Seven raw material colours are recorded and all reflect those observed in the debitage assemblage. One colour (8) does account for 50% of all frequencies; however, none of the recovered cores or core fragments are this colour indicating the objective piece(s) from which these tools were struck was likely removed from the site. Ten microblades are complete (N=2) or near complete (N=8) (see Table 6.62).

Table 6.62 Completeness index for Sandy Point microblades.

	Complete	Proximal section	Medial section	Distal section	Proximal/ medial sections	Medial/distal sections
Count	2	2	1	0	8	3

Remnant striking platforms are present on 68.8% (N=11) of these tools and 55% of them have advanced states including multiple flake facets and evidence of platform trimming indicating greater skill was involved in preparing these microblades for detachment. The remaining platforms are minimally modified and/or cortical. There is little evidence indicating the use of heavy force loads. Bulbs of percussion (N=11) and compression rings (N=15) are common, however. Table 6.63 summarizes the metrical attributes for this category.

Table 6.63 Metrical attribute summaries for the Sandy Point microblades.

	N	X	R	S^2	S
Length	2	16.15	1.1	0.61	0.78
Width	16	6.21	12.1	7.9	2.81
Thickness	16	1.73	2.4	0.52	0.72
Weight	16	0.2	0.41	0.02	0.13

Lateral margins are straight and symmetrical on seven microblades while nine are asymmetrical. Single dorsal arrises are recorded on nine tools, six have two, and one has three. Of those microblades with multiple arrises, five are parallel indicating the cores from which they were struck were highly standardized. None of these tools exhibit evidence of hafting modifications, polish, or proximal end modification, and none of them are retouched. Eight microblades do, however, have use-wear in the form of edge rounding (N=1), and edge rounding and step fracturing (N=7). None of these tools are rejuvenated.

Cores

There are 13 cores in this assemblage accounting for 1.3% of the artifact total. All are made of poor quality, fine-grained chert, and cortex frequencies are extremely high (69.2%). Six raw material colours are recorded but two account for 69.2% of all frequencies (1, 5). Mean core weight is 9.52 g (R = 41.9, S^2 = 124.4, S = 11.15) and the measures of dispersion indicate an extreme level of internal variation. Nine cores are complete and four consist of fragments. Striking platforms are either unprepared and cortical (N=7) or chipped (N=6). While only two cores exhibit platform battering, both are clearly associated with low skill levels (see Figure 6.6). Direction of force application is multi-directional for nine and unidirectional for four indicating the use of a more generalized technological strategy. The mean number of flake scars is 4.54 (R = 4.0, S^2 = 1.60, S = 1.27). Evidence of secondary distal crushing is moderate with five cores possessing this state. There is no evidence of secondary use of these artifacts.

Sandy Point (LlDv-10): Macro-Scale Interpretations

The principal lithic technological activities pursued at this site include raw material testing, early stage core reduction, and the production of tool preforms and blanks. The extreme homogeneity in raw material type and quality observed in the debitage assemblage indicates local chert sources were exploited. The wide variety of raw material colours and high incidence of cortex further indicates these sources comprised small cobbles or nodules. Since this chert is of consistently poor quality, toolmakers likely wanted to ensure they obtained the best possible stone for tool production; therefore, raw material testing is expected. The comparatively high frequency of moderate to large flakes with varied colours, extensive cortical cover, and traits associated with early stage core reduction and the use of heavy force loads indicates many nodules were worked; but only a few of them were selected for further reduction at this site.

Five colours of chert with consistent raw material textures and quality dominate the overall frequencies in the size 1 (94%) and 2 (84%) categories. These flakes have moderate dorsal scar counts, single and multi-faceted platforms, and lack heavy percussion features. In terms of the reduction continuum, these types of flakes are associated with the early stages of tool production where blanks and preforms are roughed out. However, these tools were not finished here given the virtual absence of size 1 flakes with elaborate striking platforms, interior surface lipping, and high dorsal scar counts. It is possible this pattern was created by post-occupational damage to the site or inconsistent screening methods during excavation. But the presence of several rejected bifacial preforms made of this local chert support the interpretation that tool production at this site did not involve late stage tool reduction and/or finishing. The distributions for flake size grades and dorsal scar counts reflect this as well. More than half of the flakes (68.2%) are larger than 1/4" in size and have low to moderate dorsal scars. This is the only site examined in this study where size 1 flakes do not dominate the entire assemblage.

The Percent Type calculations for Sandy Point indicate 80.3% of the assemblage derives from tool production activities while 23.3% is from core reduction. These figures total 103.6%, which is within the expected range of error. These figures are consistent with the other lines of evidence already discussed since the production of multiple tool preforms would generate considerably more lithic debitage than would activities associated with raw material testing and early stage core reduction, particularly if some cores or nodules were removed from the site for further reduction elsewhere. It should be noted, however, the higher recorded frequency of tool production may be slightly overestimated since many of the flakes in this assemblage that were produced during early stage core reduction are larger than 3/4" in size and, therefore, are not included in this equation. The Sullivan and Rozen (1985) method also supports the inference that tool production was the dominant activity with medial/distal and proximal flakes (75.5%, N=888) outnumbering complete flakes and shatter (24.5%, N=288). The flake-to-tool ratio is 13:1, which is higher than those recorded for the coastal sites and demonstrates some lost tool utility was being replaced through the production of new tools.

The other artifact categories included in this assemblage indicate that some tools were made for immediate use and then abandoned. These expedient implements would further contribute to a higher incidence of tool production debris. With the exception of four burins and two informal tools, all of the used flakes, informal tools, and burins (N=38) are made on large flakes exhibiting traits associated with early stage reduction. These flakes appear to have been selectively removed from the debitage assemblage since the raw material attributes for these implements are identical to those observed for the debitage in terms of type, texture, quality, colour, and cortex. These burins are not intensively used and exhibit comparatively little modification given that the original flake attributes are still plainly visible on nearly every tool. The high frequency of primary burin spalls indicates new burins were being made but not intensively used or resharpened. While the exterior RII for the informal tools is fairly high, this figure is inflated by the recorded value for one tool; otherwise, these implements are not intensively worked and used either.

Several heavily curated implements, including bifaces (N=2), scrapers (N=3), and burins (N=4), were brought to the site in a reduced state and abandoned without further modification. The near-total absence of the materials from which these tools are made in the debitage assemblage supports this. The practice of tool abandonment is common when toolmakers are in areas where new lithic sources can be readily procured, such as quarries (e.g. Gramly 1984). The functional diversity of these formal types is comparatively low, however, suggesting the individuals who occupied the site were not carrying a complete toolkit.

The abandoned bifacial preforms all exhibit production flaws such as stacked fractures and failed edges; some also broke during manufacture. Since raw material is abundant in the inland areas, toolmakers could afford to be choosy about the quality of the tools being roughed out for future use. If they were likely to fail or could not be salvaged, they were left behind.

Despite this, other tools made at the site were removed when they occupants left, most notably a microblade core(s). It is likely other preforms, tool blanks, and cores were removed from the site since raw material testing, core reduction, and limited tool production were the primary site activities.

The absence of structural features and faunal remains strongly suggests the site's occupants did not stay long. Since preservation conditions at Mosquito Ridge are good, it seems likely they would be equally good at Sandy Point given the short distance between the sites. Therefore, if animal carcasses were brought to Sandy Point for processing and consumption, the remains would preserve. The fact they are not present strongly suggests the occupation was ephemeral and that the actions of the occupants were focused on technological activities. As Beck *et al.* (2002:488) and Kelly (2001:68) note, in order for hunter-gatherers to spend time acquiring and processing toolstone, they must give up the opportunity to do something else, which in this case appears to be hunting. Because lithic raw material was being readily procured for retooling and expedient tool use, Sandy Point is determined to be a warm season occupation where raw material testing and acquisition were the principal activities.

Sandy Point: Micro-Scale Interpretations

Micro-scale patterns of variation in this assemblage are especially interesting because they demonstrate the presence of low skill level at this site. Previous explanations for the "crude" appearance of this assemblage attributed it to the selective use of an expedient technological strategy during the warm season when raw material sources were readily available (Milne 1999, 2000a). While some of these tools are the result of expedient manufacture and use, some are clearly the products of novice flint knapping episodes. The most obvious examples of this include a heavily battered core and several rejected bifacial preforms (see Figures 6.6, 6.7, and 6.8, respectively). These tools closely mirror those illustrated by Shelley (1990), which were made by contemporary novice knappers. Evidence of low skill is also present in the debitage with moderate frequencies of flakes displaying minimally modified, crushed, and battered platforms; evidence of excessive force, and hinged, stepped, and outrepassé distal states. Figure 6.9 illustrates a flake from the Sandy Point debitage that exemplifies these attribute states.

Because variation attributable to low skill level co-occurs with flakes and tool artifacts exhibiting more advanced skill (i.e. microblades, scrapers, burins), it is evident novices and experts were working together in the same vicinity at the Sandy Point site. In other words, the assemblage exhibits qualitative variability in terms of skill level. The conditions for this to occur are ideal since the site is located in an area where raw materials and food resources are abundant. The availability of these resources combined with a warm season occupation would have created a more relaxed social atmosphere in which novices could learn and practice this skill. However, there is no variation in the reduction strategies used, indicating activities were still very much focused on raw material acquisition.

The ephemeral nature of this occupation, the absence of structural features, and the low diversity in formal tool types suggests the entire social group was not present at this site. Furthermore, the absence of faunal remains combined with a focused set of technological activities suggests the occupants comprised a specific task group organized for raw material acquisition. Given the distances to be traveled from the coastal areas to the interior, the individuals comprising this group may have included young men and women who were physically able to make such a journey, and older, more experienced hunters and expert toolmakers. These older individuals were likely responsible for ensuring the younger members of their social network were well equipped to deal with various adaptive contingencies in their social, economic, and physical environment (see Binford 2001:467). The journeys made by these task groups likely had a dual purpose: to acquire a specific resource and to enculturate the younger members of society (see Stout 2002; Weedman 2002). On a purely social level, these trips may have also provided young people the chance to "get away" from the more rigid social and physical structures governing the cold season camps.

There is no evidence in this assemblage to indicate the social relations of production were rigid or that the demands for technological conformity were high. Only one informal tool exhibits retouch on the non-working element (i.e. across its dorsal surface) and only the exhausted formal types, which were not made at this site, display intricate levels of tool finishing (i.e. continuous flake patterns, polish, edge serration). It appears as though the attention of experts was more focused on the activities of the novices and the basic acquisition of raw material. In other words, experts were not spending their time maintaining and repairing existing curated types; nor were they working to replace tools that broke or were near exhaustion. By explicitly considering skill level and social organization as factors contributing to variability, the artifacts in this assemblage are now correctly identified for what they are: some are expediently manufactured tools and rejected preforms, and some are the rejected, unused products of novice flint knapping episodes.

Mosquito Ridge (MaDv-11): Main Site Proper

Debitage

Raw material types are homogeneous with 97.2% of flakes consisting of chert (see Table 6.64). The quality of this material is consistently poor (98%) and fine-grained textures dominate (90.1%) (see Table 6.65). Cortex is recorded on 14.4% (N=1546) of all flakes (see Table 6.66); however, the sheer numbers of small size flakes in this assemblage that do not possess this attribute state (N=8940) deflate the significance of this figure. Of those flakes with cortex, 25% (N=348) occur in moderate to large size grade categories indicating they were removed from larger objective pieces with extensive cortical cover. Raw material colour is variable with 41 recorded categories. Four colours (5, 1, 2, 10) do account for 73.3% (N=7886) of all frequencies but the remaining 2876 flakes are variously distributed among the other 37 colour categories indicating a wide variety of chert was being worked at the site.

Table 6.64 Raw material types, Mosquito Ridge debitage.

	Raw Material Type				
	Chert	Chalcedony	Crystal-quartz	Quartzite	Slate
Debitage	10457	12	267	9	17
Percentage	97.1	0.1	2.5	0.1	0.2

Table 6.65 Raw material texture, Mosquito Ridge debitage.

	Raw Material Texture			
	Vitreous	Fine-grained	Coarse-grained	Very coarse-grained
Debitage	308	9747	647	60
Percentage	2,9	90.5	6.0	0.6

Table 6.66 Percentage of cortex cover, Mosquito Ridge debitage.

	Percentage of Cortex Cover				
	0	1-49%	50-99%	100%	Platform only
Debitage	9216	752	372	182	240
Percentage	85.6	7.0	3.5	1.7	2.2

Table 6.67 Mean weights (g) for Mosquito Ridge debitage, used flakes, and informal tools.

	N	**X**	**R**	**S^2**	**S**
Debitage	10762	0.2	7.4	0.1	0.3
Used flakes	13	1.4	3.0	1.0	1.0
Informal tools	47	0.7	4.4	0.5	0.7

The size grade distribution is unimodal (see Figure 6.10) with 54.8% of all flakes recorded in the size one category. Flake weights are also unimodal in distribution from 0.09 g to 1.5 g (see Figure 6.10) after which they become more variable given the presence of a several large flakes. The mean flake weight is 0.18 g (see Table 6.67). The dorsal scar count distribution is unimodal (see Figure 6.10) and peaks at two scars. Just over 65% of the entire assemblage displays between zero and two dorsal scars (N=7022), and 92.7% of these flakes (N=6508) are in the two smallest size grade categories indicating the objective pieces from which they were struck were not in an advanced state of reduction.

Remnant striking platforms are present on 60.2% (N=6478) of all flakes and 67.7% of them exhibit traits associated with early stage reduction and the use of heavy force loads, including single flake facets, platform crushing and shatter, and/or cortical cover. These flakes are broadly distributed among all size grade categories and possess anywhere from zero to five dorsal scars; however, most of the higher scar counts are on moderate to large flakes. Relatively few flakes (15.8%) in the smallest size grade categories display more advanced platform states and high dorsal scar counts indicating minimal late stage tool production and finishing.

Only 4318 flakes in this assemblage were examined for evidence of platform battering. This attribute state was added to Appendix A after the debitage analysis had begun. Platform battering is moderate (22%, N=944) and 83% (N=783) of these flakes exhibit minimally modified platforms and crushing. Hinge and snap terminations are also recorded on 15.9% (N=150) of them indicating some evidence of low skill level among toolmakers at this site. Interior surface lipping is recorded on 9.5% of all flakes while eraillure scars are present on 10.6%. Bulbs of percussion and compression rings are recorded for 49.7% and 57.3% of all flakes, respectively. The incidence of secondary distal crushing or flake detachment is very low with only 3.2% of all flakes possessing this attribute state. Debitage completion indices and flake breakage patterns are summarized in Tables 6.68 and 6.69, respectively.

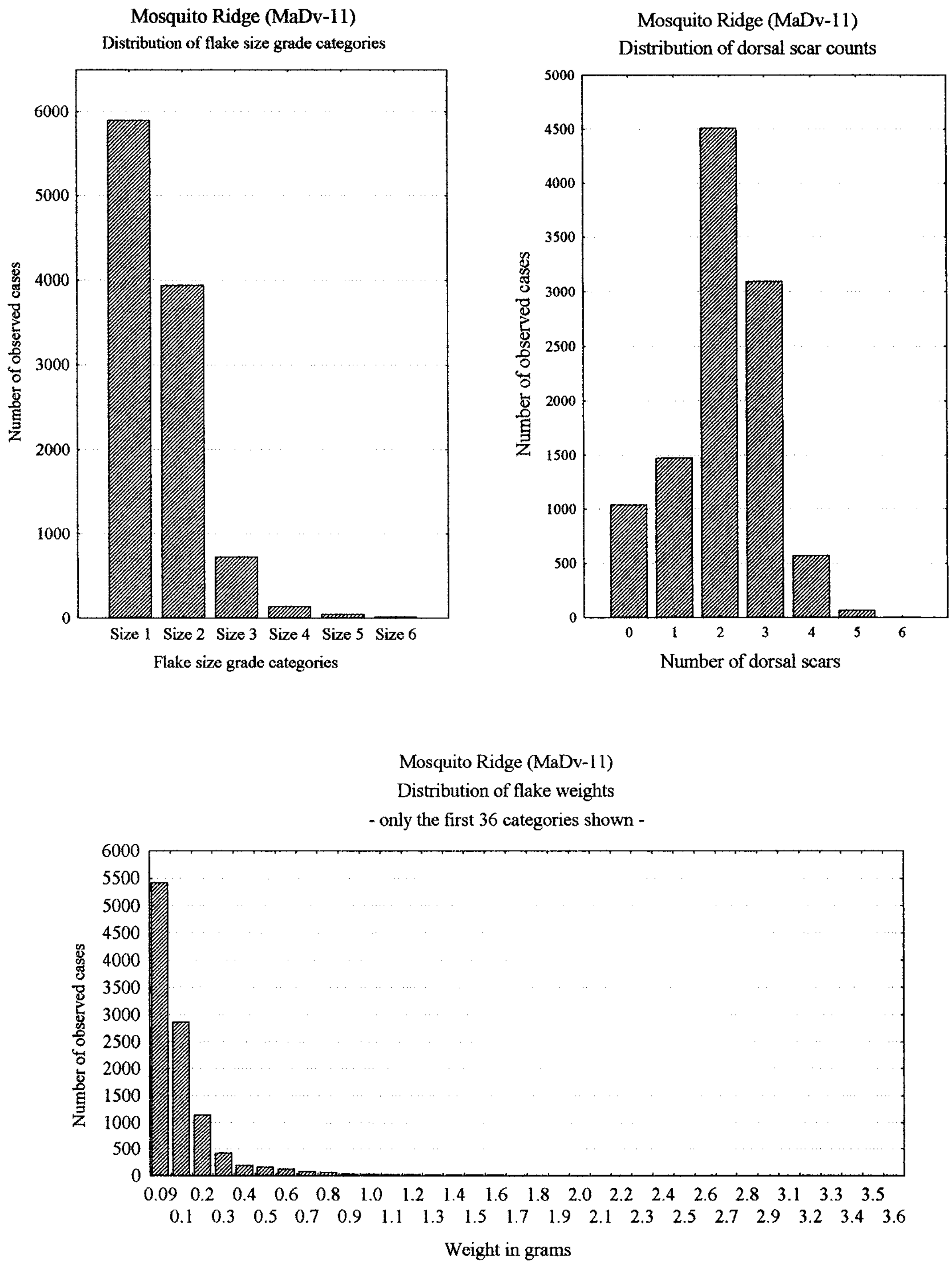


Figure 6.10 Frequency distributions for Mosquito Ridge flake size grade categories, dorsal scar counts, and weight (g).

Table 6.68 Debitage completeness index, Mosquito Ridge assemblage.

	Debitage Completeness Index				
	Shatter	Medial/distal	Split	Proximal	Complete
Frequencies	939	3341	239	5065	1178

Table 6.69 Breakage types and frequencies observed on flake margins, Mosquito Ridge site.

	Margin	**Feather**	**Step**	**Hinge**	**Outrepassé**	**Snap**	**Absent/Ind.**
Debitage	Distal	3025	989	442	50	5315	941
	Proximal	0	656	53	0	2605	7448
	Right	6634	161	13	0	3012	942
	Left	6562	161	9	0	3390	940

Informal Tools: Used Flakes

There are 13 used flakes in this assemblage accounting for 3% of the artifact total. All but one of these tools is made of poor quality, fine-grained chert, and one has cortex. One tool is made of poor quality, vitreous crystal-quartz. Five raw material colours are recorded all of which mirror those observed in the debitage assemblage. Most of these tools consist of moderate to large size flakes with more variable weights (see Table 6.67) and between two to five dorsal scars. Two tools consist of size two flakes, which are fairly small for this artifact category; however, one is entirely cortical while the other has only two dorsal scars indicating they were removed from the debitage during early stage reduction for expedient use.

Remnant striking platforms are present on 11 flakes and include minimally modified states with evidence of crushing and/or cortex. Platform battering is present on four tools while two exhibit evidence of platform trimming. Interior surface lipping (N=1), eraillure scars (N=2), and secondary distal crushing (N=1) occur in minimal frequencies. Bulbs of percussion are present on nine tools while compression rings are present on 12. All tools display use-wear in the form of edge rounding and step fracture terminations, and were used on one (N=11), two (N=1), or three (N=1) margins. Proximal flakes (N=10) dominate this sample as do distal step (N=9) and snap (N=2) fractures.

Informal Tools: Retouched Flakes

Retouched flakes make up 10.6% (N=47) of the artifact count for this assemblage. Raw material types are more variable with 81% made of fine-grained chert, 13% of vitreous crystal-quartz, and 6% of vitreous chalcedony. The quality of these toolstones is marginally better with 15% recorded as unflawed. Cortex cover is moderate (23.1%) and raw material colours (N=10) are similar to those observed in the debitage assemblage. These tools consist largely of moderate size flakes with more variable weights (see Table 6.67), and low to moderate dorsal scar counts. Remnant striking platforms are present on 53.2% (N=25) of flakes, and 68% of them have multiple flake facets; these flakes are moderate to large in size. The remaining platforms include minimally modified cortical states associated with early stage reduction. Evidence of platform battering (N=12) is moderate while platform trimming (N=2) is low. Eraillure scars (N=6) occur in moderate frequencies while interior surface lipping and secondary distal crushing are absent. Bulbs of percussion (50%) and compression rings (81%) occur in moderate to high frequencies.

Most tools are retouched on their exterior surfaces (N=39) but some are retouched on their interior surfaces (N=4) or both (N=4). Exterior surfaces exhibit intense retouch (RII=2.12) while interior surfaces are not as heavily worked (RII=1.42). The shapes of these retouched edges are concave, straight, or convex. Three implements exhibit intentional modification on the non-working portion of the tool (i.e. across the dorsal surface). Evidence of use-wear is moderate (56%). Most tools consist of medial/distal (N=22) and proximal (N=16) flakes but there are also several complete specimens (N=9). Feathers (N=25) and snap fractures (N=15) dominate the distal termination frequencies.

Informal Tools: Burin Spalls

There are 90 burin spalls in this assemblage accounting for 20.3% of the artifact total. Most are made of poor quality, fine-grained chert (7%). Cortex cover is low (6.7%). Ten raw material colours are recorded but the same four dominant colours observed in the debitage assemblage (5, 1, 2 10) account for 80% of frequencies. Secondary spalls (N=55) outnumber primary spalls (N=35), and 90% are either complete (N=52) or proximal (N=29) sections. Most platforms (83%) display advanced states of preparation; however, some are minimally modified with remnant cortical cover (17%). Bulbs of percussion are common (85%) while compression rings are present on only half of these artifacts. The degree of dorsal flaking is variable and is evenly distributed among all recorded categories. Only two spalls exhibit evidence of post-detachment modification and use. Table 6.70 summarizes the metrical attributes for this category. Distal states include feathers (N=32), hinges (N=10), and step (N=17) and snap (N= 31) fractures.

Table 6.70 Metrical attribute summaries for Mosquito Ridge burin spalls.

	N	X	R	S^2	S
Length	52	12.3	15.7	11.26	3.36
Width	90	3.07	3.6	0.48	0.68
Thickness	90	1.08	2.4	0.21	0.45
Weight	90	0.10	0.11	0.001	0.03

Formal Tools: Burins

There are 24 burins in this assemblage accounting for 5.4% of the artifact count. Most (N=23) are made of poor quality, fine- to coarse-grained chert, and seven have cortex. One burin is made of good quality, vitreous crystal-quartz. Raw material colours are variable with 11 different shades recorded; however, all reflect those represented in the debitage and burin spall categories. Remnant striking platforms are visible on 14 tools and include higher frequencies of minimally modified, crushed, and/or cortical states (N=11). Additional evidence of platform battering (N=5), eraillure scars (N=6), bulbs of percussion (N=15), and compression rings (N=16) indicate many of these flakes were detached using heavier force loads during early stage reduction and were selectively removed from the debitage for further use.

Nearly all of these burins are complete (N=19) or near complete (N=4), and have obtuse (N=18) or perpendicular (N=4) working edges. Lateral margins are symmetrical for seven tools and asymmetrical for 15. Four burins are laterally thinned to facilitate hafting. Basal element outlines are straight (N=6), convex (N=12), concave (N=1), and bivectoral (N=1), and only five are symmetrical in form. Table 6.71 summarizes the metrical attributes for this category. Measures of dispersion indicate a fairly high degree of variability in tool length and width.

Table 6.71 Metrical attribute summaries for Mosquito Ridge burins.

	N	X	R	S^2	S
Length	19	20.94	20.1	30.3	5.5
Width	22	12.78	15.1	10.86	3.3
Thickness	24	4.14	5.1	1.7	1.31
Weight	24	1.16	2.5	0.36	0.6

Primary flake scars are unifacial on 11 burins and bifacial on nine; four tools show no post-detachment modification other than their spalled edge. Secondary flake scars are unifacial on eight burins and bifacial on 12. Of those burins with secondary flake scars, five are continuous in pattern and 15 are discontinuous. The degree of flaking on 16 burins ranges from none to moderate indicating most of these tools were not intensively worked and maintained. Six burins do, however, exhibit more intense flaking.

Polish is observed on two tools and is located on the ventral and dorsal surfaces, respectively. Eight burins have modified basal elements; six are thinned unifacially and two bifacially. Most burins have one working edge (N=20) but three have two locations. Many of these tools are not intensively used and display between one and three scars (N=14). The mean number of spall scars is 3.0 ($R = 8.0$, $S^2 = 4.39$, $S = 2.10$). None of these tools are rejuvenated.

Formal Tools: Bifaces

Bifaces make up 8.6% (N=38) of the artifact total in this assemblage and most are made of poor quality, vitreous (N=1) or fine-grained chert (N=34), with minimal cortex (N=3). Three bifaces are vitreous, crystal-quartz, two of which are unflawed toolstone. Nine raw material colours are recorded and all of them mirror those observed for the debitage assemblage. Only three bifaces are complete (see Table 6.72). There are 14 bifacial edges in this assemblage indicating tools were being repaired and maintained at the site.

Of those bifaces with intact blade elements, three are symmetrically straight (N=2) and convex (N=1) while five are asymmetrical. Blade element cross-sections are plano-convex (N=2), plano-triangular (N=2), and biconvex (N=13). Edge sinuosity is comparatively low with ten tools displaying straight edges, 11 with slightly sinuous edges, and only two with moderately sinuous edges. The occurrence of stacked fractures is even lower with only three tools possessing this trait. Given the low frequencies of these attribute states and the fact none of them co-occur, it is highly unlikely unskilled toolmakers made these implements. They all appear to be preforms that either broke while being shaped or failed during thinning. Table 6.73 summarizes the metrical attributes for this artifact category. There is a pronounced degree of variation in tool length and width. Much of this variation can be attributed to the large, unfinished bifacial blanks in this assemblage.

Hafting modifications are recorded on six bifaces: two are side notched, two are stemmed, one is pointed, and one is laterally thinned. Basal elements are straight (N=4), convex

(N=6), or triangulo-concave (N=1) in outline, and eight are symmetrical while three are asymmetrical. Primary flake scars are bifacial on all tools. Secondary scars are bifacial on 23 tools and unifacial on one. Only five bifaces have continuously patterned secondary flake scars. The degree of flaking on these tools is recorded as low (N=5), moderate (N=12), and intense (N=7). Edge serration is present on four bifaces. None of these tools are polished. Basal element modification is recorded on 13 tools all of which consists of bifacial thinning. Ten tools display some evidence of use-wear in the form of edge rounding (N=3), step fracturing (N=2), and a combination of these states (N=5). None of these tools are rejuvenated. Table 6.74 summarizes the breakage types observed for these tools.

Table 6.72 Completeness Index for Mosquito Ridge bifaces.

	Complete	**Tip missing**	**Tip, blade element missing**	**Basal, haft elements missing**	**Tip, basal, haft elements missing**	**Longitudinal split**	**Blade, basal, haft elements missing**	**Bifacial edge**
Count	3	1	9	2	2	4	3	14

Table 6.73 Metrical attribute summaries for Mosquito Ridge bifaces.

	N	**X**	**R**	**S^2**	**S**
Length	6	23.5	22.1	84.4	9.2
Width	11	12.5	16.8	23.0	4.8
Thickness	23	3.6	4.4	1.4	1.2
Weight	38	0.5	2.4	0.4	0.6

Table 6.74 Breakage patterns for Mosquito Ridge bifaces.

	Margin	**Feather**	**Step**	**Hinge**	**Snap**	**Absent/Ind.**
Biface	Distal	18	1	1	5	13
	Proximal	0	1	0	12	25
	Right	4	0	0	21	13
	Left	18	0	0	7	13

Formal Tools: Scrapers

There are two scrapers in this assemblage accounting for less than 1% of the artifact total. Both are made of poor quality, fine-grained chert, and neither have cortex. Raw material colours reflect the dominant types observed in the debitage and flake tool categories (1, 10). One is complete and one is missing its basal element. Lateral margins are asymmetrical for both. Scraping edges are located on the right laterodistal margins and are symmetrically concave. Typologically, both are concave side scrapers. These tools have no hafting modifications. The basal element on the complete scraper is convex and asymmetrical in outline. Table 6.75 summarizes the metrical attributes for these tools.

Table 6.75 Metrical attribute summaries for Mosquito Ridge scrapers.

	N	X	R	S^2	S
Length	2	33.5	12.0	72.0	8:5
Width	2	16.7	5.0	12.5	3.5
Thickness	2	6.6	2.0	2.0	1.4
Weight	2	3.3	2.6	3.4	1.8

Primary and secondary flake scars are unifacial on both tools and the secondary scars are continuous in distribution. These tools are not polished and the basal element on the complete tool is unmodified. The mean edge angle is 64° ($R = 8.0$, $S^2 = 32.0$, $S = 5.7$). Both scrapers exhibit moderate retouch on their exterior surfaces. The mean RII value is 1.35 ($R = 0.1$, $S^2 = 0.01$, $S = 0.07$). Use-wear in the form of edge rounding and step fracture terminations is present on both tools. One scraper exhibits evidence of rejuvenation and has been spalled on its working edge to form a burinated edge.

Formal Tools: Microblades

Microblades make up 47.4% (N=210) of the artifact count in this assemblage. These tools are made mostly of poor quality, fine-grained chert (N=167) and unflawed, vitreous crystal-quartz (N=26). Lower frequencies of poor quality, vitreous and fine-grained chalcedony (N=7), and coarse-grained chert (N=10) are also present. Raw material colours are variable with 16 shades recorded. All of these colours reflect those observed in the debitage and five of them account for 85.7% of all frequencies (1, 2, 5, 4, 10). However, only seven of these colours are represented in the core assemblage indicating many of these microblades (N=57) were struck from cores that were subsequently removed from the site. Few of these tools are complete (N=8) and medial fragments dominate the completeness index (see Table 6.76).

Table 6.76 Completeness index for the Mosquito Ridge microblades.

	Complete	**Proximal section**	**Medial section**	**Distal section**	**Proximal/ medial sections**	**Medial/distal sections**
Count	8	14	113	7	49	19

Remnant striking platforms are present on 35.2% (N=74) of these tools and 51.5% of them have advanced states of preparation including multiple flake facets, grinding or abrasion, and evidence of platform trimming (35%) indicating more effort and skill was invested in their detachment. The remaining platforms are minimally modified with evidence of crushing and cortex. Platform battering (19%) and eraillure scars (11%) indicate the use of heavier force loads, as does the prevalence of bulbs of percussion on those tools with platforms (99%). Compression rings are also common (86%). Table 6.77 summarizes the metrical attributes for this category.

Table 6.77 Metrical attribute summaries for the Mosquito Ridge microblades.

	N	X	R	S^2	S
Length	8	19.5	14.4	25.6	5.1
Width	201	6.8	9.0	2.7	1.6
Thickness	210	2.0	4.0	0.5	0.7
Weight	210	0.2	1.5	0.03	0.2

Lateral margins are symmetrically straight (N=139) and convex (N=19) on 73.8% of all microblades while 55 have asymmetrical margins of various shapes. Corner notching is present on ten tools and two are stemmed. Single dorsal arrises are recorded on 92 tools, 107 have two arrises, and seven have three arrises. Of those microblades with multiple dorsal arrises, 82 are parallel indicating a high degree of standardization in the cores from which they were struck. Polish is recorded on two tools and is located on the proximal and distal ends, respectively. None of these microblades have been modified on their proximal ends.

Retouch is present on 27 tools and is located on their interior (N=7) or exterior surfaces (N=20). The degree of retouch observed ranges from low to moderate and is reflected in the low values recorded for the Retouch Intensity Indices on the interior (RII = 1.19) and exterior surfaces (RII = 1.38). Evidence of use-wear is high with 41 tools displaying edge rounding and 155 with edge rounding and step fractures. Two of these tools are rejuvenated.

Cores

There are 19 cores in this assemblage accounting for 4.3% of the artifact total. Most are made of poor quality, fine-grained chert and cortex cover is high (52.6%). Two cores made of poor quality, vitreous crystal-quartz, both of which lack cortex. While raw material colours are variable with 10 colours recorded, the same four dominant colours observed in the debitage and flake tool categories account for 68% of all frequencies among the cores (1, 2, 4, 10). The remaining colours are unusual and are represented in very small frequencies in the debitage and tool categories indicating these objective pieces were brought to the site and abandoned. The mean core weight is 2.98 g (R = 16.8, S^2 = 14.28, S = 3.78). Platform states are unprepared and cortical (N=4), chipped (N=9), and chipped and cortical (N=4). There is no evidence of platform battering. Direction of force application is unidirectional for 11 and multidirectional for eight indicating a higher incidence of standardized core technology. The mean number of flake scars is 5.21 (R = 5.0, S^2 = 1.73, and S = 1.32). Secondary distal crushing is present on eight cores and none exhibit evidence of secondary use.

Mosquito Ridge (MaDv-11): Macro-Scale Interpretations

The principal lithic technological activities pursued at this site include core reduction and the production of tool preforms and blanks. Like Sandy Point, the extreme homogeneity in raw material type and quality combined with pronounced variation in colour indicates local chert sources were exploited; however, the levels of cortex recorded at Mosquito Ridge are notably lower considering the size of this assemblage. Since the "package" size and type (Bradbury and Franklin 2000) of this material consists of cortical nodules and cobbles, the lower incidence of cortex indicates some of the material worked at Mosquito Ridge was brought to the site in a reduced or semi-reduced state. While raw materials are abundant in the interior, they are broadly distributed across the landscape given their depositional context. Therefore, if toolmakers set out from the site to acquire raw material and then tested it for quality, as they were doing at Sandy Point, it would make sense for them to partially reduce the nodules if they were transporting them to a secondary location for the purpose of tool production. As Beck *et al.* (2002:481) note, "rocks are heavy" and when raw material must be transported, excess weight will be removed to facilitate this. However, the traveling distance and the utility of the toolstone will determine the degree of reduction. Still, these behaviours would explain the lower incidence of cortex at Mosquito Ridge.

The unimodal distributions for flake size grade, dorsal scar count, and weights all indicate the use of a single reduction strategy. Moreover, the high frequencies of flakes in all size grade categories with minimally modified platforms, low dorsal scar counts, and evidence of heavier force loads indicate this strategy focused on core reduction and the production of tool preforms and blanks. While size one and two flakes dominate this assemblage, their combined attribute states demonstrate they were detached from tools that were not in an advanced state of reduction. Given the low frequencies of finishing flakes in this assemblage, it is certain the preforms and blanks made here were completed somewhere else. Like Sandy Point, the stages of the reduction present at Mosquito Ridge are principally early to middle.

The Percent Type calculations for Mosquito Ridge indicate 57.7% of the assemblage derives from tool production activities while 43.5% is from core reduction. These figures total 101.2%, which is within the expected range of error. This breakdown of technological activities is consistent with the patterns observed in the debitage assemblage and indicates toolmakers were intensively reducing cores to manufacture blanks and preforms; they were also preparing cores for use in other site locations. The presence of cortical microblades and microblades with single dorsal arrises made on materials not represented in the recovered core assemblage strongly suggests toolmakers were fashioning cores out of local materials and then removing them from the site for future use. Prepared cores, whether they are standardized or generalized, provide valuable sources of raw materials when access to toolstone is restricted (Andrefsky 1998; Beck and Jones 1990; Kelly 1988). Given the geological and seasonal conditions that restrict access to this resource in the southern Baffin region, manufacturing cores of this nature to mitigate such shortfalls is entirely expected.

The Sullivan and Rozen (1985) method also supports the inference that tool production and core reduction were occurring at the site; however, medial/distal and proximal flakes (80%, N=8645) far outnumber complete flakes and shatter (20%, N=2117) suggesting tool production was pursued more intensively. This disproportion can be explained, in part, by the fact some flakes undoubtedly failed during detachment because of the flaws in the toolstone. When force is applied to flawed toolstone, especially when using hard percussors during early stage core reduction, flakes are more likely to break and shatter (Wenzel and Shelley 2001:118). Therefore, some of the flake breakage recorded for this assemblage can be attributed to raw material failure. It is also likely this higher incidence of flake breakage is the result of post-occupational factors, namely trampling by caribou and later occupants at the site. The flake-to-tool ratio is 35:1, which is the highest recorded for all the site components included in this study. This ratio further demonstrates tool utility was being renewed through the intense production of preforms, blanks, and prepared cores. In other words, the occupants of the site were retooling and planning for future technological needs.

The used flakes in this assemblage all exhibit traits associated with early stage reduction. Their large size, low dorsal scar count, higher cortex frequencies, and colour similarities to the debitage demonstrates these flakes were selectively removed for expedient use. Raw material attributes recorded for the informal tool categories are slightly different, however. Several tools are made on flakes of unflawed crystal-quartz and chalcedony, and the striking platforms on these tools are more advanced suggesting they were struck from prepared cores. The fact these materials are not present in the core assemblage demonstrates these objective pieces were removed from the site. Moreover, the lower frequencies of these materials (particularly the chalcedony) in the debitage assemblage further indicates these cores were brought to the site ready made. Still, there are comparatively high frequencies of informal tools made on moderate to large flakes of local chert that were removed from the debitage assemblage for further modification and use.

Other expedient tools included in this assemblage include burins, two sidescrapers, and a large number of microblades. Many of the burins are made on flakes removed from the debitage and display little post-detachment modification. These tools were not intensively used and were abandoned with considerable utility remaining. However, the presence of several heavily flaked primary burin spalls with elaborate striking platforms indicates the tools from which they were struck were likely made at the site and then removed. The small frequencies of curated burins included in the assemblage appear to have been brought to the site in a reduced state and discarded in the process of retooling. The scrapers are also made on flakes of local chert and while these tools are more intensively worked, they too were discarded with considerable utility remaining. It is important to note that scrapers are rare in this assemblage suggesting the activities associated with these tools were not intensively practiced at this site. Microblades appear to have been made, used expediently, and abandoned given the high frequency of used specimens and low incidence of retouch. Since raw material is abundant in this area, expedient use of microblades is not unexpected. These tools provide sharp edges and can be easily detached from prepared cores. And, since raw material is readily available, conservation of these cores may not have been a concern since new ones could be readily made.

The bifaces are very fragmented and several clearly failed during production resulting in their discard. The presence of bifacial edges indicates some tools were repaired, and several bifacial base and haft elements suggests tools that broke during use were returned to the site where they were removed from the haft and replaced. Some formal tools are heavily curated and were brought to the site in a reduced state without being intensively worked or used prior to their abandonment. One sideblade and a core fragment made of unflawed, vitreous gray chert are examples of this selective discard since there are only three flakes of this material in the debitage assemblage (see Figure 6.11).

The size of this assemblage and its distribution over such a large area indicates the tool production activities were intensively pursued at Mosquito Ridge and that the Pre-Dorset likely returned to this site on multiple occasions. Given the availability of raw materials within the interior region, sites like Sandy Point are expected as the norm where individuals could have acquired toolstone and made tools on the spot. However, it seems the Pre-Dorset came specifically to Mosquito Ridge to undertake tool production. One reason for this might be the accessibility to avian resources in this region of Burwash Bay. Stenton (1989:250) states nesting waterfowl such as snow geese are plentiful in the low-lying marsh areas surrounding this site and would certainly have attracted settlement in this vicinity. These birds are easily caught during the annual moult and Mosquito Ridge is one of the few sites Stenton (1989:330) investigated where bird remains outnumbered other faunal resources, namely caribou, in warm season features.

The faunal assemblage excavated from Mosquito Ridge indicates a heavy exploitation of snow geese during the Pre-Dorset occupation of this site (Donnelly 2002; see Appendix C). This species undoubtedly provided the Pre-Dorset with a reliable, easily acquired, and rich source of food while they engaged in lithic technological activities. The large quantity of bird remains at the site suggests toolmakers timed their arrival in the interior to coincide with the annual moult, which also starts before the mosquito infestation. The mosquitoes are so intense in this inland area that even the caribou move to higher ground where the wind provides refuge from these relentless pests (Stenton 1989). These insects would pose similar irritations for Pre-Dorset task groups occupying this area. While the presence of bugs likely would not have prevented the Pre-Dorset from engaging in tool production, it probably influenced their preference about when to come to the site. In other words, if fat-rich, flightless geese are available during the late spring/early summer when there are no mosquitoes, it provides a very appealing atmosphere in which to work stones compared to later in the summer when the birds begin to regain flight and bugs are abundant. The dominance of snow geese in the faunal assemblages and the evidence of intense core and tool production activities at Mosquito Ridge indicates the Pre-Dorset were not at this site to hunt caribou; rather, they were here to renew their toolstone supply and retool.

Like Sandy Point, there is no definitive evidence of structural features at the Mosquito Ridge site. It is possible tent ring perimeter rocks were scavenged by later Neo-Eskimo occupants at the site; however, there are no appreciable gaps in the distribution of debitage in any of the excavated units indicating reduction activities were not spatially restricted at the site. If there were gaps, they would provide some evidence as to where tent walls might separate outside activities from inside activities. They would also provide insights as to the location of separate activity areas. It is possible the site occupants reduced chert inside and outside their dwelling structures, which would effectively reduce the visibility of these gaps. This would make sense if they occupied the site when the mosquito infestation was intense since the confines of a structure provide some relief from insects. But if tool production were the principal activity pursued, there would be no need to spatially separate activities since everyone would be doing the same thing.

Mosquito Ridge (MaDv-11): Micro-Scale Interpretations

Micro-scale patterns of variation in this assemblage indicate novices were not engaged in tool production activities at Mosquito Ridge to the same extent as they were at the Sandy Point site. Comparatively few flakes (3.5%) in the debitage can be attributed to low skill. Moreover, formal tools like bifaces and cores made by novices are not present in noticeable frequencies. Simply stated, there are few abandoned tools that can be attributed to novice tool making. The social relations of production appear to have been more structured at this site, which would explain the lower incidence of novice participation.

Several informal tools and one rejected biface preform demonstrate some toolmakers invested a greater degree of time and effort in working these artifacts. The informal tools all display retouch on their non-working margins and the preform has finely serrated edges. Since none of these artifacts display use-wear, they appear to have been made for the sake of making them. In other words, toolmakers were demonstrating their "technical know-how" (Dobres 1995:40).

This seeming shift in the realm of technological production is likely tied to the intense focus placed on raw material acquisition and tool production at this site. Because the Pre-Dorset were here for this purpose, they undoubtedly wanted to secure an abundant supply of toolstone to satisfy their immediate and future technological needs. And, given the distances to be traveled back to the coastal regions, it would make sense to reduce this material as much as possible to facilitate transport (see Beck *et al.* 2002). Depending on the utility of the toolstone and the toolmakers' intention for the final product(s), cobbles may be reduced into blanks, preforms, and prepared cores. These forms enable more useable raw material to be carried but they are still general enough that any type of formal tool can be made from them. Preparing material in this manner places different demands on people's time. Consequently, the attention of experts would necessarily be directed more towards this task than towards teaching novices about tool production. If the Pre-Dorset failed to get what they needed while they were inland, the potential for their entire group to suffer serious raw material stress throughout the remainder of the seasonal round would increase substantially.

Like Sandy Point, the low diversity in formal tool types suggests the whole social group was not present at Mosquito Ridge. The absence of structural features and spatially separate activity areas further supports this inference. This combined with the evidence of intensely focused technological and subsistence related activities indicate the site was most likely occupied by task groups that were specially organized for raw material procurement. Like Sandy Point, the composition of these groups also likely included younger individuals, and expert toolmakers and hunters.

The size of Mosquito Ridge suggests the site may have been a focal point for the inland region where distant groups of Pre-Dorset came to meet. Stenton (1989:335) states this was likely a function of the site during the Thule and historic periods given its central location in the interior lakes region. The confluence of critical resources at this site (i.e. birds, toolstone, caribou) makes the site attractive for human occupation, so the fact people occupied it for thousands of years hardly seems fortuitous. The change in the social relations of production provides support for this inference since meeting up with distant groups would certainly change the dynamics among all individuals particularly if group alliances were being reaffirmed and prospective marriages arranged. Despite the potential diversity in these types of interactions and the people involved, they did not affect the intensity of tool production or the technological strategies used at the site. The Pre-Dorset came to Mosquito Ridge to work toolstone and socialize because the availability of birds could provide them with an easily acquired food source to sustain them while they retooled and interacted with others. The season of occupation would necessarily be in the late spring/early summer since this is when the birds are in this area, their fat stores are rich, and they are moulting. Moreover, there is no ground cover (i.e. ice and snow) impeding access to local raw materials.

Mosquito Ridge West (MaDv-11)

Debitage

Raw material types are very homogeneous with 98.6% of all flakes consisting of chert (see Table 6.78). The quality of this material is poor (99.1%) and largely fine-grained in texture (see Table 6.79). Cortex is recorded on 17.8% (N=884) of all flakes and 22.7% of them (N=196) are in the moderate to large size grade categories indicating the objective pieces from which they were struck consisted of local chert nodules (see Table 6.80). There are 33 different raw material colours present in this assemblage; however, seven of them (1, 5, 2, 10, 22, 8, 20) account for 94.4% (N=4594) of all frequencies. The remaining colour categories have few flakes recorded in each of them indicating the objective pieces from which they were struck were not extensively worked.

Table 6.78 Raw material types, Mosquito Ridge West debitage.

	Raw Material Type				
	Chert	Chalcedony	Crystal-quartz	Quartzite	Slate
Debitage	4800	26	29	2	9
Percentage	98.6	0.5	0.6	0.1	0.2

Table 6.79 Raw material texture, Mosquito Ridge West debitage.

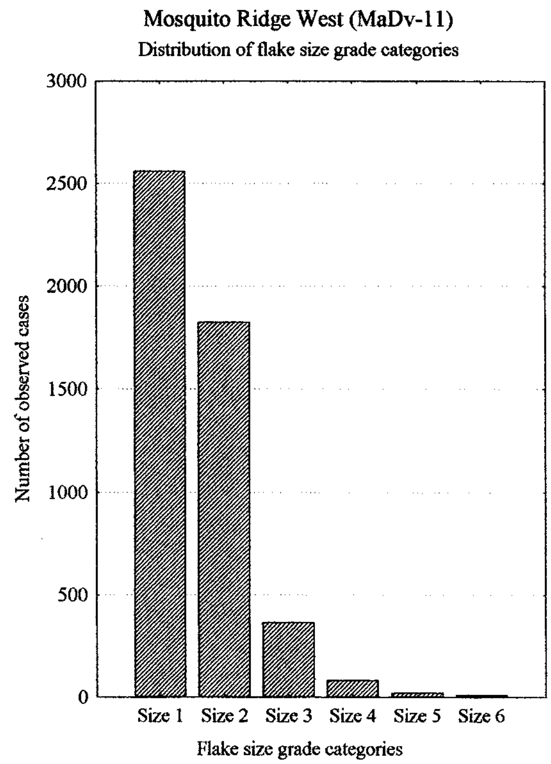
	Raw Material Texture			
	Vitreous	Fine-grained	Coarse-grained	Very coarse-grained
Debitage	64	4364	389	49
Percentage	1.3	89.7	8.0	1.0

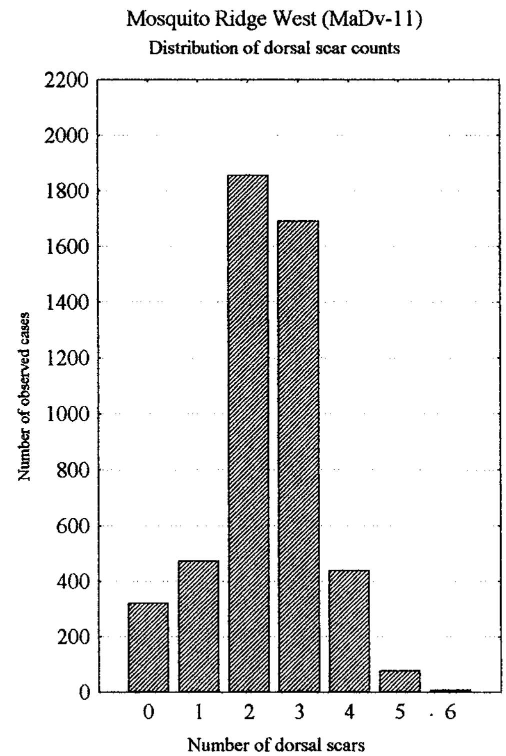
Table 6.80 Percentage of cortex cover, Mosquito Ridge West debitage.

	Percentage of Cortex Cover				
	0	1-49%	50-99%	100%	Platform only
Debitage	4002	448	161	70	185
Percentage	82.2	9.2	3.3	1.5	3.8

The size grade distribution is unimodal (see Figure 6.12) with 90.2% of all flakes recorded in the two smallest categories. Flake weights are also unimodal in distribution for values between 0.09 g and 1.2 g (see Figure 6.12). The mean flake weight is 0.18 g (see Table 6.81) and the measures of dispersion indicate a comparatively low degree of variability. The dorsal scar count distribution is unimodal (see Figure 6.12) and peaks at two scars. More than half of all flakes (54.5%) possess zero to two scars, and of these, 50% are in the smallest size grade categories.

Remnant striking platforms are present on 62.7% (N=3072) of all flakes and 59.2% of them have minimally modified states with evidence of crushing, shattering, and/or cortex. These flakes are variously distributed among all size grade categories and exhibit between zero and five dorsal scars. Only 20.7% of flakes recorded in the smallest size grade categories display more advanced platform states and high dorsal scar counts (i.e. $3 \geq$ scars), indicating late stage reduction (i.e. tool shaping, finishing) was not intensively pursued at this site. Evidence of platform battering (33%, N=1016) is moderate while platform trimming is low (6.5%, N=201). Flakes with battering, minimally modified platforms, and step and hinge terminations total 3.4% of the entire assemblage indicating the presence of low skill level among toolmakers at the site. If flakes exhibiting these same attributes but with distal snap fractures are added, this figure rises to 11.5%. Interior surface lipping is observed on only 6.6% of all flakes while eraillure scarring is present on 15.6%. Bulbs of percussion and compression rings are recorded on 55.6% and 84.2% of all flakes, respectively. Evidence of secondary distal crushing is noted for only 9.1% of the assemblage. Debitage completion indices and flake breakage patterns are summarized in Tables 6.82 and 6.83, respectively.





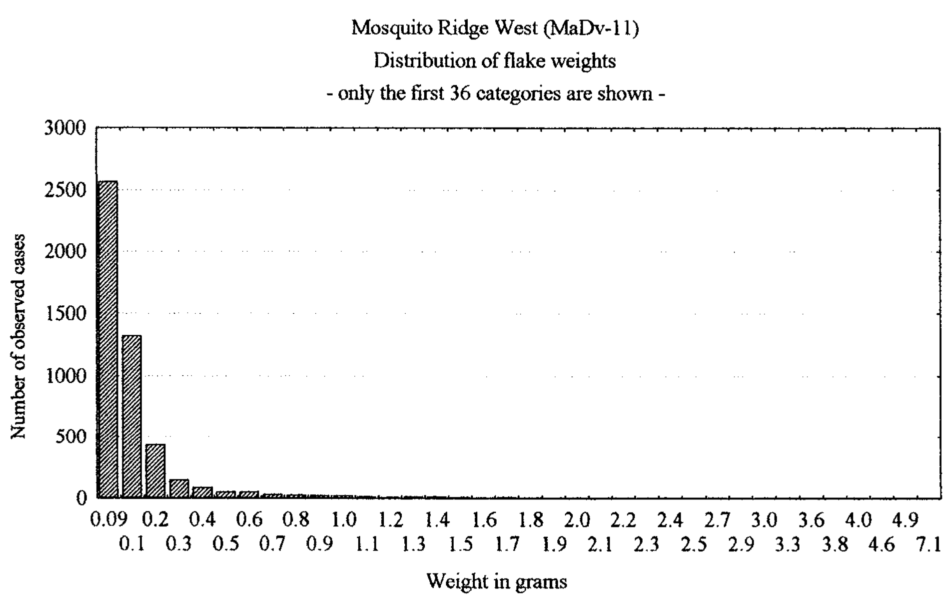


Figure 6.12 Frequency distributions for Mosquito Ridge West flake size grade categories, dorsal scar counts, and weights (g).

Table 6.81 Mean weights (g) for Mosquito Ridge West debitage, used flakes, and informal tools.

	N	X	R	S^2	S
Debitage	4886	0.2	11.8	0.2	0.4
Used flakes	19	0.9	1.8	0.4	0.6
Informal tools	34	1.0	7.6	2.0	1.4

Table 6.82 Debitage completeness index, Mosquito Ridge West assemblage.

	Debitage Completeness Index				
	Shatter	Medial/distal	Split	Proximal	Complete
Frequencies	292	1521	50	2358	645

Table 6.83 Breakage types and frequencies observed on flake margins, Mosquito Ridge West.

	Margin	Feather	Step	Hinge	Outrepassé	Snap	Absent/Ind.
Debitage	Distal	1438	343	270	24	2499	292
	Proximal	269	14	0	0	1217	3366
	Right	3174	69	8	0	1323	292
	Left	3188	58	3	0	1325	292

Informal Tools: Used Flakes

Used flakes make up 8.3% (N=19) of the artifact total in this assemblage. All but two of these tools are made of poor-quality, fine-grained chert, with minimal cortex cover (10.5%). The remaining tools are made of poor quality, vitreous crystal-quartz and chalcedony. Eight raw material colours are recorded and three of them (1, 2, 5) account for 74% of all frequencies. These tools consist of small to moderate size flakes (i.e. size 2 to 4) with slightly variable weights (see Table 6.81) and low to moderate dorsal scar counts. Remnant striking platforms are present on 11 flakes and include single flake facets (N=4), multiple flake facets (N=6), and cortical (N=1) states. Evidence of platform battering (N=3), interior surface lipping (N=1), eraillure scars (N=2), and secondary distal crushing (N=2) is minimal. Compression rings are present on 17 tools while bulbs of percussion are present on less than half (N=9). Types of use-wear include edge rounding (N=1), step fracturing (N=3), and a combination of both (N=15). Tools were used on one (N=11), two (N=4), or three (N=4) margins. Proximal (N=9) and medial/distal (N=8) flakes are common and distal states include feathers (N= 5), hinges (N=2), and steps (N=3), and snaps (N=9).

Informal Tools: Retouched Flakes

Retouched flakes make up 14.9% (N=34) of the artifact total in this assemblage. Two tools are made of flawed, vitreous chalcedony while the rest are poor quality, fine to coarse-grained chert. Cortex cover is moderate (23.5%) and raw material colours closely mirror those observed in the debitage assemblage with eight shades recorded. Flake sizes are variable and range across all size grade categories (i.e. 1 to 6); however, 67% are moderate to large in size. Flake weights are more variable as well (see Table 6.81) but dorsal scar counts are low to moderate.

Remnant striking platforms are present on 53% of flakes and 72.2% of them are minimally modified states with evidence of crushing, shattering, and/or cortex cover. Platform battering (N=5), eraillure scars (N=6), platform trimming (N=1) and interior surface lipping are low to non-existent. Secondary distal crushing is also minimal (N=5). Bulbs of percussion (41%) and compression rings (79%) occur in moderate to high frequencies.

These tools exhibit retouch on their interior surfaces (N=10), exterior surfaces (N=21), and on both surfaces (N=3). The intensity of retouch is moderate and exterior surfaces are more heavily worked (RII=1.65) than interior surfaces (RII=1.47). The shapes of these edges are convex, concave, or straight, and 65% display use-wear. Only two tools are retouched on their non-working margins. Three of the implements are made on complete flakes while eight are medial/distal fragments and two are proximal fragments. Distal terminations include feathers (N=7), hinges (N=1), and step (N=6) and snap (N=9) fractures.

Informal Tools: Burin Spalls

There are 37 burin spalls in this assemblage accounting for 16.2% of the artifact total. All are made of poor quality chert that is largely fine-grained (95%) in texture. Eight raw material colours are recorded and the same four dominant colours observed in the debitage and burin categories account for 95% of frequencies in this artifact category (1, 2, 5, 10). The incidence of cortex is low (N=5). Primary spalls (N=20) slightly outnumber secondary spalls (N=17), and 86.5% are either complete (N=24) or proximal (N=8) sections. Striking platforms are somewhat variable with 75% displaying advanced preparation while the remaining 25% exhibit minimally modified states with evidence of crushing and cortex. Bulbs of percussion are present on nearly every artifact (95%) and compression rings are also common (78%). Degree of dorsal flaking is variable with 65% exhibiting low to moderate intensity. Spalls exhibiting intense flaking (N=7) are nearly equal to those that have none (N=6). The fact that four spalls are primary and lack dorsal flaking indicates the burins from which they were struck consisted of unmodified flakes. Only two spalls exhibit evidence of post-detachment modification and use. Table 6.84 summarizes the metrical attributes for this artifact category. Distal states include feathers (N=9), hinges (N=2), and step (N=12) and snap (N=14) fractures.

Table 6.84 Metrical attribute summaries for Mosquito Ridge West burin spalls.

	N	X	R	S^2	S
Length	24	12.6	10.3	9.04	3.01
Width	37	3.43	3.2	0.72	0.85
Thickness	37	1.93	2.8	0.48	0.70
Weight	37	0.12	0.21	0.002	0.05

Formal Tools: Burins

There are 23 burins in this assemblage accounting for 10% of the artifact total. All are made of poor quality, fine-grained chert, and 12 have cortex. Eight raw material colours are recorded and all of them reflect those observed for the debitage and burin spall categories. Remnant striking platforms are visible on 15 burins and include higher frequencies of minimally modified, crushed, and/or cortical states. Additional evidence of platform battering (N=2), eraillure scars (N=4), bulbs of percussion (N=10), and compression rings (N=14) indicate some of these flakes were detached using heavy force loads during early stage reduction and selectively removed from the debitage.

Most burins are complete (N=15) or near complete (N=1). Working edges are obtuse (N=11), arcing (N=1), or perpendicular (N=8). Lateral margins are symmetrical for ten tools and asymmetrical for 11. Side notching is present on one burin and five are laterally thinned to facilitate hafting. Basal elements are straight (N=8), convex (N=10), concave (N=2), or bivectoral (N=1), and ten are symmetrical in outline. Table 6.85 summarizes the metrical attributes for this category.

Table 6.85 Metrical attribute summaries for Mosquito Ridge West burins.

	N	X	R	S^2	S
Length	16	22.3	9.2	7.4	2.7
Width	21	12.35	9.5	4.27	2.07
Thickness	23	4.51	4.6	1.96	1.4
Weight	23	1.24	2.6	0.41	0.64

Primary flake scars are unifacial on 11 burins, bifacial on ten, and two show no post-detachment modification other than the spalled edge. Secondary flake scars are unifacial on 12 tools and bifacial on nine. Of those burins with secondary flaking 14 have discontinuous patterns and seven are continuous. The degree of flaking observed on 14 burins ranges from none to moderate indicating these tools were not worked very intensively. Nine burins do, however, display more intensive patterns. Polish is observed on seven burins and is located on either the distal (N=1) or dorsal (N=6) areas. Those tools with this attribute also display more intensive patterns of flaking indicating they were more heavily curated than the other burins included in this assemblage. Nearly all of these tools have one working edge but one burin has three separate locations each of which has only one spall scar. The intensity of use exhibited by these tools is low to moderate with 18 displaying between one and three spall scars. The mean number of scars is 2.7 (R = 9.0, $S^2 = 3.68$, S = 1.92). None of these tools are rejuvenated.

Formal Tools: Bifaces

Bifaces make up 16.6% (N=31) of the artifact total in this assemblage. Most are made of poor quality, fine-grained chert (N=26), and two have cortex. Five bifaces are made of vitreous crystal-quartz, four of which are poor quality material. Seven raw material colours are recorded (2, 1, 4, 5, 10, 43, 58) but only four of them are represented in notable frequencies in the debitage assemblage indicating some of these bifaces were brought to the site in a finished state and abandoned. The lower frequencies of crystal-quartz debitage in the analyzed samples (N=29) and the comparatively high incidence of bifaces made of this material (N=5) highlight this. If these tools were made at the site, there would be significantly more crystal-quartz debris resulting from this process. Eight bifacial edges are present indicating some tools were repaired and maintained.

Only three tools are complete (see Table 6.86). Of those bifaces that can be oriented, the blade elements on three are symmetrically straight (N=1) or convex (N=2) while five are asymmetrical. Blade cross-sections are plano-convex (N=9), biplano (N=2), and biconvex (N=8). Edge sinuosity is low to moderate with eight edges recorded as straight, five as slightly sinuous, and five as moderately sinuous. Stacked fractures are observed on only four bifaces. Two complete bifaces, one of which is typologically a large side blade, have moderately sinuous edges, stacked fractures, and are un-used. These combined attribute states suggest these artifacts are abandoned preforms since they both have moderate to intense degrees of flaking. It appears these tools could not be thinned after attempts were made to do so and were thus abandoned unfinished. The presence of several biface tips and medial sections indicates some preforms failed during production and were discarded. Table 6.87 summarizes the metrical attributes for this category.

Table 6.86 Completeness Index for Mosquito Ridge West bifaces.

	Indeterminable	**Complete**	**Tip, blade element missing**	**Basal, haft element missing**	**Tip, basal, haft element missing**	**Blade, basal, haft elements missing**	**Bifacial edge**	**Tip, basal elements missing**	**Basal element missing**	**Tip, blade, basal elements missing**
Count	2	3	5	1	4	5	8	1	1	1

Table 6.87 Metrical attribute summaries for Mosquito Ridge West bifaces.

	N	**X**	**R**	**S^2**	**S**
Length	3	34.0	8.5	22.3	4.7
Width	11	16.5	8.9	8.9	3.0
Thickness	21	3.9	3.7	0.9	1.0
Weight	31	0.9	3.9	1.3	1.1

Hafting modifications are recorded on four bifaces: two are side notched, one is stemmed, and one is laterally thinned. Basal elements on six tools are convex in outline and only two of them are symmetrical. Primary flake scars are bifacial on all tools. Secondary flake scars are bifacial on 22 tools and unifacial on one. Patterns of occurrence of secondary flake scars are continuous on four bifaces and discontinuous on 18. The degree of flaking observed on these artifacts is moderate to high for 78.3% (N=18), indicating some were more intensively worked.

Edge serration is recorded on three bifaces. Of the six bifaces with intact basal elements, modification is recorded on three, all of which are bifacially thinned. Six tools display evidence of use-wear in the form of edge rounding (N=2), step fracturing (N=1), and a combination of these states (N=3). None of these tools are polished or display evidence of rejuvenation. Table 6.88 summarizes the breakage patterns for these tools.

Table 6.88 Breakage patterns for Mosquito Ridge West bifaces.

	Margin	Feather	Step	Hinge	Snap	Absent/Ind.
Biface	Distal	9	1	0	10	11
	Proximal	0	1	0	11	19
	Right	16	1	0	5	10
	Left	18	1	2	5	10

Formal Tools: Scrapers

There are five scrapers in this assemblage accounting for 2.2% of the artifact count. All are made of poor quality, fine-grained chert, and two have minimal cortex. Three raw material colours are recorded and all are consistent with those observed in the debitage assemblage. Two scrapers are complete, one is missing its working edge, and one is longitudinally split. One other scraper is broken across its hafting element and both pieces were recovered. This tool is treated as a complete specimen in the assessment of its attribute states. Lateral margins are symmetrical on one tool and asymmetrical on two. The scraping edges are located on the right (N=2) or left (N=2) laterodistal margins, and they are straight (N=1), concave (N=2), or convex (N=2) in shape. Only three edges are symmetrical in outline.

Side notching is present on one tool. Basal elements are straight, concave, or convex, and four are symmetrical in form. Table 6.89 summarizes the metrical attributes for this category. Primary and secondary flake scars are unifacial on all scrapers. Secondary flake scar patterns are continuous on two scrapers and discontinuous on three. One scraper is polished on its left laterodistal margin while another is thinned bifacially on its basal element.

The mean edge angle is 61° (R = 15.0, S^2 = 39.6, S = 6.1). Spurs are recorded on the working edge of the scraper that is broken across its hafting element. The co-occurrence of spurs and this kind of breakage is common among novices particularly when the tools are mounted in hafts or handles. When novices attempt to resharpen these implements or reshape them, they frequently apply too much pressure on the tool resulting in its breakage across the hafting element (Weedman 2002:739-741). A second scraper fragment also appears to be fractured across its hafting element further suggesting novices were working these tools. All of these tools display moderate to intense retouch on their exterior surfaces.

Table 6.89 Metrical attribute summaries for Mosquito Ridge West scrapers.

	N	X	R	S^2	S
Length	3	30.2	6.6	13.5	3.8
Width	4	15.0	3.4	2.2	1.5
Thickness	5	6.3	2.6	1.4	1.2
Weight	5	2.3	3.0	1.3	1.1

The mean value for the Retouch Intensity Index is 1.92 (R = 3.1, S^2 = 1.4, S = 1.18), which is fairly high; however, the measures of dispersion indicate some of these tools were worked somewhat more intensively than others. Four scrapers have use-wear in the form of edge rounding and step fractures. One scraper is rejuvenated and is spalled on its working edge. This tool has a large flaw on its dorsal surface that could not be removed as indicated by a series of stacked fractures. It seems the working edge was spalled in an effort to extract some use out of it prior to abandonment.

Formal Tools: Microblades

Microblades make up 31.9% (N=73) of the artifact total in this assemblage. Most are made of poor quality, vitreous (N=2) and fine-grained (N=47) chert. Lower frequencies of vitreous chalcedony (N=11) and crystal-quartz (N=13) tools are also present. Cortex cover is minimal (N=3). Nine raw material colours are recorded, five of which account for 90% of all frequencies (1, 5, 4, 10, 2). All colours reflect those observed in the debitage assemblages; however, only three of these are recorded among the cores (1, 4, 10). This means microblades made of the remaining raw material colours (N=25) were struck from cores that were removed from the site.

Few microblades are complete (N=4) and medial sections dominate the completeness index (see Table 6.90). Remnant striking platforms are present on 42% (N=31) of these tools and 77.4% of them have single and multi-faceted states with evidence of platform trimming (32.3%). These microblades also have eraillure scars, bulbs of percussion, and compression rings indicating moderate to heavy force loads were used to detach them despite the greater effort invested in preparing the striking platforms. Table 6.91 summarizes the metrical attributes for this category.

Table 6.90 Completeness index for Mosquito Ridge West microblades.

	Complete	**Proximal section**	**Medial section**	**Distal section**	**Proximal/ medial**	**Medial/ distal**	**Split**
Count	4	13	31	2	14	8	1

Table 6.91 Metrical attribute summaries for Mosquito Ridge West microblades.

	N	X	R	S^2	S
Length	4	16.2	10.2	21.6	4.65
Width	69	6.4	7.4	2.73	1.65
Thickness	73	1.78	2.8	0.38	0.61
Weight	73	0.18	0.41	0.01	0.11

Lateral margins are symmetrically straight (N=51) and convex (N=3) on 74% of all microblades while 18 are asymmetrical. Single dorsal arrises are observed on 37 tools, 33 have two arrises, and three have three arrises. Of those microblades with multiple arrises, 26 are parallel indicating they were struck from standardized cores. Corner notching is observed on four tools. Polish is present on two tools and is located on the proximal and right lateral margins, respectively. None of these tools display proximal end modification.

Retouch is observed on 17.8% (N=13) of these microblades and is located mostly on exterior surfaces (N=11). One tool is retouched on its interior surface while the other is retouched on both surfaces. The degree of retouch is moderate as indicated by the Retouch Intensity Index for interior (RII = 1.45) and exterior surfaces (RII = 1.78). Evidence of use-wear is high with 20 tools displaying edge rounding, one with step fracturing, and 36 with edge rounding and step fracturing. There is no evidence of rejuvenation for these microblades.

Cores

There are seven cores in this assemblage accounting for 3.0% of the artifact total. Six cores are made of poor quality, fine-grained chert, and have high cortex frequencies (57.1%). One core consists of unflawed, vitreous crystal-quartz, and also has cortex. Three raw material colours are recorded (4, 10) and one of them accounts for 71.4% of all variation (1), which is the same colour that dominates the debitage, flake tool, and microblade categories. Five cores are complete and two are fragments. Mean core weight is relatively low at 2.0 g (R = 2.6, S^2 = 0.96, S = 0.98). Striking platforms are either unprepared and cortical (N=4) or chipped (N=3), and none of these cores display evidence of platform battering. Direction of force application is unidirectional for three and multidirectional for four indicating the use of both standardized and generalized strategies. The mean number of flake scars observed is 4.3 (R = 6.0, S^2 = 4.38, S = 2.06). Evidence of secondary distal crushing is moderate (N=3) while secondary use is present on one crystal-quartz fragment.

Mosquito Ridge West (MaDv-11): Macro-Scale Interpretations

The principal lithic technological activities pursued in this component include core reduction and the production of tool preforms and blanks. Raw material types and quality are extremely homogeneous while colour types are variable, all of which indicates local chert sources were being exploited. The levels of cortex are slightly higher in this component than those recorded for the main site proper; however, they are still lower than what is expected given the size of the assemblage and the cortical nature of the local material. This means the raw materials worked here were in a reduced or semi-reduced state when they were brought to the site.

The distributions for flake size grade, weight, and dorsal scar count mirror those recorded for the main site proper and indicate the use of a single reduction strategy. The higher frequencies of flakes in all size grade categories with minimally modified platforms, low dorsal scar counts, and evidence of heavier force loads further indicates this strategy was also focused on core reduction and the production of tool preforms and blanks. The incidence of late stage finishing debris is slightly higher suggesting some tools were being worked more intensively. Despite this, however, tools made at Mosquito Ridge West were not being completed here. If they were, late stage finishing debris would dominate the overall flake frequencies since this part of the reduction continuum generates proportionately more flakes than any of the other stages, especially when bifaces are produced (Deller and Ellis 1992:88-89, 91). The recovery of several rejected tool preforms supports the interpretation that tool production was still heavily focused on the earlier stages of the reduction continuum.

The Percent Type calculations for Mosquito Ridge West indicate 70.6% of the assemblage derives from tool production activities while 32% is from core reduction. These figures total 102.6% and are within the expected range of error. This breakdown of technological activities is consistent with the other lines of evidence generated in this analysis and indicates toolmakers were reducing cores to manufacture tool blanks and preforms. The Sullivan and Rozen (1985) method also supports the inference that tool production was the dominant activity with medial/distal and proximal flakes (80%, N=3929) outnumbering complete flakes and shatter (20%, N=937). The flake-to-tool ratio is 27:1 indicating tool utility was being renewed. Like the main site proper, the occupants of Mosquito Ridge West were retooling and planning for future technological needs.

Tools in several categories were expediently made for immediate use. Used flakes, informal tools, and many of the burins consist of moderate to large flakes that were selectively removed from the debitage during early stage reduction. These implements were not intensively used since most of them display evidence of attrition on only one margin; the RIIs for the informal tools are moderate and a large number were never used; and the mean number of scars recorded for the burins is low indicating few working edges were rejuvenated. The presence of several heavily worked primary spalls does, however, indicate some burins were more intensively worked and then removed from the site. Microblades were expediently made and used given the high frequency of use-wear and low incidence of retouch observed for this category. Scraper frequencies are slightly higher in this component and all are made on large flakes of local materials. While these tools display more intense modification, they appear to have been made at the site, used, and abandoned. All scrapers have considerable remaining utility.

Based on this discussion, Mosquito Ridge West appears to be a direct extension of the main site proper. Patterns in the debitage assemblages are virtually identical for both areas and demonstrate toolmakers were exploiting local chert sources, and using the same reduction and use strategies. Artifact types, frequencies, and condition are also similar. Some heavily curated tools were brought to the site and abandoned, such as the crystal-quartz bifaces, while others were expediently made on local materials for use during the site occupation. The high flake-to-tool ratios indicate many tool blanks and preforms were removed from the site when the occupants left. The combined flake-to-tool ratio for both components totals 32:1. Given the obvious retooling activities occurring at Mosquito Ridge, the abandonment of curated tools is entirely expected, and since raw material is abundant in this locale, the use of expedient tools to perform on-site activities is also expected (see Andrefsky 1994a, 1994b).

Snow geese remains dominate the faunal assemblage recovered from Mosquito Ridge West (Donnelly 2002). This demonstrates subsistence practices, time of occupation, and site seasonality are the same for both components. Task groups came to Mosquito Ridge West during the warm season, most likely in the late spring/early summer. The absence of structural features and the near continuous distribution of debitage in every excavated unit indicate site activities were not spatially separated in this component either.

The discovery by Stenton (1985, 1989) of Pre-Dorset lithic artifacts in excavation units from the Thule winter houses and Inuit tent rings separating these two components means the Pre-Dorset occupation of Mosquito Ridge extends nearly a kilometer along the crest of this esker. The sheer size of this occupation and the consistency in site activities in all areas supports the interpretation that the Pre-Dorset came back to this site many times to acquire toolstone and to refurbish their lithic toolkits. The calibrated radiocarbon date of 4290 – 4080 BP from Grid 1 further indicates this pattern of behaviour was well established very early in the Pre-Dorset period on southern Baffin Island.

Mosquito Ridge West: Micro-Scale Interpretations

Micro-scale patterns of variation isolated at Mosquito Ridge West are very similar to those observed for the main site, and, therefore, the sources of this variation are deemed to be the same. Comparatively few flakes (3.4%) in this debitage assemblage can be directly attributed to novice flintknapping episodes. This means novices were not participating in tool production activities in this component to the extent they were at the Sandy Point site. There are, however, three crude formal tools that are determined to be the products of novice actions. These include two unused bifaces with stacked fractures and sinuous edges, and the scraper snapped across its hafting element with spurs on its working edge (see Figures 6.13 and 6.14). Both tools display diagnostic traits indicating low skill for each respective type (see Shelley 1990; Weedman 2002). Despite the presence of these tools, the evidence of novice flint knapping at this site is still comparatively low.

Like the main site proper, there appears to have been a shift in the social relations of production at Mosquito Ridge West, which would have limited novice participation in tool making. This shift also appears to be linked to the greater demands placed on expert flint knappers to acquire sufficient toolstone and to make tool blanks, preforms, and prepared cores for transport. It is important to note that several informal tools and the rejected concave sidescraper display moderate to intense retouch on their non-working margins (i.e. across their dorsal and ventral surfaces). This suggests experts may have been showing off their skills. But since the entire social group was not present at this site, this display may have been more frivolous in the sense that someone was trying to one-up someone else simply for the sake of doing it. Or, a toolmaker may have just felt like embellishing a particular implement; that is, they just felt like doing "otherwise." For whatever reason toolmakers decided to retouch and shape these items more intensely than others, their presence (combined with a notably lower incidence of novice activity at the site) does point to a change in the social relations of production at Mosquito Ridge West, no matter how subtle.

Coastal Site Interpretations

Shaymark and Davidson Point are similar in terms of lithic reduction and use strategies, access to raw material, site location, site seasonality, and toolkit diversity. Toolmakers at both sites were involved in late stage reduction (i.e. tool finishing) and tool maintenance activities, and had access to a stable supply of raw material in the form of prepared cores, tool blanks, and preforms. There is no evidence of early and middle stage reduction at either site, which means these materials were in a reduced state when they were brought in. Variable amounts of remnant cortex indicates the original parent materials comprised cortical nodules or cobbles, and given the diversity in raw material colour, they appear to have been procured from the inland areas. It is highly unlikely Pre-Dorset toolmakers were acquiring these materials from local coastal sources. There is no evidence of raw material stress in these assemblages and local chert pebbles were not being used as substitute material (Ricklis and Cox 1993) for tool production activities. However, toolmakers do appear to have been monitoring the consumption of lithic material given the restricted evidence of novice flint knapping episodes.

The Percent Type calculations and flake-to-tool ratios for these sites are different, however. Multiple lines of evidence indicate core reduction was somewhat more intensive at Davidson Point and the higher flake-to-tool ratio indicates more tool utility was being replaced at this site. But these differences are not overly pronounced and they could well be artifacts of Davidson Point's disturbed context and/or differences in the excavation methods used at each site, since fill from Davidson Point was not screened whereas at Shaymark it was.

Both sites are located on points of land, which at the time of occupation would have resembled narrow peninsulas paralleling the Sylvia Grinnell River and extending out into Koojesse Inlet. Subsistence activities likely focused on Arctic char and caribou. These species are abundant and easily accessible at both site locations, and are optimal in the late summer and early fall. The lithic reduction and use strategies isolated in these assemblages indicate Shaymark and Davidson Point were occupied during the warm season and that toolmakers had a renewed raw material supply. The location of these sites and the optimality of local resources combined with lithic evidence indicating a warm season occupation and a newly acquired supply of toolstone all strongly suggest the Pre-Dorset were at these sites in the late summer and early fall. Moreover, the emphasis on organic tool production and processing activities as indicated by the high frequencies of burins, spalls, scrapers, and microblades, further suggests these people may have been preparing for the winter. However, it is important to note there is no evidence indicating the Pre-Dorset spent the winter at these sites, which means they departed from the coastal uplands and traveled to another location, most likely in the outer coastal regions.

The social relations of lithic production are more structured at Shaymark and Davidson Point. This is to be expected if all members of individual and/or collective social groups were present. A grouping like this would necessarily change the patterns of social organization, especially if individuals who had disbanded into separate task groups and family units for the warm season were again present at one site. Given the nature of the reduction strategies used and the dominance of late stage debris at these sites, it is clear that experts were the ones engaged in lithic tool production and maintenance activities. Toolmakers at these sites appear to have been demonstrating their "technical know-how" (Dobres 1995:40)" (Dobres 1995) while working these implements and it is equally probable they were doing the same in an organic medium. However, to prove or explore this possibility further is impossible given the lack of preservation at these sites.

The size of the occupation at Shaymark and the consistency in activities indicate the Pre-Dorset repeatedly came back to the site for the same purpose. Maxwell (1973) describes the presence of a tent ring and it is probable others once existed but have since been dismantled and/or disturbed by later activities in the site area. The size of the Davidson Point Pre-Dorset component is difficult to estimate given its disturbance by the Thule. The Pre-Dorset occupation here may have been equally large as the one at Shaymark, and structures may have also once existed. While both assemblages were disturbed, evidence of post-occupational damage is minimal. The lateral margins on most flakes are intact and many distal terminations snapped because of raw material flaws and/or production failures (Amick and Mauldin 1997; Wenzel and Shelly 2001). Fractures recorded among the formal tools categories are largely attributed to failure during use and/or production. It is certain some of the tool fragments from Shaymark were broken by vehicle and human traffic in the area; however, a large portion of the site area surveyed and excavated in 1999 was still intact further indicating most of the recorded tool breakage occurred as a result of production and use (see Milne 2000b).

In summary, Shaymark and Davidson Point are interpreted as representing warm season sites where the Pre-Dorset came to exploit local subsistence resources and to prepare their lithic and organic toolkits for future use, likely in anticipation of the winter season. The actual timing of these occupations is more difficult to pinpoint exactly given the absence of preserved faunal material; however, char and caribou in this coastal upland area are optimal in the late summer/

early fall. Perhaps these sites represent the Palaeo-Eskimo equivalent of an Inuit autumn sewing camp. The debitage assemblage indicates only the later stages of the reduction continuum are present and that toolmakers were using a single technological strategy, namely late stage tool finishing and tool maintenance.

The patterns of variability isolated for the Area Q component at Tungatsivvik indicate this site represents a different type of occupation compared to Shaymark and Davidson Point. Toolmakers at Area Q were also engaged in late stage reduction and tool maintenance activities but they were maintaining and conserving existing curated types, some of which were made of exotic toolstones. In addition to these activities, toolmakers were also reducing local chert pebbles using a bipolar strategy to generate useable flakes for expedient tool production. Even though toolmakers were using mixed technological strategies, there is no evidence indicating they were experiencing acute raw material stress. Rather, it appears toolmakers were maintaining their existing curated toolkit and exploiting local sources as a way to meet their immediate technological needs while they waited for a renewed raw material supply. This new toolstone would have been acquired by task groups specially organized to go inland to get it.

The social relations of production were not structured at Area Q and there is little evidence of novice activities. This is to be expected if the social group occupying Area Q comprised those individuals who remained in the coastal uplands while specially organized task groups went inland. Novice knappers capable of making this journey most certainly would have been included in such a task group since going inland where raw materials are plentiful would provide them the opportunity to knap stone.

The size of the Area Q occupation is relatively small but the presence of structural features and faunal remains demonstrates the people did stay here for a period of time. The debitage assemblage indicates the site was a warm season occupation, as does the unrestricted access to local chert pebbles. The time of occupation was probably in the spring since the Pre-Dorset were still carrying a heavily curated toolkit, that was likely used during the winter, and they did not yet have access to new toolstone. If the entire social group (i.e. members of an extended family or social network), arrived in the coastal uplands in the spring and organized themselves into coastal and inland task groups shortly thereafter, it would leave ample time for people to go inland to get the resources needed and return to the coast. It is possible task groups made multiple inland journeys throughout the warm season; however, the frequency and duration of these trips would be have been determined by the availability and distribution of the resources (both material and subsistence) sought by the task groups. Because camps in the coastal uplands were moved periodically throughout the warm season (Stenton 1989), it is seems certain other sites similar to Area Q exist throughout the Upper Frobisher Bay region.

In summary, Area Q is interpreted as representing a warm season occupation in the coastal uplands where individuals who were not part of an inland task group(s) remained. During this occupation, toolmakers used mixed technological strategies to conserve their existing lithic toolkits and to exploit local chert pebbles to make expedient flake tools for immediate use in the vicinity. The individuals who engaged in these technological activities are interpreted as having been predominantly women since women frequently remained in residential sites, particularly when they were pregnant or had young children, while men went out on hunting trips (see Binford 1978a:363; Stenton 1989, 1991a). This means women in Pre-Dorset culture were capable toolmakers. So when and how did they acquire this skill? Based on the micro-scale interpretations for the inland sites it is entirely likely young women who were not yet married and did not have children were included as members of the inland task groups. This implies women also went inland during the summer to acquire toolstone and learn to knap it. If young people were enculturated through their participation in these inland task groups, it would be equally important for women to understand their surroundings and to acquire the skills necessary to deal with a variety of adaptive contingencies. Gero (1991:172) cites ethnographic examples of women in Australia participating in the long distance procurement of lithic raw materials so it is not unreasonable to believe Pre-Dorset women did the same thing. Moreover, if the inland area were an important place to meet up and socialize with other distant groups for the purpose of maintaining the population's reproductive fitness, it would be especially important that women were included (see also page 289). It is important to note that Area Q shows no signs of post-occupational disturbance making it a rare example of an isolated, undisturbed Pre-Dorset component in the upper Frobisher Bay region.

The Area D component at Tungatsivvik appears to represent yet another type of occupation for the Pre-Dorset in the coastal upland region. Patterns of lithic assemblage variability indicate toolmakers were focused on late stage reduction and maintenance activities, and were working objective pieces already in an advanced state of reduction (i.e. existing curated tools). A limited amount of lost tool utility was also being replaced through the exploitation of local chert pebbles. Toolmakers used a bipolar reduction strategy to make several expedient tools for immediate use. They also made a limited number of new tools, which were then removed from the site when the occupants left. These activities account for the higher flake-to-tool ratio recorded for this site.

The people who occupied Area D did not stay here long, thus the social relations of production appear to have been inconsequential. The unrestricted access to local chert pebbles and the absence of raw material stress in this lithic assemblage indicates a warm season occupation. Since the site is located in the coastal uplands and was occupied for a brief time during the warm season, Area D is interpreted as representing a stopover point for the Pre-Dorset while they were on their way to another location. It is possible this site occupation coincided with a periodic decline in the local caribou herds, thus necessitating a trip by the entire social group to the interior to hunt. The low degree of toolkit diversity and lack of deposited curated formal types indicates the Pre-Dorset were hanging on to their existing toolkit in anticipation of future needs. They would not have had the time or the available raw materials to retool at this site prior to departing for the interior.

Like Area Q, Area D shows no signs of post-occupational damage or disturbance. The lower elevation of Area D compared to Area Q, the spatial separation between these components, and the differences in lithic assemblages strongly suggests these occupations are unrelated. Therefore, Tungatsivvik appears to have been used by the Pre-Dorset both as a warm season camp where small coastal task groups stayed and as a stopover point, most likely during those years when caribou herds were in decline.

Inland Sites: Interpretations

The Pre-Dorset occupations at Sandy Point and Mosquito Ridge are different yet they are complementary. Sandy Point is an ephemeral occupation where a specially organized task group(s) came during the warm season to acquire lithic raw material. This acquisition process involved raw material testing and some early stage reduction, likely to facilitate transport. Because lithic raw materials in the inland region are broadly distributed and of highly variable quality, small, ephemeral sites like Sandy Point are to be expected since toolmakers would have traveled through the region in search of sources and then actively tested them to ensure they obtained the best toolstone possible (see Wenzel and Shelley 2001:113).

Several of the nodules tested at Sandy Point were selected for further reduction. This material was used to make a limited number of expedient tools, and to rough out additional cores, tool blanks, and preforms. Both expert and novice toolmakers conducted this work indicating the social relations of production at Sandy Point were relaxed. The individuals making up this task group were likely from the same larger social group. Thus the degree of familiarity between experts and apprentices would further contribute to a more relaxed atmosphere and permit experts to direct their attention more towards the actions of novices. The abundance of lithic raw materials at this site and its season of occupation clearly provided opportunities for novices to engage in tool production; however, these activities did not detract from the task group's main objective, which was to acquire lithic raw material.

The presence of several discarded intact, curated formal types at Sandy Point indicates toolmakers anticipated refurbishing their toolkits with new implements made from local raw material, but these retooling activities were not intensively pursued at Sandy Point. While some tool utility was replaced through the production of expedient tools, blanks, and preforms, the small size of this assemblage and the high frequency of early and middle stage reduction debris indicates tool production activities were comparatively limited. Some of the Sandy Point assemblage was undoubtedly lost to post-occupational forces that negatively impacted parts of this site (see Stenton 1986) yet it is impossible to determine exactly how much of it is gone. Despite this, patterns of variability isolated among the debitage and artifacts excavated from intact units still indicate tool production, particularly tool finishing, was not intensive at this site. If it were, the size of the Sandy Point debitage assemblage would be significantly larger, like it is at Mosquito Ridge and Mosquito Ridge West.

Mosquito Ridge and Mosquito Ridge West are discussed together in this section since it is clear both components belong to the same extended occupation. Accordingly, these components are now collectively referred to as Mosquito Ridge. The Pre-Dorset at this site also comprised specially organized task groups who were in the inland region to acquire lithic raw materials. Yet the intensity and types of reduction activities they performed at the Mosquito

Ridge site differ compared to those conducted at Sandy Point. The sheer size of the debitage assemblage at Mosquito Ridge (along with the multiple lines of evidence generated from this analysis) indicates this site was a lithic workshop where the Pre-Dorset came during the warm season to retool and to renew their supply of lithic raw material. Toolmakers were using a single technological strategy and the stages of reduction present are predominantly early to middle.

Toolmakers were intensively reducing local lithic sources; however, the lower than expected frequency of cortex in the debitage assemblage suggests these materials were brought to the site in a reduced or semi-reduced state. If toolmakers left Mosquito Ridge to procure these parent materials or procured them prior to their arrival, it would make sense to first test the nodules where they were found and then partially reduce them to facilitate the transport of this toolstone back to Mosquito Ridge. Sandy Point certainly provides support for this type of procurement strategy and furthermore, these two sites are well within walking distance of one another along the West Burwash Moraine. Ironically, Wenzel and Shelley (2001) recorded a similar pattern of raw material testing and transport at another ASTt site known as Mosquito Lake, which is located in the interior of Alaska. Members of the Denbigh Flint Complex occupied this site and it too was used a lithic workshop. Toolmakers obtained their raw material from a nearby quarry. This stone is also of poor quality and occurs in the form of small nodules and cobbles. Consequently, extensive raw material testing was conducted at the source locations to find good quality toolstone, which was then transported back to the Mosquito Lake site. This testing also resulted in a lower frequency of large cortical flakes at this workshop site and mirrors the pattern observed at the Mosquito Ridge site.

Conceivably, the Pre-Dorset could have traveled from Mosquito Ridge to Sandy Point where they located abundant chert nodules, tested them, partially reduced them, and then brought them back to Mosquito Ridge for further reduction. Or, the task group(s) could have stopped at

Sandy Point first, acquired the stone, and then traveled with it further up the West Burwash Moraine to Mosquito Ridge. While this analysis has not provided definitive evidence indicating a direct link between these two sites (e.g. tool refits, corresponding radiocarbon dates), the similarities in raw material attributes and the stages of the lithic reduction continuum isolated in each respective assemblage strongly suggests they are complementary to one another in the context of a broader technological and land use system. It is important to note that Sandy Point represents only one known procurement site and there are undoubtedly others similar to it within this interior region; they have simply yet to be located.

Mosquito Ridge represents an ideal location for a lithic workshop. It is easily accessible from the West Burwash Moraine, there is an abundance of avian resources nearby, and raw material is easily acquired since sources are distributed throughout the surrounding area. These factors surely would have encouraged the Pre-Dorset to return to this site on multiple occasions. The social relations of production are more structured here than they are at Sandy Point; however, they are by no means overly rigid. Evidence of novice flint knapping at Mosquito Ridge is present but its occurrence appears to be more restricted. Two factors are likely responsible for this. First, the intensity of tool production at Mosquito Ridge would have demanded more attention from experts since this was a location where retooling occurred. Because experts would necessarily be more focused on securing an adequate supply of lithic raw material in anticipation of future technological needs, opportunities for apprentice toolmakers to learn would be more restricted. It is also likely novices were not permitted to freely knap the stone brought to this site given the costs associated with its acquisition. In other words, task groups traveled to find this stone, they invested their energy in testing it and reducing it, and then they carried those nodules of better quality back to the workshop site where experts reduced them into prepared cores, tool blanks, and preforms. Having novices practice their tool making at sites like Sandy Point poses no additional costs to the task group since stones can be distributed to the novices or they can find their own, there is no transportation costs involved, and if mistakes are made and toolstone is wasted, it does not affect the group's reserved supply. If novices actively knapped the better quality toolstone that was selectively transported back to Mosquito Ridge for tool production, they would quickly consume the supply, thus forcing the task groups to venture out more frequently to procure new toolstone. This awareness highlights the agency of the novice toolmaker since they seem to have been aware of when they could engage in tool production activities and what toolstones they were permitted to use.

The fact local nodules and cobbles were being so intensively reduced at Mosquito Ridge indicates the material was being carried considerable distances. Beck *et al.* (2002) recently conducted a study measuring the intensity of lithic field processing activities in relation to the distances stones were carried. When they exceeded 60 km from the point of acquisition (i.e. quarry) to the final destination (i.e. residential site), toolstones were more intensively reduced in the field to facilitate transport and to allow toolmakers to carry with them as much useable stone as possible. This pattern is consistent with what is observed at Mosquito Ridge and should be entirely expected since the distance from the interior lakes region to any one of the southern Baffin coastlines easily exceeds 60 km. However, it is important to note that the package size and quality of this material certainly determined the extent to which some of these objective pieces were reduced. In instances where nodules or cobbles were used to make generalized cores, toolmakers would have left some remnant cortex because to remove it all would decrease the overall utility of the toolstone (see Beck *et al.* 2002:490). These cores were likely used as sources for flake blanks. In turn, these blanks were made into tools whose functionality is not affected by the presence of cortex (i.e. burins, scrapers, informal tools).

Both Sandy Point and Mosquito Ridge were warm season occupations given the unrestricted access toolmakers had to local chert resources and the nature of the lithic reduction strategies, which indicate toolmakers were gearing up and renewing their toolstone supplies. The faunal assemblage at Mosquito Ridge indicates an intense exploitation of snow geese, which are readily available in this area during the spring and summer (Stenton 1989). The late spring and early summer are the optimal times to occupy this site since the snow cover is melted, the mosquito infestation has not yet started, and the birds are just starting to moult. It is most likely the Pre-Dorset ventured to the interior at this time of year to take advantage of these conditions while acquiring their lithic raw materials. The assemblages excavated from Mosquito Ridge and Mosquito Ridge West did not suffer any considerable post-occupational damage. It is certain some flakes and discarded tools were broken due to trampling by the site occupants, and by caribou passing through the site area; however, most of the breakage patterns observed are attributed to failure during production and raw material flaws.

Summary

The primary objective of this chapter was to present the results of the analysis conducted on the seven site assemblages included in this study. Data were described first according to each maximal artifact category. Then macro-scale and micro-scale interpretations were provided for each site component. Finally, comparisons were made among the coastal and inland sites, respectively. In the following chapter, direct comparisons are made between the coastal and inland areas, and the hypotheses outlined in Chapter 4 are evaluated. An assessment of the analytical methods used in this study is also provided, along with some suggestions for future studies of Pre-Dorset and other Palaeo-Eskimo lithic artifact assemblages that aim to use a combined methodological approach.

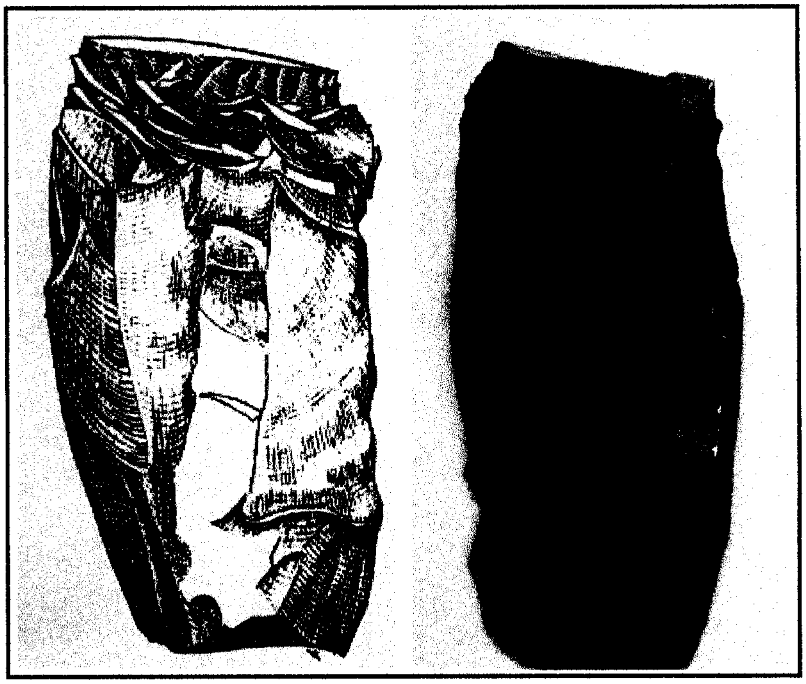


Figure 6.6 Novice core from the Sandy Point site (LlDv-10). The image on the left is an example of a novice core made by a contemporary knapper (from Shelley 1990).

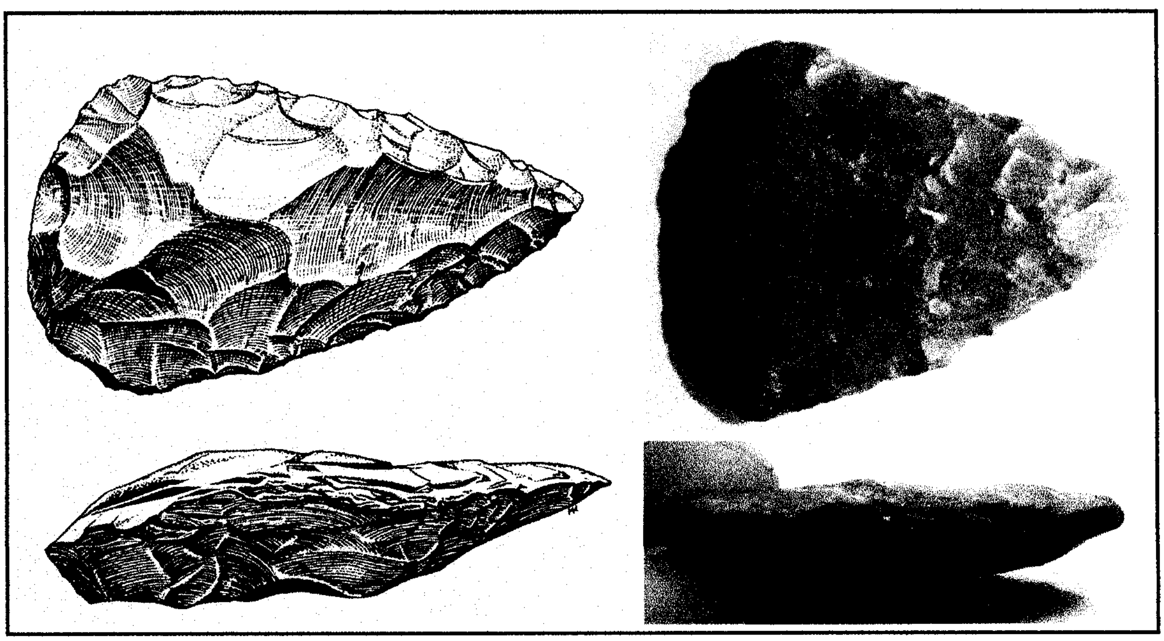


Figure 6.7 Novice biface from the Sandy Point site (LlDv-10). The image on the left is a novice biface made by a contemporary knapper (from Shelley 1990).

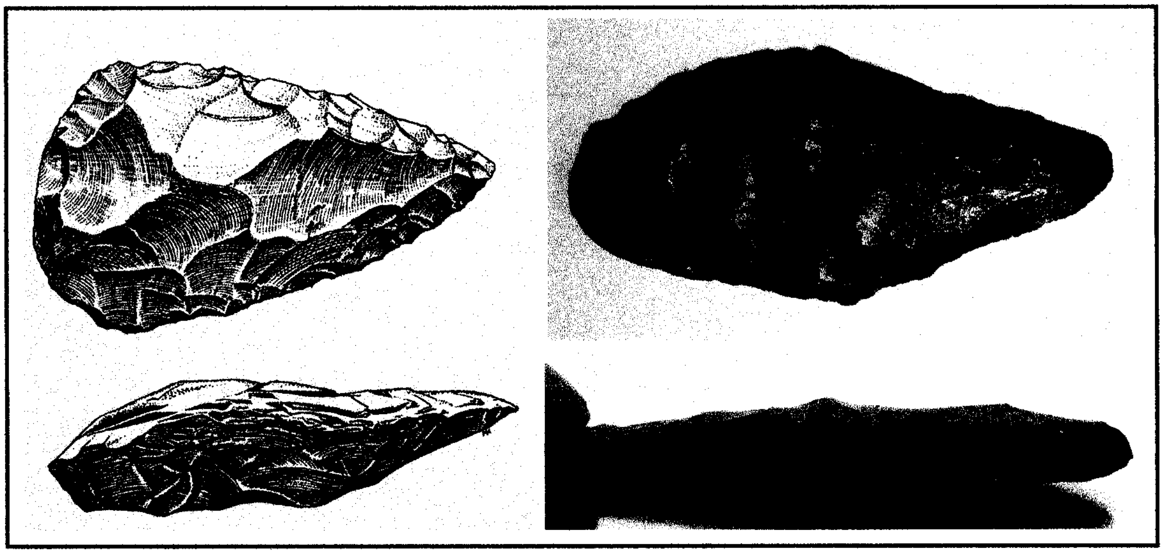


Figure 6.8 Novice biface from the Sandy Point site (LlDv-10). The image on the left is a biface made by a novice contemporary knapper (from Shelley 1990).

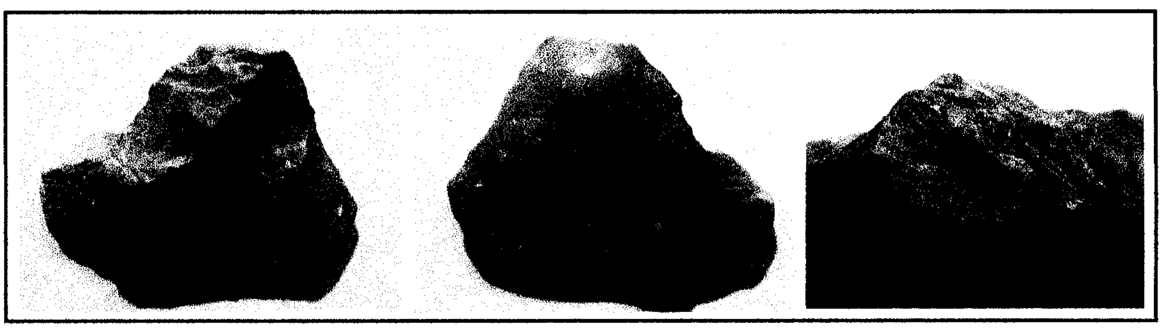


Figure 6.10 An example of a debitage flake produced by a novice knapper at the Sandy Point site (LlDv-10). Note the minimally modified striking platform, the battering below it, and the pronounced hinge distal termination.

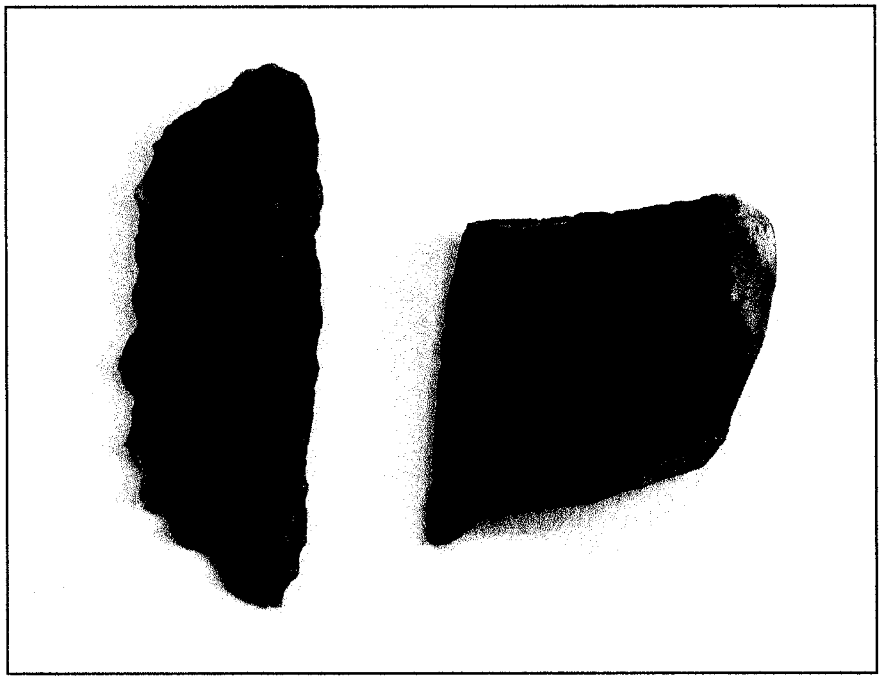


Figure 6.11 Chert sideblade and core fragment recovered from Grid 1 at the Mosquito Ridge site (MaDv-11). These artifacts are made of highly vitreous, unflawed, near-translucent chert.

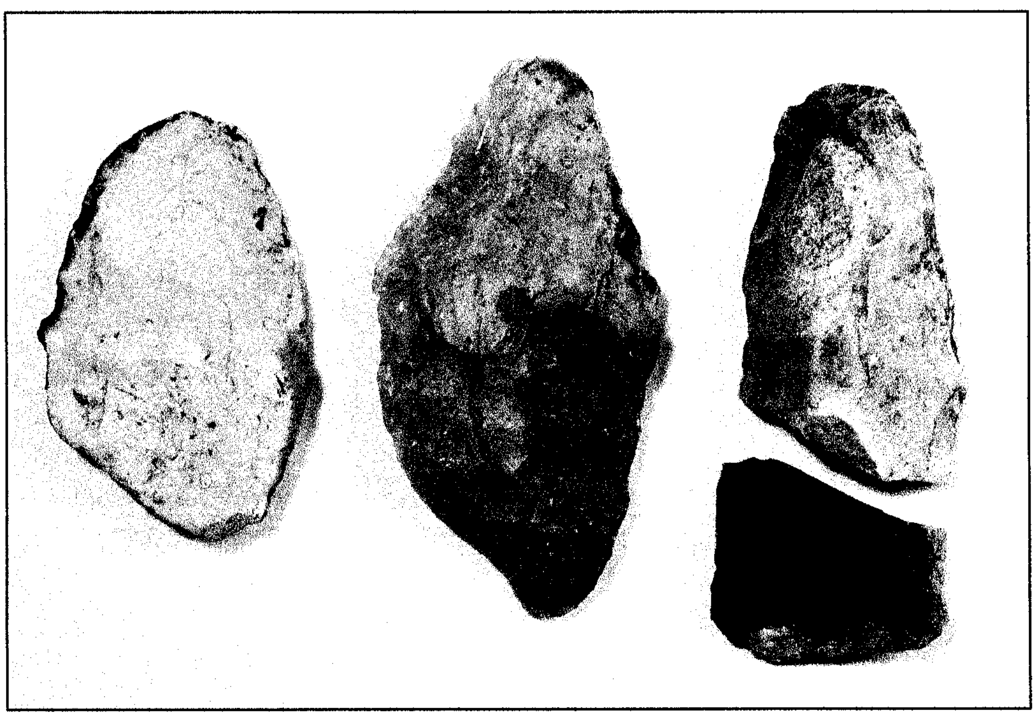


Figure 6.13 Novice tools recovered from Grid 3 at Mosquito Ridge West.

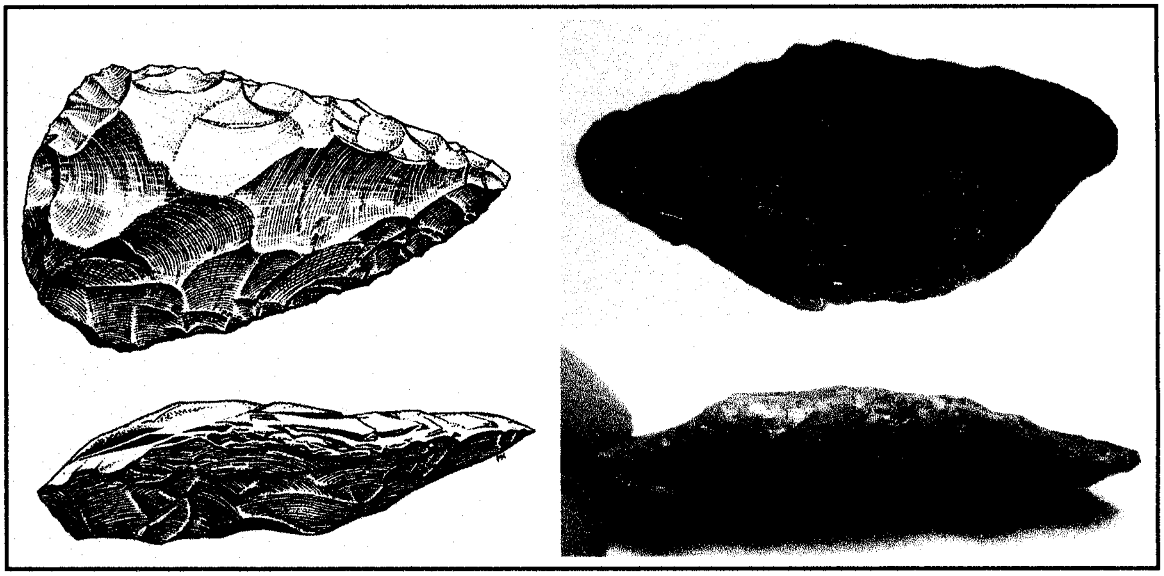


Figure 6.14 Novice biface from the Mosquito Ridge West (MaDv-11) component. The image on the left is a novice biface made by a contemporary knapper (from Shelley 1990).

Chapter 7

Comparative Analysis and Interpretation

Coastal and Inland Sites: Data Comparisons

The aim of this section is to present clearly those data described in Chapter 6 that most simply highlight the similarities and differences recorded among the coastal and inland sites examined in this study. Attribute states used to record the intensity of tool use clearly show a consistent ordering of the sites, which remains constant for most artifact categories.

Table 7.1 lists the calculated Retouch Intensity Indices for informal tools, scrapers, and microblades by site. External and internal retouch indices are averaged where more than one margin is worked. The mean values for the informal tool categories indicate the degree of retouch is consistently higher among the coastal sites while informal tools recovered from the inland sites were not as intensively worked or maintained. These values not only reflect differences in tool use intensity, but they also correspond to the increased distance from the coast to available toolstone sources in the interior. Since raw material is abundant inland, toolmakers at Sandy Point and Mosquito Ridge would be less likely to invest the time and energy to retouch a flake edge since it would be faster to strike a new flake from an available core or pick one out of the debitage when a new, sharper edge was needed (Nelson 1991; Parry and Kelly 1987). Interestingly, Area D has the lowest mean RII value; however, given the transitory nature of this occupation and the fact these tools were expediently made using local materials, it is not surprising that little effort was invested in their production.

The intensity of retouch recorded for scrapers is similarly high among the coastal sites compared to those inland. The tools from Shaymark were heavily worked and maintained, as were those from Davidson Point. In contrast, the scrapers from Mosquito Ridge were minimally retouched. The recorded value for Sandy Point is higher; however, the raw material analysis indicates these tools were brought to the site in a complete state and abandoned. This means these scrapers were used and maintained at a location other than Sandy Point. Still, their RII values are notably lower than those recorded for similar tools from the coastal sites.

Table 7.1 Mean values for Retouch Intensity Indices and site rankings.

	Retouch Intensity Indices									
	Informal tools				**Scrapers**		**Microblades**			
	Ext.	**Int.**	**X**	**Rank**	**X**	**Rank**	**Ext.**	**Int.**	**X**	**Rank**
Shaymark	2.14	1.82	2.0	**2**	3.93	**1**	1.52	1.52	1.52	**2**
Davidson Point	1.97	1.81	1.9	**3**	2.71	**3**	2.1	0.8	1.45	**3**
Area Q	2.10	2.08	2.1	**1**	3.30	**2**	0	0	0	**-**
Area D	1.40	1.35	1.4	**-**	0	**-**	1.65	0	1.65	**1**
Sandy Point	1.98	1.13	1.6	**4**	2.33	**4**	0	0	0	**-**
Mosquito Ridge	1.98	1.45	1.7	**5**	1.63	**5**	1.58	1.32	1.45	**3**

The intensity of retouch recorded for microblades does not present as clear a pattern as those recorded for the other tool categories. Despite this, microblades recovered from the coastal sites were still worked and maintained more intensively at Shaymark and Area D than at Mosquito Ridge. While Davidson Point and Mosquito Ridge share the same retouch values for this tool category, the external RII for the Davidson Point microblades is the highest for all sites further pointing to a more intense degree of tool use for this category among the coastal locations.

Tool use intensity was also evaluated for the recovered cores. Table 7.2 lists the mean scar values, mean weights, and ranks by site for this artifact category. Again, those cores from the coastal sites display the highest number of scars indicating a more intense degree of toolstone reduction. This is expected given the distance of these sites from the inland areas. The costs associated with transporting lithic raw material from the interior to the coast would be considerably higher; therefore, it is expected that toolmakers would use these objective pieces more intensively to extract as much utility as possible from them before abandonment. Moreover, since this imported toolstone is larger in size and of better quality than the local chert pebbles, it would provide further incentive to use these cores to produce new tools rather than resorting to the pebbles. In contrast, the cores recovered from the inland sites are not as intensively worked. At Sandy Point, these objective pieces are generally very large and have comparatively fewer flake scars. Since raw material is readily available in this vicinity, there would be little need for toolstone conservation or the same degree of selectivity compared to that observed for sites on the coast. Toolmakers could easily procure a new core when old ones were used up, and there would be little to no cost associated with abandoning a core with remaining utility since toolstone is abundant. The cores from Mosquito Ridge consist largely of fragments with lower mean scar values. Given the high flake-to-tool ratio recorded for this site, most prepared cores were likely removed for use elsewhere; thus, resulting in the recovery of relatively few intact specimens.

Table 7.2 Mean Scar and Weight Values for Recovered Cores.

	Cores			
	N	**Mean Scars**	**Rank**	**Mean Weight**
Shaymark	23	5.2	**2**	2.24
Davidson Point	10	5.0	**3**	4.28
Area Q	5	5.7	**1**	9.7
Area D	2	5.0	**3**	10.45
Sandy Point	13	4.5	**6**	9.52
Mosquito Ridge	26	4.6	**5**	2.50

The burins in these site assemblages also exhibit similar patterns of use intensity to those already described for the other tool categories. Table 7.3 lists the number of burins, burin spalls, and spall tools in each site assemblage. These figures were used to calculate a ratio to measure the intensity of edge rejuvenation. The mean number of spall scars is also included as an additional measure to evaluate tool use. For the coastal sites, Shaymark and Davidson Point clearly have the highest frequencies of burins, burin spalls, and burin spall tools. The calculated ratios for these sites are correspondingly high indicating working edges were being intensively used and rejuvenated. In comparison, Mosquito Ridge has the highest spall-to-burin ratio for all sites suggesting a similar intensity of use; however, Mosquito Ridge has the second lowest value for mean spall scars. This means that while many burin edges were rejuvenated, those tools that were abandoned at the site were not the ones being intensively used. The large number of spalls at this site can be explained, in part, by the relatively high frequency of new burins that were made and subsequently removed for future use, as indicated by the greater incidence of primary spalls. And, the comparatively high number of expedient flake burins at Mosquito Ridge that were spalled once and then discarded also contributes to the total spall frequency. Since only two of 90 spalls were used secondarily, it further indicates a lower degree of tool use intensity at this site. Sandy Point has the lowest spall-to-burin ratio and mean spall scar value. It also ranks last for frequency of burin spall tools.

Table 7.3 Burin Use Intensity Ratios and Indices.

	Burins							
	N	**N Spalls**	**Spall:Burin Ratio**	**R**	**Mean Spall Scars**	**R**	**Spall tools**	**R**
Shaymark	208	476	2.3:1	**2**	3.7	**4**	100	**1**
Davidson Point	15	30	2.0:1	**3**	4.2	**3**	8	**2**
Area Q	8	11	1.4:1	**4**	4.5	**2**	2	**3**
Area D	6	3	0.5:1	**6**	5.7	**1**	0	**-**
Sandy Point	16	6	0.4:1	**5**	2.2	**6**	1	**4**
Mosquito Ridge	47	127	2.7:1	**1**	2.9	**5**	4*	**3**

* Mosquito Ridge and Mosquito Ridge West have two burin spalls in each respective assemblage.

Area D and Area Q have lower spall-to-burin ratios than the other coastal sites; however, they are ranked first and second, respectively, for mean spall scars. This clearly shows that the burins abandoned at these sites were more intensively used compared to the specimens recovered from the inland sites. However, the lower incidence of spalls relative to recovered spall scars suggests some of these tools were brought to the site ready made having been used at another location prior to their abandonment at Tungatsivvik. Area Q has two burin spall tools while Area D has none. These values are much lower than those for the other two coastal sites. However, recovery methods may have contributed to this pattern since neither component was screened.

Biface use intensity is assessed by comparing the mean recorded values for tool length, width, and thickness (see Table 7.4). A coefficient of variation is also calculated for each metrical attribute state to examine if the degree of variability for this tool category increases as distance from the interior and toolstone sources correspondingly increases. Only complete bifaces were used for these calculations.

Table 7.4 Mean metrical attribute measures and CVs for complete bifaces.

	Bifaces									
	N*	**Length**	**CV**	**R**	**Width**	**CV**	**R**	**Thickness**	**CV**	**R**
Shaymark	15	23.8	0.45	**5**	11.6	0.33	**5**	3.3	0.60	**5**
Davidson Point	14	29.5	0.22	**3**	15.3	0.31	**4**	4.5	0.38	**3**
Area Q	3	28.7	0.44	**4**	15.5	0.30	**3**	3.8	0.26	**4**
Area D	0	0	0	-	0	0	-	0	0	-
Sandy Point	4	38.6	0.21	**1**	20.4	0.25	**1**	4.9	0.17	**1**
Mosquito Ridge	3	22.9	0.42	**6**	11.0	0.36	**6**	2.9	0.59	**6**
Mosquito Ridge West	3	34.3	0.14	**2**	19.5	0.11	**2**	4.9	0.01	**1**

* On complete specimens only

Bifaces from Sandy Point and Mosquito Ridge West are longer, wider, and thicker than at any other site. These tools also display the lowest degree of variation for every recorded state.

The bifaces from these sites consist largely of rejected preforms and blanks. They also include those specimens made by novice toolmakers. Regardless, the lower degree of variability and larger overall size of these bifaces reflects their unfinished and unused states. In contrast, the bifaces from the coastal sites are notably shorter, narrower, and proportionately thinner. They also display a higher degree of internal variation as indicated by the calculated CVs for each state. The higher calculated CVs for bifaces from the coastal sites is expected since these tools have been shaped, thinned, used, and maintained more intensively than those from the inland sites. The coastal bifaces also encompass a wider variety of functional types including bipoints, triangular endblades, bifacial knives, sideblades, and stemmed endblades. These tools display different morphologies, thus contributing to a greater degree of variation among the recorded metrical attribute states.

The only anomaly to this pattern is the main Mosquito Ridge component. The sideblade and stemmed endblade recovered from Grids 1 and 2 are finely flaked, thinned, and serrated (see Figure D.19 and D.20). The sideblade was brought to the site and abandoned as indicated by the raw material attributes recorded in the debitage assemblage. And, the stemmed endblade was near completion but was seemingly abandoned unused. Since only three complete bifaces were recovered from this component, and two of them include tools that were in late stage reduction, the attribute states for this artifact category are more similar to those recorded for the coastal sites than the other inland site components.

Based on the values listed in Table 7.4, it appears that bifaces become shorter, narrower, and thinner as one moves away from the interior. The degree of internal variation also increases and reflects the greater morphological variability present among finished bifaces and those in later stages of reduction and use. In contrast, the bifaces from the inland sites are larger overall and exhibit a lower degree of internal variation, which reflects their earlier stages of reduction and their unfinished states as blanks and preforms.

The consistent ranking of these sites as reflected by the recorded patterns of formal and informal tool use intensity indicates the coastal sites and inland sites differ qualitatively in terms of the nature of site activities pursued. They also differ technologically given the different reduction strategies used to meet the demands of these activities. The flake-to-tool ratios and overall frequencies of recovered formal tools to debitage indicate site function in the interior was focused on lithic tool production and toolstone renewal (see Figures 7.1 and 7.2). These inland sites have the highest ratios, and the lowest frequency of formal tools. The recorded debitage striking platforms at both sites also indicate a notably high frequency of minimally modified states (see Figure 7.3). Dorsal scar counts are comparatively low indicating the objective pieces being worked were not in an advanced state of reduction (see Figure 7.4). Sandy Point also has the highest recorded cortex frequencies further indicating the materials being worked consisted of cortical nodules (see Table 7.5). In contrast, Mosquito Ridge ranks fourth for flakes bearing 50-100% cortex; however, this supports the interpretation that raw material brought to the site was in a reduced or semi-reduced state. When striking platforms and dorsal scar counts are cross-tabulated, it is clear early and middle stage reduction dominated these sites (see Figure 7.5).

All of these attribute states further highlight functional differences between the two inland sites (see Table 7.6). Sandy Point has a lower flake-to-tool ratio than Mosquito Ridge yet higher frequencies of minimally modified platform states, flakes with 0-2 dorsal scars, and cortex compared to any other site. Moreover, size 1 flakes do not dominate the overall flake frequencies, and flake weights are heaviest in this assemblage (including the used flake and informal tool category), which reflects the presence of numerous large, blocky flakes that commonly produced during early stage reduction. These states further support the inference that site function at Sandy

Point was the acquisition of lithic raw materials whereas the lower values recorded for Mosquito Ridge indicate toolmakers at this location were more focused on tool production activities.

Table 7.5 Recorded frequencies of cortex cover for debitage assemblages. Rank is based on the frequency of flakes with 50-100% cortical cover.

	Percentage of Cortex Cover			
	0	**1-49% and platform**	**50-100%**	**Rank**
Shaymark	80.2	15.1	**4.7**	**6**
Davidson Point	90.2	6.2	**3.6**	**5**
Area Q	81.5	11.8	**6.7**	**2**
Area D	83.7	9.8	**6.5**	**3**
Sandy Point	65.4	19	**15.6**	**1**
Mosquito Ridge	84.6	10.4	**5.0**	**4**

Table 7.6 Compared attribute states for Sandy Point and Mosquito Ridge.

	Flake:tool ratio	**Minimally modified platforms**	**Cortical platforms**	**0-2 dorsal scars**	**Mean flake weight**
Sandy Point	13:1	48%	19%	66% (776)	0.5
Mosquito Ridge	32:1	40%	10.4%	62% (9673)	0.2

In contrast, tool production activities were not the focus of site activities at Shaymark and Davidson Point. Rather, individuals appear to have been engaged more in late stage reduction and tool maintenance. These sites have the lowest flake-to-tool ratios and highest frequencies of formal tools (see Figures 7.1 and 7.2). The striking platforms on complete flakes also indicate a high frequency of advanced platform states (see Figure 7.3). The dorsal scar counts are notably high indicating the objective pieces worked at these were in an advanced state of reduction (see Figure 7.4). Moreover, cortex frequencies for flakes with 50-100% coverage are lowest for these two sites, further supporting this interpretation (see Table 7.5). When striking platforms and dorsal scar counts are cross-tabulated, the patterns stand in stark contrast to the inland sites and clearly show late stage reduction activities dominated at these sites. (see Figure 7.5).

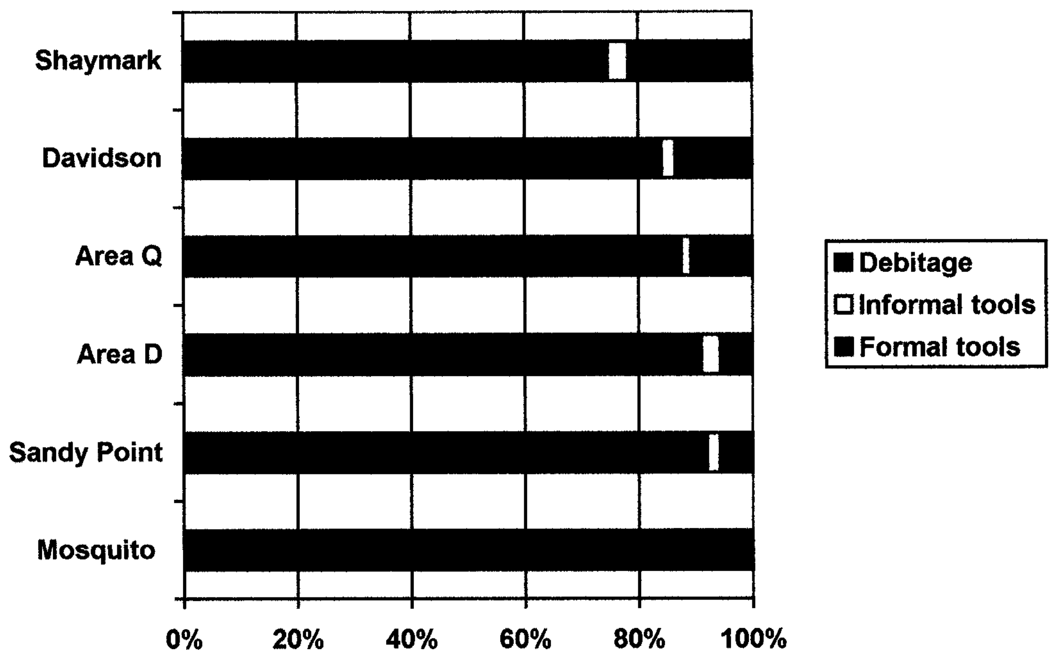


Figure 7.1 Recorded tool and debitage frequencies by site component.

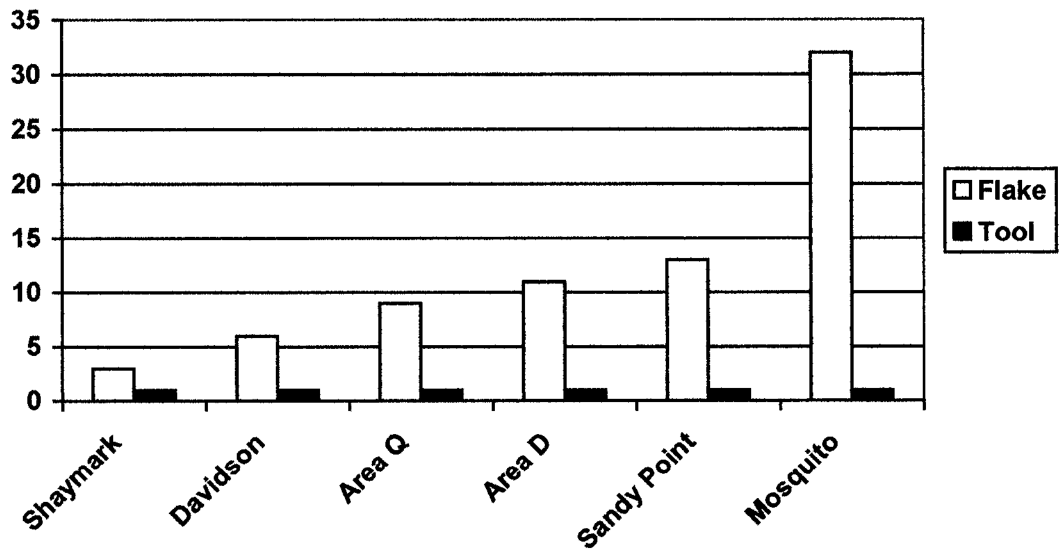


Figure 7.2 Recorded flake-to-tool ratios by site component.

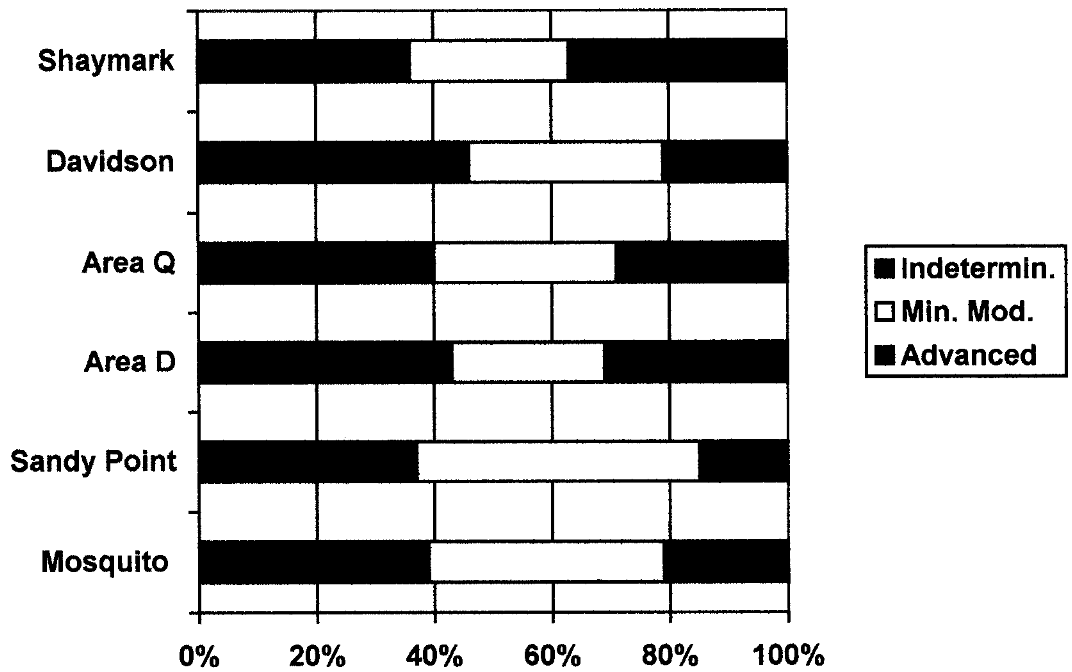


Figure 7.3 Recorded striking platforms by site component.

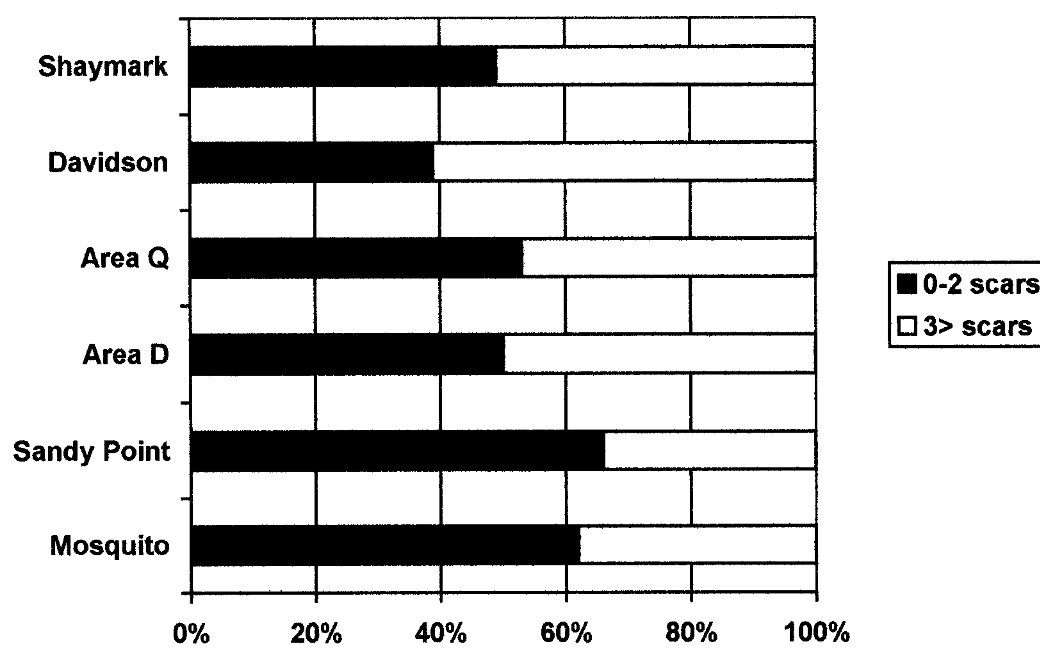


Figure 7.4 Recorded dorsal scar counts by site component.

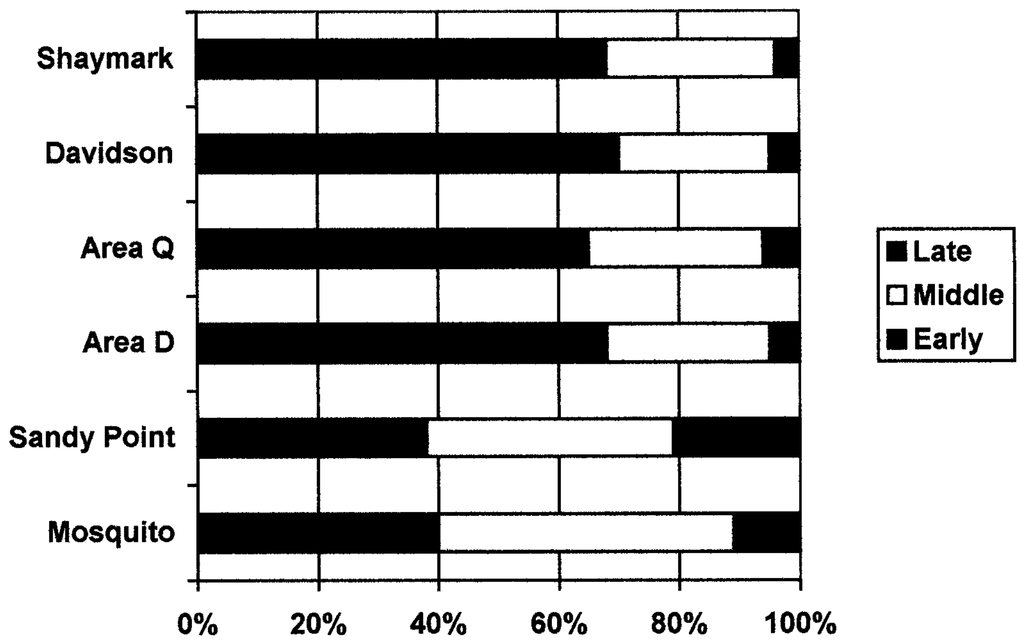


Figure 7.5 Stages of reduction continuum present (striking platform x dorsal scar count on complete flakes only).

At Area Q and Area D, toolmakers were replacing some lost tool utility through the exploitation of local chert pebbles but activities were still largely centered on tool maintenance and repair. The flake-to-tool ratios for these sites are more moderate (see Figures 7.2). However, Area Q has proportionately more formal tools than Area D (see Figure 7.1). Despite this, the reduction activities at both sites are similar. Striking platforms on complete flakes indicate both advanced states associated with late stage reduction and maintenance, as well as minimally modified and cortical states produced during early stage reduction (see Figure 7.3). Dorsal scar counts indicate some objects worked at these sites were in an advanced state of reduction while others consisted of minimally shaped cores and pebbles (see Figure 7.4). These sites are ranked second and third for flakes bearing 50-100% cortex cover, which reflects the selective reduction of local cortical pebbles. When striking platforms and dorsal scar counts are cross-tabulated, they indicate a slightly higher proportion of early and middle stage reduction compared to the other coastal sites; however, late stage reduction activities still clearly dominate at both locations.

It should be noted that in my effort to present these data from the debitage analysis in a simpler format that clearly conveys the broad patterns that distinguish these assemblages, I had to collapse certain attribute states into several more general categories. These principally include striking platforms and dorsal scar counts. Minimally modified states include: crushed, shattered, unprepared (i.e. cortical), single facet, and any combination of these states. Advanced states include: multiple facets, abraded or ground, faceted (i.e. bifacial), and any combination of these states. These gross categories do not convey the small, late stage flakes present at Shaymark that have single facet platforms, nor do they recognize the large, early stage reduction flakes at Mosquito Ridge and Sandy Point that have multiple flake facets. Similarly, by collapsing dorsal scar counts into two mutually exclusive categories, those flakes that had fewer scars but were smaller and clearly produced during late stage reduction were lumped together with those that were larger and from early stage activities. And, those flakes that were larger and had a greater surface area with more scars were lumped together with those that were produced during late stage reduction, which also had high dorsal scar counts. Effectively, when these attributes are cross-tabulated, there is a slight over representation of early stage reduction among the coastal sites, and late stage reduction among the inland sites. Despite this minor loss of resolution from the larger analysis, clear and consistent patterns distinguishing these sites are still plainly visible indicating tangible differences do exist between these inland and coastal occupations.

Coastal and Inland Sites: Evaluation of Research Hypotheses

The results described in Chapter six and those presented in the previous section demonstrate there is notable variation in Pre-Dorset site types and site function in the coastal uplands of Frobisher Bay (see Table 7.7). Shaymark and Davidson Point represent warm season sites where people appear to have come together in late summer to exploit local food sources, and to prepare their lithic and organic toolkits prior to their departure to the outer coastal regions. Area Q is a small warm season camp occupied by individuals who remained on the coast while task groups went inland to procure subsistence and material resources. And, Area D is interpreted as a warm season stopover site where the Pre-Dorset briefly stayed prior to departing for another location, likely in the interior where they may have hunted caribou. There is, however, one important commonality among all of these coastal upland sites: they were occupied during the warm season. In other words, none of them represent winter occupations, which means the Pre-Dorset did not spend their winters at the head of Frobisher Bay. It is most likely that they spent this part of the seasonal round on the sea ice close to the flow edge or along the shores in the outer coastal regions. This land use pattern closely mirrors that described for the Inuit occupying this region during the historic period (Boas 1964; Stenton 1989).

Patterns of lithic assemblage variability isolated in the inland sites clearly show the Pre-Dorset traveled to this region in specialized task groups for the purpose of acquiring lithic raw materials (see Table 7.8). More importantly, these task groups were using a direct procurement strategy. There is no evidence indicating toolstone was acquired as a secondary activity to caribou hunting. This is perhaps best illustrated by the very low frequency of caribou remains in the Mosquito Ridge faunal assemblage. While direct procurement of lithic raw material is considered somewhat unusual given the costs incurred using this kind of strategy (see Binford 1979:259), it appears to have been an extremely important component of the Pre-Dorset seasonal round. These task groups were not going inland to procure birds or caribou; they were going to get stones. And, as Beck *et al.* (2002:488) and Kelly (2001:68) note, in order for hunter-gatherers to spend time acquiring and processing toolstone, they must give up the opportunity to do something else. The acquisition of raw material obviously took precedence over subsistence activities at these sites. This should not be entirely surprising since food resources are abundantly distributed throughout the coastal upland regions during the warm season making them readily accessible to the Pre-Dorset. In other words, it was not necessary for these people to go to the interior to get food and bring it back since food was sufficiently abundant on the coast. However, the geological distribution of the inland lithic raw materials does not change, meaning the toolmakers had to go inland to get them, and the best time of year to do this is during the warm season.

It is important to contextualize Binford's (1979:268) comments regarding the costs associated with the direct procurement of toolstone. In his study of the Nunamiut, hunters were faced with severe time stress at specific times or seasons of the year, and they had to carefully schedule their activities. Hunting caribou during the annual migrations presented the Nunamiut with such situations. Therefore, Binford's statement that direct procurement of toolstone was very unusual and generally reflected situations when planning for the hunters had gone terribly wrong, refers specifically to these periods of time stress during the seasonal round. Rather than return empty handed, hunters would pick up lithic raw materials; however, they never did this when the hunt was successful and caribou had to be processed and transported. Binford's (1979:268) inferences about costs and toolstone acquisition do not refer to those periods where time stress was not a factor. In other words, he was not referring to activity scheduling during the Arctic warm season where subsistence resources are more plentiful and easily acquired, and when people generally could relax. The evidence from Mosquito Ridge and Sandy Point seems to reflect acquisition during such a period. Task groups were in the interior during the warms season, had access to moulting waterfowl for subsistence, and could spend time renewing their raw material supply without creating conflicts with other scheduled activities.

Table 7.7 Summary data for Coastal Sites.

	Principal technological activities	**Toolkit diversity**	**Reduction strategies/ stages present**	**Key debitage attributes**	**Flake:tool ratios**	**Percent Type (tool vs. core)**	**Social organization /relations of production**	**Season of occupation**	**Site Function**
Shaymark (N=5,091)	late stage tool finishing/ maintenance	high	curation/ unimodal distributions	small flakes with elaborate platforms, high dorsal scars, trimming dominate, high cortex (18%)	3:1 (low)	87.1% - 19% (106.1)	entire social group/ structured, experts working	late summer, early autumn	warm season gathering site – preparing lithic and organic toolkits for winter
Davidson Point (N=1,123)	late stage tool finishing/ limited core reduction	high	curation/ multimodal distributions	some exotic toolstone, small flakes with elaborate platforms, high dorsal scars, dominate, low cortex frequency (9.8%)	6:1 (low)	55.4% - 48.5% (103.9)	entire social group/ structured, limited evidence of novices	late summer, early autumn	warm season gathering site – preparing lithic and organic toolkits for winter
Area Q (N=363)	late stage reduction, tool maintenance/ bipolar	high	curation, limited expediency* /multimodal distributions	some exotic toolstone, small flakes with elaborate platforms, high dorsal scars – high frequency of shatter– high cortex (18.5%)	9:1 (low)	69% - 33.5% (102.5)	individuals not included in inland task groups/relaxed	spring/ summer	warm season occupation
Area D (N=324)	late stage reduction, tool maintenance/ bipolar	low	curation, limited expediency/ unimodal distributions	small flakes with elaborate platforms, high dorsal scars – some bipolar flakes – high cortex (16.3%)	11:1 (low - med.)	61.7% - 42.9% (104.6)	single family unit(s)/ inconsequential	spring	temporary stopover camp

*Limited expediency refers to the production of informal tools, burins, scrapers, etc. using flakes derived from local chert pebbles.

Table 7.8 Summary data for Inland Sites.

	Principal technological activities	**Toolkit diversity**	**Reduction strategies/ stages present**	**Key debitage attributes**	**Flake:tool ratios**	**Percent Type (tool vs. core)**	**Social organization /relations of production**	**Season of occupation**	**Site Function**
Sandy Point (N=1,276)	raw material testing, early stage core reduction/ some preform-blank production	low	expediency/ early-middle stages, unimodal distributions	minimally modified platforms, heavy percussion features, low dorsal scars, size 2 flakes dominate, high cortex levels – 30%	13:1 (low - med.)	80.3% - 23.3% (103.6)	task groups/ novices participating, relaxed	spring/ early summer	raw material acquisition site – more limited tool production, teaching novices to knap
Mosquito Ridge (N=11,205)	core reduction/ intense preform, blank production- minimal late stage reduction - retooling	low	curation*, some expediency/ early-middle stages, unimodal distributions	minimally modified platforms, heavy percussion features, low dorsal scars, lower cortex levels, size 1 flakes dominate	35:1 (high)	57.7% - 43.5% (101.2)	task groups/ novice activities curtailed, more structured arena – socializing with distant groups	spring/ early summer	lithic workshop – raw material acquisition, tool production, bird hunting
Mosquito Ridge West (N=5,095)	core reduction/ intense preform- blank production, minimal late stage reduction - retooling	low	curation, some expediency/ early-middle stages, unimodal distributions	minimally modified platforms, heavy percussion features, low dorsal scars, lower cortex levels, size 1 flakes dominate	27:1 (high)	70.6% - 32% (102.6)	task groups/ novice activities curtailed, more structured arena – socializing with distant groups	spring/ early summer	lithic workshop – raw material acquisition, tool production, bird hunting

* Curation at these sites refers to the advanced preparation of raw materials in the anticipation of inadequate future conditions (see p. 54). In this case, conditions would be the geological and seasonal restrictions of toolstone during the winter in the outer coastal regions.

But, if these sites were occupied during a period when caribou numbers were in decline, considerations of time stress and costs of procurement most likely would approximate those discussed by Binford since securing adequate quantities of hides would have been of primary importance and would have placed different demands on people's time and energy. The Pre-Dorset most likely did go inland to hunt caribou even if they were not doing so at these sites. Since these are the only two Pre-Dorset occupations presently known in the interior of southern Baffin, further investigations are needed to determine if caribou hunting was intensively pursued in this region, and if these activities co-occurred with cyclical fluctuations in the herds.

The stages of the lithic reduction present in the coastal upland sites are all at the latter end of the continuum (see Figure 7.5). Toolmakers were engaged in late stage reduction activities, whether it was tool finishing, or repair and maintenance. In contrast, the stages present in the inland sites consist almost entirely of the early and middle segments of the continuum (see Figure 7.5). Toolmakers were busily acquiring new toolstone and reducing it for long distance transport. When these stages are combined, a near complete sequence is represented among these sites. The reduction of toolstone appears to have been carefully staged while the Pre-Dorset were performing different activities with different people in different locations. These stages are discernible and their presence in these sites record the movement of toolstone from the point of procurement inland during the spring and summer, to the coastal uplands in the late summer and early fall, to the outer coastal regions in winter, and back again to the coastal uplands and interior regions in the spring and summer. As the seasons, site locations, activities, and social organization changed throughout the year, so too did the manner in which the Pre-Dorset treated their toolstone and interacted with one another while it was being worked.

This consistency implies a strict conformity to tool production and use for the Pre-Dorset on southern Baffin Island, and reflects the agency of individuals to know what strategies were appropriate to use during the course of the seasonal round. For example, when task groups were in the inland areas, it was all right for novices to engage in flint knapping since raw materials were abundant and these wasteful reduction episodes would not jeopardize the group's overall supply. In contrast, novices do not appear to have participated in tool production activities to any great extent in the coastal upland sites since the supply of available toolstone had significantly higher costs associated with it (given its acquisition from the interior using a direct procurement strategy) and it was not easily replaced. The fact there is little variation in the way these toolstone supplies were reduced from site to site in this region indicates individuals did not deviate from the established norms. Toolmakers were acting in ways to reinforce the existing socio-historical structures governing the social relations of production resulting in the maintenance of the technological "status quo."

However, the physical structures affecting the seasonal changes in the environment, availability of subsistence resources, and the distribution of lithic raw materials in the southern Baffin region effectively demand this kind of conformity in reduction and use strategies since to underestimate the amount of toolstone needed throughout the year or to be wasteful with the available supply would impose severe stress on the viability of this technology to meet the needs of these people. Simply stated, a decision to do "otherwise" in this kind of circumstance could spell disaster for the well being of the group, particularly since lithic tools are an integral part of the hunting strategies practiced by the Pre-Dorset, and not having enough toolstone to make an implement could prevent a group from acquiring food resources.

When the sites included in this study are considered collectively as part of an adaptive system, a discernible pattern of land use and resource exploitation emerges. The Pre-Dorset likely spent their winters in the outer coastal regions and on the sea ice where they could hunt seals from the open water and at their breathing holes, and they carried with them an intensely curated formal lithic toolkit. With the onset of spring, people in the winter camps traveled to the coastal uplands. Once there, they disbanded into separate task groups. One or more groups stayed in the coastal uplands where they conserved their existing lithic toolkit and exploited local chert pebbles. Subsistence activities likely focused on abundant seasonal resources including birds, fish, caribou, and berries. The other task group(s) went inland to acquire toolstone to renew the entire group's supply. While there, they exploited abundant supplies of snow geese and interacted with other task groups dispatched to the interior from other distant coastal locations. Once these inland task groups returned to the coastal uplands, they probably turned towards caribou hunting. By the end of the summer, those groups of Pre-Dorset who spent the warm season in separate camps appear to have reunited with one another at sites, such as Shaymark and Davidson Point, where they could continue to hunt caribou and fish for char. Technological activities at these late summer sites focused on lithic and organic tool production, and possibly sewing in anticipation of the group's return to the outer coastal regions and the sea ice where they spent the winter. Area D indicates the Pre-Dorset may have also followed an inland lake strategy (Stenton 1989) when caribou herds were in decline; however, the inland equivalent of this site type has yet to be located.

While it is not my objective to prove these sites are connected, that is, having been occupied by a single group of Pre-Dorset people in the southern Baffin region, the consistency and complementarity in the patterns of lithic assemblage variability isolated among them does indicate members of this culture had an established pattern of land use between these inland and coastal regions. The results of this study principally conform to Hypothesis 3. However, the acquisition of lithic raw material was not embedded as a secondary activity to caribou hunting. Rather, the Pre-Dorset went inland to get this toolstone using a direct procurement strategy and while they were there, they subsisted largely on avian resources because they were available, easily acquired, and offered a reliable food source that could sustain them as they focused their attention on retooling activities. Since lithic tools were such an integral part of their everyday lives, the importance the Pre-Dorset placed on this resource and the lengths they went to get it make complete sense, particularly when one considers the seasonal and geological conditions that restrict its access. The costs associated with using a direct procurement strategy appear to have been offset by embedding important social activities in these journeys.

Novices were included in the task groups that went inland and through their participation, these individuals not only learned how to knap stone, but they also likely learned about their environment, and the availability and distribution of subsistence and material resources critical to their existence. In other words, these journeys to procure lithic raw material and to manufacture stone tools would have also served as a way to enculturate younger generations. Stout's (2002) study demonstrates that teaching people to make stone tools does not just involve teaching them "how to do;" rather it also teaches them "how to act." Through the acquisition of this skill, novices work closely with the experienced members of their social groups and in doing so are exposed to the accepted norms that structure their technological, economic, and social environments.

It should be stated that the Area D component at Tungatsivvik also conforms, in part, to Hypothesis 2 since this occupation appears to represent one segment of the interior lakes pattern. It is entirely plausible that the Pre-Dorset implemented a similar land use strategy to mitigate the periodic shortfalls in caribou herds in the southern Baffin region. However, further investigation of the inland area is required to confirm this inference.

Micro-scale patterns of variability isolated in this study indicate the social relations of tool production among the Pre-Dorset are complex and change in accordance with different seasons, site locations and activities, access to toolstone, and shifts in group social organization.

The social atmosphere in the inland sites was the most relaxed since food resources were abundant, experts had more time to dedicate to novice activities, and there were no additional costs imposed on the task group in terms of raw material acquisition. Novices appear to have known they could practice at sites like Sandy Point whereas they did not readily knap stone selected for transport and reduction at the workshop site(s), like Mosquito Ridge. It is likely novices understood that experts had to focus their attention more on retooling activities while at these workshop sites instead of on their apprenticeship. It is also likely novices were engaged in other activities, including hunting birds or socializing with individuals from other distant groups, which would have further limited their reduction episodes.

In contrast, the social relations of production were more structured at late summer sites in the coastal uplands where lithic tools were in their final stages of finishing. Social organization appears to have changed, possibly to accommodate the reunion of disbanded groups at these locations. Moreover, site activities changed and placed different demands on people's attention and time. But the intensity of these activities also provided opportunities for individuals to negotiate their position and status within a larger social network, and there is evidence expert knappers were investing more time and energy in working their tools as demonstrated by the higher frequencies of fine flaking patterns, edge serration (on bifaces), polish, and symmetrical morphologies. Effectively, individuals were more readily demonstrating their "technical know-how" (Dobres 1995). Several bifaces included in these aggregation sites exhibit an intense degree of embellishment that exceeds the functional requirements of these tools; however, these tools are heavily curated, used, and intact, indicating they were brought to these sites and abandoned in anticipation of being retooled. It is likely these tools were finished and retouched in winter sites, and brought to the coastal uplands with the Pre-Dorset in the spring where they were further used and maintained. The intensity of work exhibited by these tools implies the social relations of production were most rigid at winter sites where stress on raw material and subsistence resources would have been most acute. However, until winter sites are identified and investigated, assessments of toolmaker agency in these situations must remain speculative.

An important corollary of this micro-scale analysis is the interpretation that women in Pre-Dorset culture were also skilled toolmakers. If women were equally capable of making and maintaining a variety of stone tools, they too must have undergone a period of apprenticing to acquire this skill. Therefore, it is probable young women also accompanied the task groups who went inland to acquire toolstone and in the process, were engaged in novice tool production activities. These journeys would provide all young people with opportunities to meet individuals from distant groups, find potential mates, and learn to cope with a variety of adaptive contingencies. Establishing marriages or unions such as this would increase the reproductive pool for these otherwise small, distant groups of people (see MacDonald 1998, 1999; MacDonald and Hewitt 1999). Reproductive fitness was undoubtedly a critical consideration for all early Palaeo-Eskimo populations. Thus, it would be futile to simply have men socializing in these inland settings if they served as a gathering location where one objective was to ensure the larger population's stability.

Macro- and micro-scale patterns of variability isolated in this analysis indicate the land use strategies practiced by the Pre-Dorset on southern Baffin Island are far more complex than a simple inland/coastal dichotomy. They also demonstrate interpretations about individual agency; the social relations of production, and social organization can be made using lithic evidence. By changing my way of "seeing" (Dobres 1999a) I was able to access another level of interpretation about this culture and the people it included. These results demonstrate that more complex questions can be asked about Pre-Dorset lifeways and answered using lithic evidence. This should dispel any notions that little more can be learned about the Pre-Dorset precisely because their remains consist largely of stone tools and debitage. This study highlights the actions of individuals and finally brings a sense of people to the Pre-Dorset past.

Research Results: Assessment of Analytical Methods

Given the total number of artifacts examined, I believe it is important to address the efficacy of the analytical methods that were selected for use. While the current literature on lithic analysis strongly advocates using a combined methodological approach (see Chapter 5), the results of this study indicate some methods are better suited than others for isolating variability among Palaeo-Eskimo lithic assemblages. The size and nature of the lithic raw materials exploited by these people on southern Baffin Island, as well as the size of the tools made from them, affect the utility of three methods in particular, thus reducing their interpretive value. These include: MANA, mass analysis, and the Sullivan and Rozen (1985) method. Because Carr and Bradbury's (2001) Percent Type approach draws on mass analysis, its application to these assemblages is also questionable.

The premise of MANA is to trace the distribution of lithic raw materials in archaeological sites by means of examining proportionate frequencies of specific raw material types, colours, textures, quality, and cortex (see Ingbar *et al.* 1989; Larson 1994; Larson and Ingbar 1992; Larson and Kornfeld 1997; see also p. 124). These attribute states can be measured among sites in a region to understand how analytical nodules are acquired, transported, and used in different situational contexts. The effectiveness of this method is, however, dependent to a large extent on being able to identify clear differences in the lithic raw materials being worked. In other words, if the toolstone being worked was extracted from a fixed location (i.e. quarry, living bedrock), which has distinct qualitative properties, it is easier to isolate its relative distribution across the landscape. Much of the theoretical basis for this approach was developed by Larson's

(1990, 1994) doctoral work, which focused on sites where such lithic sources exist. Therefore, it was possible to trace where analytical nodules came from, where they were transported to, and how they were worked, used, and abandoned. Larson and Kornfeld (1997:5) do note that this method is not as effective when applied in areas that have extremely homogeneous toolstone sources, like North Dakota where use of Knife River Flint is pervasive.

However, in the present study, this method is not particularly useful when raw material sources are highly variable and consist of small cortical "packages" (Bradbury and Franklin 2000) that occur in secondary contexts. Table 7.9 lists the 10 most common raw material colours isolated among the inland and coastal sites for debitage. Table 7.10 lists the 10 most common raw material colours for the informal and formal tool categories. The ranking is determined by the gross frequency of flakes by colour type. For example, the most dominant colour recorded in the debitage assemblage for Shaymark was colour five (light brownish gray/pinkish gray) with 1168 flakes. The second most dominant colour is ten (light gray/pale brown) with 793 flakes. Therefore, these two colours are ranked first and second in overall frequencies for the debitage assemblage. Colour one is the third most frequent and is ranked third, and so forth.

Based on a comparison of these colours and frequencies, there is no clear pattern that would indicate certain toolstone types were more intensively used than others in a given location or that they were selectively transported to some sites and not others. Since most of the toolstone present in these assemblages, in all artifact categories, is flawed by the presence of vugs, voids, or fossil inclusions, it is also difficult to make broad assessments about qualitative selectivity. Certainly some stones are less flawed than others but generally there is a higher frequency of consistently flawed material in every site. Similarly, texture is equally homogeneous consisting of fine-grained materials. Interpretations about cortex frequencies are not overly robust either since the package type of this material consists of variable sized cortical nodules and pebbles, which are intensively reduced in the interior through raw material testing activities, and for long distance transport. There are two sites where clear patterns related to cortex and toolstone transport are discernible, and these include Sandy Point, which has the highest frequency of recorded cortex and occurs inland, and Davidson Point, which has the lowest and occurs on the coast. Overall, I do not think MANA is very useful in the analysis of southern Baffin Island Pre-Dorset sites. The lithic raw materials are too small and variable in colour yet too homogeneous in quality, texture, and cortex cover. These factors complicate efforts to identify patterns that can be linked to toolstone sourcing, transport, and use.

Table 7.9 Raw material colour frequencies for debitage by site. The ranking of colours from one through ten denotes the most common to least common recorded colour by assemblage. The numbers listed by site are the actual colour codes, which are listed in Appendix A.

	Raw Material Colours for Debitage									
rank	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Shaymark	5	10	1	6	2	22	4	27	7	12
Davidson Point	5	1	10	27	2	6	4	7	12	11
Area Q	10	6	1	5	4	22	2	9	27	40
Area D	5	1	10	6	2	27	4	9	11	12
Sandy Point	5	1	8	2	10	7	9	20	12	30
Mosquito Ridge	5	1	2	10	12	7	6	4	3	20
Mosquito Ridge West	1	5	2	10	20	8	20	3	7	4

Table 7.10 Raw material colour frequencies for informal and formal tool categories by site. The ranking of colours from one through ten denotes the most common to least common recorded colour by assemblage. The numbers listed by site are the actual colour codes, which are listed in Appendix A.

	Raw Material Colours for Informal and Formal Tools									
rank	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Shaymark	5	1	10	27	2	4	7	9	6	12
Davidson Point	5	1	10	4	2	27	33	7	12	30
Area Q	10	5	1	6	4	22	2	33	40	-
Area D	5	1	2	10	43	27	9	53	-	-
Sandy Point	1	5	8	10	2	3	30	4	40	13
Mosquito Ridge	1	2	5	10	4	12	27	3	9	40
Mosquito Ridge West	1	2	5	10	4	43	9	12	8	27

Mass analysis was not overly definitive for examining changing patterns in flake size and weight among sites. However, dorsal scar counts did provide clear patterns that were linked to specific changes in reduction strategies. Nearly every site, with the exception of Sandy Point, is dominated by small size flakes with low weights. This consistency can be linked, again, to the small size of the parent materials being worked in this region and the tools made from them. Because toolmakers were exploiting smaller parent materials to make smaller prepared cores, which then yielded smaller tool blanks, the size and weight of the debris generated from reduction activities at virtually every stage is compressed into the smallest categories for nearly every site. There are proportionately more large size flakes at Sandy Point and Mosquito Ridge but they are still not as massive or numerous as one might find in culture areas further south (see Ahler 1989b) where large quarries are exploited. Only when flake size and weight are cross-tabulated with other individual attribute states, like striking platforms and dorsal scar count, do clear and consistent patterns emerge that reflect differences in lithic reduction strategies between the inland and coast. These patterns are not as robust as published examples using these same methods (see Ahler 1989a, 1989b; Bradbury and Franklin 2000; Root 1997) but they are qualitatively significant.

The Sullivan and Rozen (1985) method was not at all useful in this study. Every site yielded near identical results. Tool production accounted for between 72 – 80% of site activities while core reduction accounted for between 20 – 28%. There were virtually no differences among sites, regardless of location, function, or time of occupation. These consistent patterns are most likely linked to a higher frequency of flake breakage due to raw material flaws and/or post-occupational damage from site disturbance or trampling. It is also possible the small size of the debris at these sites further contributed to a higher frequency of broken flake margins. Because small flakes are thinner and their edges more friable, they are more prone to breakage or collapse during detachment; thus, resulting in a higher incidence of fracture.

Carr and Bradbury's (2001) Percent Type approach was not useful either since the calculations failed to isolate any clear and consistent patterns distinguishing reduction strategies among these sites. The only support it contributed to the broader interpretation of a site was for Shaymark since it indicated tool making dominated site activities. However, this is the one calculation that exceeded the normal range of error of 105% ± 5, which makes these figures somewhat suspect. Since the majority of flakes in these coastal and inland assemblages are smaller than 1/4" in size a significant portion of the dataset is eliminated from analysis automatically by Carr and Bradbury's (2001) imposed size restriction. Had these equations been devised to include small size lithic debitage, they would be more appropriate for studying Pre-Dorset and other ASTt assemblages.

Of those methods selected for use in this study, the ones that proved most useful were individual attribute analysis and simple flake-to-tool ratios. Only by cross-tabulating individual attribute states were distinct patterns clearly visible. Again, these patterns are not as robust as those recorded by lithic analysts working with sites in more southern regions where toolstone sources consist of massive quarries or living bedrock, but they are visible and qualitatively substantive in meaning.

In summary, the results discussed here indicate a combined methodological approach is not entirely effective for isolating patterns of variability among Pre-Dorset sites on southern Baffin Island. This is an important observation to make considering the current literature on lithic analysis, which increasingly advocates its use. Archaeologists, particularly those working in the Arctic studying ASTt sites, should first consider which methods are most appropriate given the nature of the lithic raw material types available in a region. Archaeologists also need to consider how these people may have acquired and used this toolstone at different times of the year. While the field of lithic analysis has made significant gains in precision through the development and application of more systematic analytical methodologies, there is still a need to remain flexible in their application depending on the nature of the assemblages being studied and the regions from where they derive. Rigid adherence to methodological rigour without sufficient consideration of context or people's actions can fail to show, and might possibly even obscure, the patterns these methods were designed to reveal.

Chapter 8

Summary and Conclusions

Research Objectives and Results

This study had two objectives: (1) to examine functional differences in Pre-Dorset sites on a regional scale in order to examine this culture's seasonal land use strategies and patterns of resource exploitation on southern Baffin Island; and (2) to study the existence of lithic assemblage variability as though "people mattered." To meet these objectives I examined lithic artifact assemblages from three inland and four coastal site components in the southern Baffin region. Multiple working hypotheses were constructed integrating elements of Stenton's (1989, 1991a, 1991b) land use model and the traditional seasonal mobility model proposed for the early Palaeo-Eskimos (Bielawski 1988; see Chapter 3). Information on the southern Baffin environment, climate, and resource base was also used. Related test expectations were devised to predict patterns of lithic assemblage variability associated with each behavioural scenario in the proposed hypotheses. These patterns explicitly consider the organization of technology and the social relations of production.

Four methods of analysis were used to isolate patterns of lithic assemblage variability: individual attribute analysis, mass analysis, minimum analytical nodule analysis, and the Sullivan and Rozen (1985) method. This combined approach generates multiple lines of evidence with which to interpret patterned variation. However, while a combined analytical approach is strongly advocated in the current literature on lithic analysis, this study demonstrates not all methods are suitable for isolating variability among Pre-Dorset assemblages. A more rigorous sampling strategy was used to draw study samples from three of the assemblages.

I can state with 95% confidence that these results are representative of the variability present in the larger populations for each respective site. Since the objectives outlined in this study have different spatial and temporal dimensions, patterns of lithic assemblage variability were isolated at two separate scales of analysis: macro and micro. Macro-scale patterns were used to interpret functional differences between these inland and coastal sites while micro-scale patterns were used to understand Pre-Dorset social organization, the social relations of production, and the agency of toolmakers. Once isolated, these patterns were interpreted using two theoretical frameworks: the organization of technology and agency theory. A multi-scalar framework was used to organize these different scales of analysis and interpretation (Dobres 1995, 1999a; Marquardt 1992).

Macro-scale patterns of lithic assemblage variability indicate functional differences are more pronounced among sites in the coastal uplands of Frobisher Bay than they are for those in the inland region near Nettilling Lake. Coastal upland sites represent temporary stopovers, warm season camps, and late summer/early fall aggregation camps whereas inland sites were principally used for raw material acquisition and as tool production workshops.

Micro-scale patterns indicate the social relations that structure Pre-Dorset tool production activities are complex and change in accordance with site location and function, access to lithic raw materials, and social organization. Of all the sites examined, the warm season aggregation camps had the most structured social relations of production. Experts were involved in late stage tool finishing and maintenance activities, and were demonstrating their technical "know-how" by means of embellishing certain tool types beyond their basic functional requirements. Skill was likely being displayed in an organic medium as well. In contrast, the social relations of production were most relaxed in the inland sites where clear evidence of novice participation in tool production activities was identified. The conditions at these sites are ideal for novices to learn because raw material is abundant and easily accessible during the warm season.

It is important to note that all of these sites were occupied during the warm season (i.e. spring, summer or early fall) indicating the Pre-Dorset did not spend their winters at the head of Frobisher Bay. Rather, with the onset of winter, these people appear to have left the coastal uplands to spend this part of the seasonal round along the shores in the outer coastal regions or on the sea ice close to the floe edge. It is likely that the social relations of production were most rigid in these winter sites since raw material and food stress would have been acute. However, very little, if anything, is presently known about the Pre-Dorset occupation of this outer coastal region.

When the macro- and micro-scale patterns of variability isolated among these inland and coastal sites are compared at a regional level, they principally support Hypothesis 3, which states:

> The Pre-Dorset followed a seasonal round, moving from the outer coastal regions farther down the bay where they wintered, to the coastal uplands where they spent the spring, summer, and early autumn. While in the coastal upland areas, specially organized task groups made periodic trips to the interior regions to procure critical resources, namely caribou and lithic raw materials.

There are only two points of divergence between the proposed hypothesis and these results: (1) the Pre-Dorset task groups that went inland did so to acquire lithic raw material using a direct procurement strategy; and (2) while the task groups were in the interior, they subsisted largely on avian resources, not caribou. The timing of this journey(s) was likely in the late spring or early summer so the Pre-Dorset could take advantage of the birds' annual moult.

It should be stated that the Area D component at the Tungatsivvik site provides some support for Hypothesis 2 since this occupation seems to represent a warm season stopover in the coastal upland area. This hypothesis is similar to Hypothesis 3; however, rather than remaining in the coastal uplands for an extended period, the Pre-Dorset only stayed for brief stopovers before departing to the inland proper where they spent the warm season. The incentive for traveling inland was likely caribou hunting, particularly when herds were in decline. It seems certain the

Pre-Dorset on southern Baffin Island experienced fluctuations in the availability of caribou and it would make sense for them to have an adaptive response to this kind of contingent circumstance. However, until the inland equivalent of this alternative strategy is identified, speculation about its existence remains tentative.

The objectives of this research have been met, resulting in a more comprehensive understanding of Pre-Dorset lifeways in the southern Baffin region. The results of this study indicate that while the Pre-Dorset and Inuit exploited the inland and coastal regions and occupied many of the same site areas, their incentives for traveling to the inland proper were different as was the frequency of their trips. Therefore, drawing direct analogies between the early Palaeo-Eskimos and Neo-Eskimos should be done with caution. These types of comparisons do have important heuristic value, as demonstrated by the integration of Stenton's (1989, 1991a, 1991b) land use model in this study, but they should be rigorously tested through the formulation and evaluation of research hypotheses.

Multiple Scales of Analysis and "Different Ways of Seeing"

My desire to study Pre-Dorset assemblage variability as though "people mattered" was inspired, in part, by Dobres' (1995, 1999a, 1999b, 2000; Dobres and Hoffman 1994) work on the Late Magdalenian. Her research demonstrates that complex social questions can be asked and answered through the careful examination of patterned variation in the material remains of past hunter-gatherer societies. The key is to make "people" explicit in the formulation of the questions being asked. Doing this will necessarily demand that archaeologists "think differently" about their data since people are placed in the forefront as being a source of variation. In turn, archaeologists will "do differently" since this kind of perceptual shift also requires a corresponding change in methodology. To find the people in the past, one must be able to isolate the remains of their actions. Finally, archaeologists will "see differently" since they become predisposed to look for patterns of variability that are socially meaningful. When using traditional culture-historical and processual approaches to interpret variability, these socially meaningful patterns remain unknown since they exist at a scale of analysis that these interpretive approaches do not consider. Effectively, Dobres demonstrates that socially meaningful patterns of variability exist in all material remains, whether they are lithic, bone, or ceramic. Archaeologists simply need to change their way of "seeing" in order to find them.

Arctic archaeologists are well aware of the variability that exists in the lithic artifact remains of the Pre-Dorset. However, explaining why this variation exists and what it means has remained enigmatic. The traditional way of seeing variability is through a normative, culture-historical lens. Material remains are used to establish spatio-temporal frameworks in order to construct cultural-historical sequences, and because the emphasis is on identifying cultures through time, the people who made and used these tools become lost in this process. There is an opinion among Arctic archaeologists that our attempts to understand more about Pre-Dorset lifeways will always be limited because the material remains of this culture consist largely of lithic artifacts. As Wobst (2000:43) notes, this perception is also common in other culture areas where lithics are the dominant remains. However, the analytical approach taken in this study demonstrates we can learn more about the people who made and used these stone tools.

By using a multi-scalar framework, I was able to identify patterned variation across multiple scales and then compare them to better understand what sources were contributing to this variation in the seven site components I examined. Macro-scale patterns identified at the site level were critical for understanding individual site function. When these sites were compared at a regional level, I was able to identify what roles they played within the larger land use system practiced by the Pre-Dorset in the southern Baffin region. This kind of regional scale analysis is necessary to understand how cultures organize their technology because relationships among those factors directly influencing its structure and use (i.e. subsistence, raw material, mobility, and seasonality) can be identified and controlled for across the landscape (Kelly 1994:133; Thacker 1996:102). Individual sites can no longer be examined in isolation from one another if Arctic archaeologists are ever to understand the broader adaptive system used by the Pre-Dorset and other early Palaeo-Eskimos.

Having identified these macro-scale patterns, I was able to hold them constant and look for evidence of people at the micro-scale (see Marquardt 1992). This juxtaposing (Dobres 1999a) of data was essential for identifying novice flint knapping episodes in the inland sites and for understanding how the social relations of production changed throughout the seasonal round. Micro-scale variation indicates people in the Pre-Dorset culture behaved differently at different sites when they were doing things with different people. However, the consistency in where these actions occurred indicates a strong conformity to established cultural norms. Through agency, individuals were maintaining existing socio-historical structures at a broad level since to do "otherwise" within the context of the seasonal round could have posed serious risk to the success and well being of individuals and their larger social groups.

The social relations of production also appear to vary as proximity to toolstone sources changed. Relations were relaxed in the inland sites where raw materials are abundant; they were more structured in the coastal uplands where toolstone is more restricted; and relations were likely most rigid in the outer coastal sites, where the Pre-Dorset presumably wintered, since toolstone would be restricted both geologically and seasonally at this time of year. These outer coastal sites would have also represented the extreme margin of the Pre-Dorset seasonal territory. Maxwell (1973, 1985) describes an intense level of conservatism in tool styles and treatments over time in the Pre-Dorset coastal sites he investigated in the Kimmirut District. Based on this, he states the Pre-Dorset appear to have been almost "compulsive" over time in their adherence to these norms (Maxwell 1985). The formal tool types examined in this study vary qualitatively in terms of craftsmanship depending on site location. Formal types were not being elaborately worked or maintained in the interior; however, they were to a greater extent in the coastal uplands. The most embellished tools are from the coastal upland sites but many were not made in these locations as indicated by the debitage analysis. Rather, the final stages of tool production and maintenance appear to have occurred during the winter at sites whose locations are still presently unknown. Still the fact tools were being intensively worked in this manner, in these locations, at this time of year is significant.

Perhaps this embellished tool finishing in the winter sites is linked to the Pre-Dorset sense of identity and self since these sites are at the most extreme extent of their regional territories and are most marginalized in terms of social contacts with other distant Pre-Dorset groups. These peoples' sense of cultural identity would be most strained at these times because winter is when survival is most tenuous. Through agency, toolmakers could negotiate individual status through their display of skill, which, in turn, would enhance and reinforce the group's social and cultural cohesion. In the warm season sites, this kind of stress is not present and thus the demands for conformity are more relaxed. Moreover, toolstone is more readily accessible, and opportunities to interact and socialize with others are more frequent. These factors would result in pronounced qualitative variation in Pre-Dorset formal types depending on site location, seasonality, access to toolstone, and social organization. Simply stated, the agency of individuals and their larger social groups must be considered as important sources contributing to stylistic variability in Pre-Dorset formal types. We can no longer attribute it merely to change over time.

Micro-scale variation also indicates a greater than expected degree of flexibility in Pre-Dorset social organization. Group affiliation was not entirely based on the nuclear family unit.

The inland and coastal task groups strongly suggest these people organized themselves in accordance with similarities in age, physical ability, technological skill (or lack thereof), and perhaps even physical states (e.g. elderly, pregnant). Since Pre-Dorset women were also likely able lithic toolmakers and may well have participated in the inland task groups, it is possible the social norms governing gender segregation were flexible depending on the time of year and the tasks at hand.

By adopting a different way of "seeing" and using a multi-scalar analytical approach, the results of this study demonstrate more detailed interpretations about Pre-Dorset lifeways are tenable. Lithic artifacts should not be seen as a limited data set. If new ways of thinking and doing are applied in their analysis, new lines of evidence can help archaeologists learn more about the people who made these tools and the situational contexts in which this behaviour occurred. Since lithic artifacts are typically the most ubiquitous and durable remains found in the sites of prehistoric hunter-gatherers (Andrefsky 1998; Shott 1994), especially among the early Palaeo-Eskimos, they offer an important yet somewhat underestimated source of information that archaeologists can use to build a more people-centered view of the past.

References Cited

Ahearn, L. M.
2001 Language and Agency. Annual Review of Anthropology 30:109-137.

Ahler, S. A.
1989a Experimental Knapping with KRF and Midcontinental Cherts: Overview and Applications. In Experiments in Lithic Technology, eds. D. S. Amick and R. P. Mauldin, pp. 199-234. BAR International Series No. 528

1989b Mass Analysis of Flaking Debris: Studying the Forest Rather Than the Tree. In Alternative Approaches to Lithic Analysis: Proceedings of the University of Tulsa Conference on Lithic Analysis, eds. D. O. Henry and G. H. Odell, pp. 85-118. University of Tulsa, Tulsa.

Alisausakas, R. T.
2002 Arctic Climate, Spring Nutrition, and Recruitment in Midcontinent Lesser Snow Geese. Journal of Wildlife Management 66(1):181-193.

Amick, D. S.
1994 The Organization of Technology: Impact and Potential. In The Organization of North American Chipped Stone Tool Technologies, ed. P. Carr, pp. 1-8. International Monographs in Prehistory, Archaeological Series No. 7, Ann Arbor, Michigan.

1996 Regional Patterns of Folsom Mobility and Land Use in the American Southwest. World Archaeology 27(3):411-426

Amick, D. S., and R. P. Mauldin
1989 Comments on Sullivan and Rozen's "Debitage Analysis and Archaeological Interpretation". American Antiquity 54(1):166-168

1997 Effects of Raw Material on Flake Breakage Patterns. Lithic Technology 22(1):18-32.

Amick, D. S., R. P. Mauldin, and L. R. Binford
1989 The Potential of Experiments in Lithic Technology. In Experiments in Lithic Technology, eds. D. Amick and R. Mauldin, pp. 1-14. BAR International Series No. 528.

Andrefsky, W., Jr.
1991 Inferring Trends in Prehistoric Settlement Behaviour from Lithic Production Technology in the Southern Plains. Midcontinental Journal of Archaeology 12(2):129-144.

1994a Raw Material Availability and the Organization of Technology. American Antiquity 59(1):21-34.

1994b The Geological Occurrence of Lithic Material and Stone Tool Production Strategies. Geoarchaeology 9(5):375-391

1998 Lithics: Macroscopic Approaches to Analysis. Cambridge University Press, Cambridge.

2000a Lithic Debitage: Context, Form, Meaning, ed. W. Andrefsky. University of Utah Press, Salt Lake City.

2001b Emerging Directions in Lithic Debitage Analysis. In Lithic Debitage: Context, Form, Meaning, ed. W. Andrefsky, pp. 2-14. University of Utah Press, Salt Lake City.

Arundale, W. H.
1980 Functional Analysis of Three Unusual Assemblages From the Cape Dorset Area, Baffin Island. Arctic 33:464-486.

1981 Radiocarbon Dating in Eastern Arctic Archaeology: A Flexible Approach. American Antiquity 46:244-271

Bailey, H. P.
1960 A Method of Determining the Warmth and Temperateness of Climate. Geografiska Annaler 43(1):1-16

Bamforth, D. B.
1986 Technological Efficiency and Tool Curation. American Antiquity 51(1):38-50.

1990 Settlement, raw material, and lithic procurement in the Central Mojave Desert. Journal of Anthropological Archaeology 9:80-104.

1991 Technological Organization and Hunter-Gatherer Land Use: A California Example. American Antiquity 56(2):216-234).

Banfield, A. W. F.
1974 The Mammals of Canada. University of Toronto Press, Toronto.

Bardon, L. A., and J. Bouyssonie
1903 Un Nouveau Type de Burin. Revue de L'Ecole d'Anthropologie de Paris 13:165-168.

Barrett, J. C.
2001 Agency, the Duality of structure, and the Problem of the Archaeological Record. In Archaeological Theory Today, ed. I. Hodder, pp. 141-164. Polity Press, Cambridge.

Barry, R. W. Arundale, J. Andrews, R. Bradly, H. Nichols
1977 Environmental Change and Culture Change in the Eastern Canadian Arctic During the Last 5000 Years. Arctic and Alpine Research 9(2):216-234.

Barton, M. C.
1988 Lithic Variability and Middle Paleolithic Behaviour: New Evidence from the Iberian Peninsula. BAR International Series No. 408.

1990 Beyond Style and Function: A View from the Middle Paleolithic. American Anthropologist 92:57-72.

Barton, C. M., D. I. Olszewski, and N. R. Coinman
1996 Beyond the Graver: Reconsidering Burin Function. Journal of Field Archaeology 23:111-125.

Baumler, M. F., and C. E. Downum
1989 Between Micro and Macro: A Study in the Interpretations of Small Sized Debitage. In Experiments in Lithic Technology, eds. D. S. Amick and R. P. Mauldin, pp.101-116. BAR International Series No. 528

Beck, C., and G. T. Jones
1990 Toolstone Selection and Lithic Technology in Early Great Basin Prehistory. Journal of Field Archaeology 17:283-299.

Beck, C., A. K. Taylor, G. T. Jones, C. M. Fadem, C. R. Cook, and S. A. Millward
2002 Rocks are Heavy: Transport Costs and Paleoarchaic Quarry Behaviour in the Great Basin. Journal of Anthropological Archaeology 21:481-507.

Bielawski, E.
1982 Spatial Behaviour of Prehistoric Arctic Hunters: Analysis of the Site Distribution on Aston Bay, Somerset Island. Canadian Journal of Archaeology 6:33-45

1988 Paleo-Eskimo Variability: The Early Archaic Small Tool Tradition in the Central Canadian Arctic. American Antiquity 53:52-74

Bilby, J. W.
1923 Among Unknown Eskimo. J. B. Lippencott Co., London

Binford, L. R.
1963 A Proposed Attribute List for the Description and Classification of Projectile Points. In Miscellaneous Studies in Typology and Classification, Anthropological Papers, No. 19, pp. 193-221. Museum of Anthropology, University of Michigan, Ann Arbour.

1965 Archaeological Systematics and the Study of Culture Process. American Antiquity 31(2):203-210.

1973 Interassemblage Variability - the Mousterian and the "Functional" Argument. In The Explanation of Culture Change: Models in Prehistory, ed. C. Renfrew, pp. 227-254. Duckworth, London.

1977 Forty-seven Trips: A Case Study in the Character of Archaeological Formation Processes. In Stone Tools as Cultural Markers: Change, Evolution, and Complexity, ed., R. V. S. Wright, pp. 24-36. Australian Institute for Aboriginal Studies, Canberra

1978a Nunamiut Ethnoarchaeology. Academic Press, New York.

1978b Dimensional Analysis of Behaviour and Site Structure: Learning from an Eskimo Hunting Stand. American Antiquity 43(3):330-361.

1979 Organization and Formation Processes: Looking at Curated Technologies. Journal of Anthropological Research 35:255-273

1980 Willow Smoke and Dog Tails: Hunter-Gatherer Settlement Systems and Archaeological Site Formation. American Antiquity 45(1):4-20

1982 The Archaeology of Place. Journal of Anthropological Archaeology 1(1):5-31

1983 Working at Archaeology. Academic Press Inc. New York.

2001 Constructing Frames of Reference: An Analytical Method for Archaeological Theory Building Using Hunter-Gatherer and Environmental Data Sets. University of California Press, Los Angeles.

Bleed, P.
1986 The Optimal Design of Hunting Weapons: Maintainability or Reliability. American Antiquity 51(4):737-747.

Boas, F.
1901 The Eskimo of Baffinland and Hudson Bay. Bulletin of the American Museum of Natural History Vol. 15:1-370

1964 The Central Eskimo. University of Nebraska Press, Lincoln. Original 1888.

Bonnichsen, R.
1977 Models for Deriving Cultural Information From Stone Tools. Archaeological Survey of Canada, Mercury Series Paper No. 60. National Museums of Canada, Ottawa.

Bordes, F.
1947 Etude Comparative des Differentes Techniques de la Taille du Silex et des Roches Dures. L'Anthropologie 54(1-2):19-34.

Bradbury, A. P.
1998 The Examination of Lithic Artifacts From an Early Archaic Assemblage: Strengthening Inferences Through Multiple Lines of Evidence. Midcontinental Journal of Archaeology 23(2):263-288

Bradbury, A. P., and P. J. Carr
1995 Flake typologies and alternative approaches: an experimental assessment. Lithic Technology 20:100-115.

1999 Examining Stage and Continuum Models of Flake Debris Analysis: An Experimental Approach. Journal of Archaeological Science 26:105-116.

Bradbury, A. P., and J. D. Franklin
2000 Raw Material Variability, Package Size, and Mass Analysis. Lithic Technology 25(1):42-58

Bradly, B. A.
1975 Lithic Reduction Sequences: A Glossary and Discussion. In Lithic Technology: Making and Using Stone Tools, ed. E. Swanson, pp. 5-14. Mouton Publishers, The Hague.

Brody, H.
1976 Inuit Land Use in North Baffin Island and Northern Foxe Basin. In Inuit Land Use and Occupancy Project, Volume 1, pp. 153-171. Department of Indian and Northern Affairs, Ottawa.

Brumbach, H-J., and R. Jarvenpa
1997 Ethnoarchaeology of Subsistence Space and Gender: A Subarctic Dene Case. American Antiquity 62(3):414-436.

Brumfiel, E. M.
2000 On the Archaeology of Choice: Agency Studies as a research Stratagem. In Agency and Archaeology, eds. M-A. Dobres and J. Robb, pp.249-255. Routledge, New York.

Cachel, S.
2000 Subsistence Among Arctic Peoples and the Reconstruction of Social Organization From Phrehistoric Human Diet. In Animal Bones, Human Societies, ed. P. Rowley-Conwy, pp. 39-48. Oxbow Books, Oxford.

Callahan, E.
1979 The Basics of Biface Knapping in the Eastern Fluted Point Tradition: A Manual for Flintknappers and Lithic Analysts. Archaeology of Eastern North America 7:1-180

Camilli, E.
1989 The Occupational History of Sites and the Interpretation of Prehistoric Technological Systems: An Example from Cedar Mesa, Utah. In Time, Energy, and Stone Tools, ed. R. Torrence, pp. 17-26. Cambridge University Press, Cambridge.

Cannon, A.
1991 The Economic Prehistory of Namu. Department of Archaeology, Simon Fraser University, Burnaby, B.C., Publication Number 19.

2003 Gender, Agency, and Mortuary Fashion. In Interacting with the Dead: Perspectives on Mortuary Archaeology for the New Millennium, eds. Gordon F.M. Rakita, Jane E. Buikstra, Lane A. Beck, and Sloan R. Williams. Volume in preparation.

Carr, P. J.
1994 Technological Organization and Prehistoric Hunter-Gatherer Mobility: Examination of the Hayes Site. In The Organization of North American Prehistoric Chipped Stone Tool Technologies, ed. P. J. Carr, pp. 35-44. International Monographs in Prehistory, Archaeological Series No. 7, Ann Arbor, Michigan.

Carr, P. J., and A. P. Bradbury
2001 Flake debris analysis, levels of production, and the organization of technology. In Lithic Debitage: Context, Form, Meaning, ed. W. Andrefsky, pp. 126-146. The University of Utah Press, Salt Lake City.

Chatters, J. C.
1987 Hunter-Gatherer Adaptations and Assemblage Structure. Journal of Anthropological Archaeology 6:336-375

Clark, J.
1987 Politics, Prismatic Blades, and Mesoamerica Civilization. In The Organization of Core Technology, eds. J. K. Johnson and C. A. Morrow, pp. 259-284. Westview Press, Boulder

Clark, J. E.
2000 Towards a Better Explanation of Hereditary Inequality: A Critical Assessment of Natural and Historic Human Agents. In Agency and Archaeology, eds. M-A. Dobres and J. Robb, pp.92-112. Routledge, New York.

Clarke, D. L.
1968 Analytical Archaeology. Methuen and Co. Ltd., London

Collins, H. B., Jr.
1956 Archaeological Investigations on Southampton and Coats Island, N.W.T. In Annual Reports of the National Museum of Canada for 1954-1955. National Museum of Canada Bulletin 142:82-113

1957 Archaeological Investigations on Southampton and Walrus Islands, N.W.T. In Annual Reports of the National Museum of Canada for 1955-1956. National Museum of Canada Bulletin 147:22-61

Collins, M. B.
1975 Lithic Technology as a Means of Processual Inference. In Lithic Technology: Making and Using Stone Tools, ed. E. Swanson, pp. 15-34. Mouton Publishers, The Hague.

Conkey, M. W.
1991 Contexts of Action, Contexts for Power: Material Culture and Gender in the Magdalenian. In Engendering Archaeology: Women and Prehistory, ed. J. M. Gero and M. W. Conkey, pp. 57-92. Basil Blackwell, Cambridge, Massachusetts.

Cotterell, B., and J. Kamminga
1987 The Formation of Flakes. American Antiquity 52(4):675-708

1990 Mechanics of Pre-Industrial Technology: An Introduction to the Mechanics of Ancient and Traditional Material Culture. Cambridge University Press, Cambridge.

Cowan, F. L.
1999 Making Sense of Lithic Scatters: Lithic Technological Strategies and Mobility. American Antiquity 64(4):593-607

Cowgill, G. L.
2000 "Rationality" and Contexts in Agency Theory. In Agency and Archaeology, eds. M-A. Dobres and J. Robb, pp. 51-60. Routledge, New York.

Crabtree, D. E.
1966 A Stoneworker's Approach to Analyzing and Replicating the Lindenmeier Folsom. Tebiwa 9:3-39.

1972 An Introduction to Flintworking. Occasional Papers of the Museum of Idaho State University, No. 28. Pocatello, Idaho.

1975 Comments on Lithic Technology and Experimental Archaeology. In Lithic Technology: Making and Using Stone Tools, ed. E. Swanson, pp. 105-114. Mouton Publishers, The Hague.

Crumley, C. L.
1995 Introduction. In Native American Interactions: Multiscalar Analyses and Interpretations in the Eastern Woodlands, eds. M. Nassaney and K. Sassaman. University of Tennessee Press, Knoxville.

Cushing, F. H.
1895 The Arrow. American Anthropologist 8:307-349.

Damas, D.
1972 The Copper Eskimo. In Hunters and Gatherers Today, ed. M. Bicchieri, pp. 3-50. Waveland Press, Inc. Prospect Heights, Illinois.

Daniel, I. R. Jr.
2001 Stone Raw Material Availability and Early Archaic Settlement in the Southern United States. American Antiquity 66(2):237-265

Deetz, J.
1968 Invitation to Archaeology. The Natural History Press. Garden City, New York.

Deller, B. D., and C. J. Ellis
1992 Thedford II: A Paleo-Indian Site in the Ausable River Watershed of Southwestern Ontario. Memoirs Museum of Anthropology, University of Michigan, No. 24.

2001 Evidence for Late Paleo-Indian Ritual from the Caradoc Site (AfHj-104), Southwestern Ontario, Canada. American Antiquity 66(2):267-299.

Dekin, A. A.
1972 Climatic Change and Cultural Change: A Correlative Study From Eastern Arctic Prehistory. Polar Notes 12:11-13.

1976 The Arctic Small Tool Horizon: A Behavioural Model of the Dispersal of Human Population into an Unoccupied Niche. In Eastern Arctic Prehistory: Paleoeskimo Problems, ed. M. Maxwell, pp. 156-164. Memoirs of the Society for American Archaeology, No. 31.

Dibble, H. L.
1987 The Interpretation of Middle Paleolithic Scraper Morphology. American Antiquity 52(1):109-117.

1995 Middle Paleolithic Scraper Reduction: Background, Clarification, and Review of the Evidence to Date. Journal of Archaeological Method and Theory 2(4):299-368.

Dobres, M-A.
1995 Gender and Prehistoric Technology: On the Social Agency of Technical Strategies. World Archaeology 27(1):25-49

1999a Of Paradigms and Ways of Seeing: Artifact Variability As If People Mattered. In Material Meanings: Critical Approaches to the Interpretation of Material Culture, ed. E. Chilton, pp. 2-23. University of Utah Press, Salt Lake City, Utah.

1999b Technology's Links and Chaines: The Processual Unfolding of Technique and Technician. In The Social Dynamics of Technology: Practice, Politics, and World Views, eds. M-A. Dobres and C. R. Hoffman, pp. 124-146. Smithsonian Institution Press, Washington, D.C.

2000 Technology and Social Agency: Outlining a Practice Framework for Archaeology. Blackwell Publishers, Malden, Massachusetts.

Dobres, M-A. and C. R. Hoffman
1994 Social Agency and the Dynamics of Prehistoric Technology. Journal of Archaeological Method and Theory 1(3):211-258.

1999 Introduction: A Context for the Present and Future of Technology Studies. In The Social Dynamics of Technology: Practice, Politics, and World Views, eds. M-A. Dobres and C. R. Hoffman, pp. 1-19.

Dobres, M-A., and J. Robb (eds.)
2000 Agency in Archaeology. Routledge, New York.

2000 Agency in Archaeology: Paradigm or Platitude? In Agency and Archaeology, eds. M-A. Dobres and J. Robb, pp. 3-17. Routledge, New York.

Donnelly, S. M.
2002 Faunal Remains from the Pre-Dorset Arctic: Analysis of the Faunal Assemblage Excavated from the Mosquito Ridge Site (MaDv-11). Manuscript in possession of the author. Department of Anthropology, McMaster University, Hamilton, Ontario.

Dornan, J. L.
2002 Agency and Archaeology: Past, Present, and Future Directions. Journal of Archaeological Method and Theory 9(4):303-329.

Duke, P.
1992 Braudel and North American Archaeology: An Example from the Northern Plains. In Annales, Archaeology, and Ethnohistory, ed. A. B. Knapp, pp. 99-111. Cambridge University Press, Cambridge.

1991 Points in Time: Structure and Event in a Late Northern Plans Hunting Society. University of Colorado Press, Boulder.

Dunnell, R. C.
1971 Systematics in Prehistory. The Free Press, New York.

Eltson, R. G.
1992a Economics and Strategies of Lithic Production at Tosawihi. In Archaeological Investigations at Tosawihi, a Great Basin Quarry, eds. R. G. Eltson and C. Raven, pp. 775-801. International Mountain Research Reports, Silver City, Nevada.

Ensor, H. B., and E. Roemer
1989 Comments on Sullivan and Rozen's Debitage Analysis and Archaeological Interpretation. American Antiquity 54(1):175-178

Finlay, N.
1997 'Kid-Knapping': The Missing Children in Lithic Analysis. In Invisible People and Processes: Writing Gender and Childhood into European Archaeology, eds. J. Moore and E. Scott, pp. 203-213. Leicester University Press, London.

Fish, P. R.
1981 Beyond Tools: Middle Paleolithic Debitage Analysis and Cultural Inference. Journal of Anthropological Research 37:374-386.

Fitzhugh, W.
1972 Environmental Archaeology and Cultural Systems in Hamilton Inlet, Labrador. Smithsonian Contributions to Anthropology No. 16. Washington, D.C.

1976a Paleo-Eskimo Occupations of the Labrador Coast. In Eastern Arctic Prehistory: Paleo-Eskimo Problems, ed. M. Maxwell, pp. 103-118. Memoirs for the Society for American Archaeology, No. 31.

1976b Environmental Factors in the Evolution of Dorset Culture: A Marginal Proposal for Hudson Bay. In Eastern Arctic Prehistory: Paleo-Eskimo Problems, ed. M. Maxwell, pp. 139-149. Memoirs for the Society for American Archaeology, No. 31.

Flenniken, J. J.
1981 Replicative Systems Analysis: A Model Applied to the Vein Quartz Artifacts from the Hoko River Site. Washington State University Laboratory of Anthropology Reports of Investigations, No. 59. Washington State University, Pullman.

Flenniken, J .J., and A. W. Raymond
1986 Morphological Projectile Point Typology: Replication, Experimentation, and Technological Analysis. American Antiquity 51(3):603-614.

Frison, G. C.
1968 A Functional Analysis of Certain Chipped Stone Tools. American Antiquity 33:149-155.

Gendron, D., and C. Pinard
2000 Early Palaeo-Eskimo Occupations in Nunavik: A Re-Appraisal. In Identities and Culture Contacts in the Arctic, eds. M. Appelt, J. Berglund, H. C. Gullov, pp. 129-142. Danish Polar Center Publication No. 8. Copenhagen.

Gero, J. M.
1989 Assessing Social Information in Material Objects: How Well Do Things Measure Up? In Time, Energy, and Stone Tools, ed. R. Torrence, pp. 92-105. Cambridge University Press, Cambridge.

1991 Genderlithics: Women's Roles in Stone Tool Production. In Engendering Archaeology: Women in Prehistory, eds. J. M Gero and M. W. Conkey, pp. 163-193. Basil Blackwell, Cambridge, Massachusetts.

Giddings, J. L.
1951 The Denbigh Flint Complex. American Antiquity 16(3):193-203.

1967 Ancient Men of The Arctic. Alfred A. Knopf. New York

Gilbert, B. M., L. D. Martin, and H. G. Savage
1985 Avian Osteology. Modern Printing Company, Wyoming.

Goodyear, A. C.
1989 A Hypothesis for the Use of Cryptocrystalline Raw Materials Among Paleoindian Groups of North America. In Eastern Paleoindian Lithic Resource Use, eds. C. Ellis and J. Lothrop, pp.1-9. Westview Press, Inc.

1993 Toolkit Entropy and Bipolar Reduction: A Study of Interassemblage Lithic Variability Among Paleo-Indian Sites in the Northeastern United States. North American Archaeologist 14(1):1-23

Gordon, B. C.
1975 Of Men and Herds in Barrenland Prehistory. National Museum of Man Mercury Series. Archaeological Survey of Canada No. 28 National Museums of Canada, Ottawa.

1996 People of the Sunlight, People of the Starlight: Barrenland Archaeology in the Northwest Territories of Canada. Mercury Series Archaeological Survey of Canada Paper No. 154. Canadian Museum of Civilization, Hull.

Gotthardt, R. M.
1990 The Archaeological Sequence in the Northern Cordillera: A Consideration of Typology and Traditions. Occasional Papers in Archaeology No. 1. Heritage Branch of the Government of the Yukon. Hude Hudan Series. Yukon Tourism, Whitehorse.

Gould, R. A.
1977 Ethnoarchaeology; Or, Where do the Models from? In Stone Tools as Cultural Markers, ed. R. V. S. Wright, pp. 162-177. Australian Institute of Aboriginal Studies, Canberra.

Gramly, R. M.
1978 Lithic Source Areas in Northern Labrador. Arctic Anthropology 15(2):36-47

1980 Raw Materials Source Areas and "Curated" Tool Assemblages. American Antiquity 45(4):823-833.

Greaves, S.
1999 The Cutting Edge: A New Look at Microcore Technology. Northwest Anthropological Research Notes 33(2):191-217.

Gunn, J.
1975 Dynamic Typology: A Model for Functional Typing of Stone Tools with an Application to French Paleolithic Burins. Newsletter of Lithic Technology 4(2):9-17.

Hall, C. F.
1865 Life With the Esquimaux. Reprinted by M. G. Hurtig, Edmonton, 1970.

Handly, M. J.
1994 Lithic Assemblage Variability at Charlie Lake Cave (HbRf-39): A Stratified Rockshelter in Northeastern British Columbia. Unpublished MA Thesis, Department of Anthropology, Trent University, Peterborough, Ontario.

Hayden, B.
1977 Stone Tool Functions in the Western Desert. In Stone Tools as Cultural Markers, ed. R. V. S. Wright, pp. 178-88. Australian Institute for Aboriginal Studies, Canberra.

1989 From Chopper to Celt: The Evolution of Sharpening Techniques. In Time, Energy, and Stone Tools, ed. R. Torrence, pp. 7-16. Cambridge University Press, Cambridge.

Hayden, B. and W. K. Hutchings
1989 Whither the Billet Flake? In Experiments in Lithic Technology, eds. D. S. Amick and R. P. Mauldin, pp. 235-257. BAR International Series No. 528

Healey, J. F.
1996 Statistics: A Tool for Social Research. Fourth Edition. Wadsworth Publishing Co.

Helmer, J. W.
1991 The Paleo-Eskimo Prehistory of the North Devon Lowlands. Arctic 44(4):301-317

1994 Resurrecting the Spirit(s) of the "Carlsberg Culture": Cultural Traditions and Cultural Horizons in Eastern Arctic Prehistory. In Threads in Arctic Prehistory: Papers in Honour of William E. Taylor, Jr., eds. D. Morrison and J. Pilon, pp. 15-34. Archaeological Survey of Canada Mercury Series Paper No. 149. Canadian Museum of Civilization, Hull.

Helmer, J. W., and I. G. Robertson
1990 A Quantitative Shape Analysis of Early Paleo-Eskimo Endblades from Northern Devon Island. Canadian Journal of Archaeology 14:107-122.

Henry, D. O., C. V. Haynes, and B. Bradly
1976 Quantitative Variations in Flaked Stone Debitage. Plains Anthropologist 22:691-693.

Hodder, I.
1999 The Archaeological Process: An Introduction. Blackwell Publishers Inc., Malden, Massachusetts.

2000 Agency and Individuals in Long-Term Processes. In Agency and Archaeology, eds. M-A. Dobres and J. Robb, pp. 21-33. Routledge, New York.

Hodder, I., M. Shanks, A. Alexandri, V. Buchli, J. Carman, J. Last, and G. Lucas
1995 Interpreting Archaeology: Finding Meaning in the Past. Routledge, New York.

Holmes, W. H.
1891 Manufacture of Stone Arrow-Points. American Anthropologist 4:49-58.

1919 Handbook of Aboriginal American Antiquities: Part I, The Lithic Industries. Bureau of American Ethnology, Bulletin No. 60.

Ingbar, E. E.
1994 Lithic Material Selection and Technological Organization. In The Organization of North American Prehistoric Chipped Stone Tool Technologies, ed. P. J. Carr, pp. 45-56. International Monographs in Prehistory, Archaeological Series No. 7, Ann Arbor, Michigan.

Ingbar, E. E., M. Larson, and B. Bradley
1989 A Nontypological Approach to Debitage Analysis. In Experiments in Lithic Technology, eds. D. S. Amick and R. P. Mauldin, pp. 117-139. BAR International Series No. 528

Jacobs, J. D.
1988 Climate, Vegetation, and resources in Southern Baffin Island. In Occasional Papers of the Prince of Wales Northern Heritage Centre No. 3, pp. 75-91. Yellowknife, N.W.T.

Jacobs, J. D., and L. D. Grondin
1988 The Influence of an Arctic Large-Lakes System on Mesoclimate in South-Central Baffin Island, NWT, Canada. Arctic and Alpine Research 20(2):212-219

Jacobs, J. D., W. N. Mode, C. A. Squires, and G. H. Miller
1985 Holocene Environmental Changes in the Frobisher Bay Area, Baffin Island, N.W.T.: Deglaciation, Emergence, and the Sequence of Vegetation and Climate. Geographie Physique et Quarternaire 39(2):151-162.

Jacobs, J. D. and J. P. Newell
1979 Recent Year-to-Year Variations in Seasonal Temperatures and Sea Ice Conditions I n the Eastern Canadian Arctic. Arctic 32(4):345-354.

Jacobs, J., and D. Stenton
1985 Environment, Resource, and Prehistoric Settlement in Upper Frobisher Bay, Baffin Island. Arctic Anthropology 22(2):59-76.

Jamieson, S.
1984 Neutral Iroquois Lithics: Technological Process and its Implications. Ph.D. Dissertation, Washington State University – Pullman. University Microfilms, Ann Arbour.

Jelinek, A. J.
1976 Form, Function, and Style in Lithic Analysis. In Culture Change and Continuity: Essays in Honour of James Bennett Griffin, ed. C. E. Cleland, pp. 19-33. Academic Press, Inc., New York.

Jensen, J. F.
2000 West Greenland Palaeo-Eskimo Raw Material Procurement Elucidated by Geological Analysis. In Identities and Culture Contacts in the Arctic, eds. M. Appelt, J. Berglund, H. C. Gullov, pp. 71-76. Danish Polar Centre Publication No. 8. Copenhagen.

Jensen, J. F., and E. B. Petersen
1998 Raw Material Distribution – Social Space, Social Interaction. Acta Borealia 15(2):139-152.

Jeske, R.
1989 Economies in Raw Material Use by Prehistoric Hunter-Gatherers. In Time, Energy, and Stone Tools, ed. R. Torrence, pp. 34-45. Cambridge University Press, Cambridge.

1992 Energetic Efficiency and Lithic Technology: An Upper Mississippian Example. American Antiquity 57(3):467-481

Jeske, R. and R. Lurie
1993 The Archaeological Visibility of Bipolar Technology: An Example from the Koster Site. Midcontinental Journal of Archaeology 18(2):131-159

Jochim, M. A.
1981 Strategies for Survival: Cultural Behaviour in an Ecological Context. Academic Press Inc. New York.

Johnson, J. K.
2001 Some Reflections on Debitage Analysis. In Lithic Debitage: Context, Form, Meaning, ed. W. Andrefsky, pp. 15-20. University of Utah Press, Salt Lake City.

Jones, G. T., C. Beck, E. E. Jones, and R. E. Hughes
2003 Lithic Source Use and Paleoarchaic Foraging Territories in the Great Basin. American Antiquity 68(1):5-38.

Kantner, J.
1996 Settlement Pattern Analysis. In The Oxford Companion to Archaeology, ed. B. Fagan, pp. 636-638. Oxford University Press, Oxford.

Keeley, L. H.
1974 Technique and Methodology in Microwear Studies: A Critical Review. World Archaeology 5:323-336.

1982 Hafting and Retooling: Effects on the Archaeological Record. American Antiquity 47:798-809

Kemp, W. B.
1976 Inuit Land Use in South and East Baffin Island. In Inuit Land Use and Occupancy Project, Volume 1, pp. 125-151. Department of Indian and Northern Affairs, Ottawa.

Kelly, R L.
1983 Hunter-Gatherer Mobility Strategies. Journal of Anthropological Research 39:277-306

1988 Three Sides of a Biface. American Antiquity 53(4):717-734.

1992 Mobility/Sedentism: Concepts, Archaeological Measures, and Effects. Annual Review of Anthropology 21:43-66

1994 Some Thoughts on Future Directions in the Study of Stone Tool Technological Organization. In The Organization of North American Prehistoric Chipped Stone Tool Technologies, ed. P. J. Carr, pp. 132-136. International Monographs in Prehistory, Archaeological Series No. 7, Ann Arbor, Michigan.

1996 Ethnographic Analogy and Migration to the Western Hemisphere. In Prehistoric Mongoloid Dispersals, eds. T. Akazawa and E. J. E. Szathmary, pp. 228-240. Oxford Science Publications, Oxford.

2001 Prehistory of the Carson Desert and Stillwater Mountains: Environment, Mobility, and Subsistence in a Great Basin Wetland. University of Utah Anthropological Papers, No. 123, Salt Lake.

Kelly, R. L., and L. C. Todd
1988 Coming into the Country: Early Paleoindian Hunting and Mobility. American Antiquity 3(2):231-244

Knuth, E.
1954 The Paleo-Eskimo Culture of Northeast Greenland Elucidated by Three New Sites. American Antiquity 19(4):17-33.

Koldehoff, B.
1987 The Cahokia Flake Tool Industry: Socioeconomic Implications for Late Prehistory in the Central Mississippi Valley. In The Organization of Core Technology, ed. J. Johnson and C. Morrow, pp. 151-185. Westview Press, Boulder.

Kooyman, B. P.
2000 Understanding Stone Tools and Archaeological Sites. University of Calgary Press, Calgary.

Kowalewski, S. A.
1997 A Spatial Method for Integrating Data of Different Types. Journal of Archaeological Method and Theory 4(3-4):287-306

Kuhn, S. L.
1989 Hunter-Gatherer Foraging Organization and Strategies of Artifact Replacement and Discard. In Experiments in Lithic Technology, ed. D. S. Amick and R. P. Mauldin, pp. 33-47. BAR International Series No. 528. Oxford.

1991 "Unpacking Reduction": Lithic Raw Material Economy in the Mousterian of West-Central Italy. Journal of Anthropological Archaeology 10:76-106.

1992 Blank Form and Reduction as Determinants of Mousterian Scraper Morphology. American Antiquity 57:115-128.

Kuijt, I., W. C. Prentiss, and D. L. Pokotylo
1995 Bipolar Reduction: An Experimental Study of Debitage Variability. Lithic Technology 20(2):116-127.

Larsen, H., and J. Meldgaard
1958 Paleo-Eskimo Cultures in Disko Bugt, West Greenland. Meddelelser om Gronland 161(2):1-75

Larson, M.
1990 Early Plains Archaic Technological Organization: The Laddie Creek Example. Ph.D. Dissertation, Department of Anthropology, University of California – Santa Barbara. University Microfilms, Ann Arbor, Michigan.

1994 Toward a Holistic Analysis of Chipped Stone Assemblages. In The Organization of North American Prehistoric Chipped Stone Tool Technologies, ed. p. Carr, pp. 57-69. International Monographs in Prehistory, Archaeological Series No. 7. Ann Arbor, Michigan.

Larson, M., and E. Ingbar
1992 Perspectives on Refitting: Critique and a Complementary Approach. In Piecing Together the Past: Applications of Refitting Studies in Archaeology, ed. L. Hofman and G. Enloe, pp. 151-162. BAR International Series No. 578, Oxford.

Larson, M., and M. Kornfeld
1997 Chipped Stone Nodules: Theory, Method, and Examples. Lithic Technology 22:4-18.

Last, J.
1995 The Nature of History. In Interpreting Archaeology: Finding Meaning in the Past, ed. I. Hodder, M. Shanks, A. Alexandri, V. Buchli, J. Carman, J. Last, G. Lucas, pp. 141-157. Routledge, New York.

Leaf, G. R.
1979 Variation in the Form of Bipolar Cores. Plains Anthropologist 24(83):39-50.

Le Blanc, R. J.
1984 The Rat Indian Creek Site and the Late Prehistoric Period in the Interior Northern Yukon. Archaeological Survey of Canada, Mercury Series Paper No. 120, Canadian Museum of Civilization, Hull.

1994 The Crane Site and The Paleo-Eskimo Period in the Western Canadian Arctic. Archaeological Survey of Canada Mercury Series Paper No. 148. Canadian Museum of Civilization, Hull.

Le Blanc, S.
2000 Groswater Technological Organization: A Decision-Making Approach. Arctic Anthropology 37:23-37.

Lewenstein, S. M.
1987 Stone Tool Use at Cerros: The Ethnoarchaeological and Use-Wear Evidence. University of Texas Press, Austin.

Loether, H. J., and D. G. McTavish
1980 Descriptive and Inferential Statistics: An Introduction. Allyn and Bacon Inc., Boston.

Luedtke, B. E.
1992 An Archaeologist's Guide to Chert and Flint. Archaeological Research Tools 7, Institute of Archaeology, University of California, Los Angeles.

Lurie, R.
1989 Lithic Technology and Mobility Strategies: The Koster Site Middle Archaic. In Time, Energy, and Stone Tools, ed. R. Torrence, pp. 46-56. Cambridge University Press, Cambridge.

MacDonald, D. H.
1998 Subsistence, Sex, and Cultural Transmission in Folsom Culture. Journal of Anthropological Archaeology 17:217-239

1999 Modeling Folsom Mobility, Mating Strategies, and Technological Organization in the Northern Plains. Plains Anthropologist 44(168):141-161

MacDonald, D. H., and B. S. Hewitt
1999 Reproductive Interests and Forager Mobility. Current Anthropology 40(4):501-525

McGhee, R.
1972 Climatic Change and the Development of Canadian Arctic Cultural Traditions. In Climatic Changes in Arctic Areas During the Last Ten Thousand Years, eds. Y. Vasari, H. Hyvarinen, and S. Hicks, pp.39-60. Acta Universitatis Ouluensis, Series A (3), Oulu.

1976 Paleoeskimo Occupations of Central and High Arctic Canada. In Eastern Arctic Prehistory: Paleoeskimo Problems, ed. M. Maxwell, pp. 15-39. Memoirs of the Society for American Archaeology No. 31.

1979 The Paleo-Eskimo Occupations at Port Refuge, High Arctic Canada. National Museum of Man Mercury Series Archaeological Survey of Canada Paper No. 92. National Museums of Canada, Ottawa.

1980 Individual Stylistic Variability in Independence I Stone Tool Assemblages from Port Refuge, N.W.T. Arctic 33(3):443-453.

1990 Canadian Arctic Prehistory. Canadian Museum of Civilization, Hull, Quebec.

1996 Ancient People of the Arctic. UBC Press, Vancouver, British Columbia.

McGlade, J., and S. van der Leeuw

1997 Introduction: Archaeology and Non-Linear Dynamics – New Approaches to Long-Term Change. In Time, Process and Structured Transformation in Archaeology, eds. S. van der Leeuw and J. McGlade, pp. 1-31. Routledge, New York.

McNemar, Q.

1969 Psychological Statistics. John Wiley and Sons, Inc. New York.

Madrigal. L.

1998 Statistics for Anthropology. Cambridge University Press, Cambridge.

Magne, M.

1985 Lithics and Livelihood: Stone Tool Technologies of Central and Southern Interior British Columbia. Mercury Series, Archaeological Survey of Canada Paper No. 133, National Museum of Man, Ottawa.

1989 Lithic Reduction Stages and Assemblage Formation Processes. In Experiments in Lithic Technology, eds. D. S. Amick and R. P. Mauldin, pp. 15-32. BAR International Series No. 528, Oxford.

2001 Debitage Analysis as a Scientific Tool for Archaeological Knowledge. In Lithic Debitage: Context, Form, Meaning, ed. W. Andrefsky, Jr., pp. 21-30. The University of Utah Press, Salt Lake.

Magne, M. P., and D. Pokotylo

1981 A Pilot Study in Bifacial Lithic Reduction Sequences. Lithic Technology 10(2-3):34-47.

Marquardt, W.

1992 Dialectical Archaeology. In Archaeological Method and Theory, ed. M. Schiffer, pp. 101-140. University of Arizona Press, Tucson.

Marquardt, W., and C. L. Crumley
1987 Theoretical Issues in the Analysis of Spatial Patterning. In Regional Dynamics, Bergundian Landscapes, in Historical Perspectives, ed. C. L. Crumley and W. Marquardt, pp. 1-18. San Diego Academic Press, San Diego.

Mauldin, R. P., and D. S. Amick
1989 Investigating Patterning in Debitage from Experimental Bifacial Core Reduction. In Experiments in Lithic Technology, eds. D. S. Amick and R. P. Mauldin, pp. 67- 88. BAR International Series No. 528. Oxford.

Maxwell, J. B.
1980 Climate of the Canadian Arctic Islands and Adjacent Waters Volume I, Climatological Studies 30. Atmospheric Environment Service, Toronto.

1981 Climate Regions of the Arctic Islands. Arctic 34(3):225-240.

Maxwell, M. S.
1973 Archaeology of the Lake Harbour District, Baffin Island. National Museum of Man Mercury Series Archaeological Survey of Canada Paper No. 6. National Museums of Canada, Ottawa.

1976a Introduction. In Eastern Arctic Prehistory: Paleoeskimo Problems, ed. M. Maxwell, pp. 1-5. Memoirs of the Society for American Archaeology No. 31.

1976b Pre-Dorset and Dorset Artifacts: The View From Lake Harbour. In Eastern Arctic Prehistory: Paleoeskimo Problems, ed. M. Maxwell, pp. 58-78. Memoirs of the Society of American Archaeology No. 31.

1984 Pre-Dorset and Dorset Prehistory of Canada. In Handbook of North American Indians, Vol. 5, Arctic, ed. D. Damas, pp. 359-368. Smithsonian Institute, Washington, D.C.

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

Meldgaard, J.
1952 A Paleo-Eskimo Culture in West Greenland. American Antiquity 17(3):222-230.

Michie, J. L.
1973 A Functional Interpretation of the Dalton Projectile Point in South Carolina. South Carolina Antiquities 5(2):24-26.

Milne, S. B.
1997 Lithic Analysis of the Paleo-Eskimo Component at the Thule Winter Site, KkDn-31, Baffin Island, NWT. Unpublished Undergraduate Honours Thesis, Department of Anthropology, University of Waterloo, Waterloo, Ontario.

1999 Pre-Dorset Lithic Technology: A Study of Lithic Assemblage Variability in an Inland Pre-Dorset Site. Unpublished MA Thesis. Department of Anthropology, Trent University, Peterborough, Ontario

2000a Pre-Dorset Lithic Technology: A Study of Lithic Assemblage Variability in and Inland Pre-Dorset Site. In Identities and Culture Contacts in the Arctic, eds. M. Appelt, J. Berglund, and H. C. Gullov, pp. 149-158. Danish Polar Center Publication No. 8. Copenhagen.

2000b Mitigation of the Shaymark Site (KkDn-2), Baffin Island, Nunavut. Technical Report Submitted to the Department of Sustainable Development, Government of Nunavut. Manuscript on File with Timescapes Heritage Consulting, Iqaluit, Nunavut.

2000c Archaeological Investigations Near Nettilling Lake, South Central Baffin Island (2000). Permit report covering the work carried out under Nunavut Archaeologists Permit 00-011. Manuscript on file with the Department of Culture, Language, Elders, and Youth, Iqaluit, Nunavut.

2003 Identifying Pre-Dorset Structural Features on Southern Baffin Island: Challenges and Considerations for Alternative Sampling Methods. Etudes/Inuit/Studies Vol. 27 (1-2). In Press for December 2003.

Millward, A. E.
1930 Southern Baffin Island. Department of the Interior, Ottawa.

Morrow, C. A., and R. W. Jefferies
1989 Trade or Embedded Procurement?: A Test Case from Southern Illinois. In Time, Energy, and Stone Tools, ed. R. Torrence, pp. 27-33. Cambridge University Press, Cambridge.

Morrow, T. A.
1996 Lithic Refitting and Archaeological Site Formation Processes: A Case Study from the Twin Ditch Site, Green County, Illinois. In Stone Tools: Theoretical Insights into Human Prehistory, ed. G. Odell, pp. 345-373. Plenum Press. New York and London.

1997 A chip off the old block: alternative approaches to debitage analysis. Lithic Technology 22:51-69.

Moss, E. H.
1983 Some Comments on Edge Damage as a Factor in Functional Analysis of Stone Tools. Journal of Archaeological Science 10:231-242.

Movius, H. L., N. C. David, H. M. Bricker, and R. B. Clay
1968 The Analysis of Certain Major Classes of Upper Paleolithic Tools. Bulletin of the American School of Prehistoric Research No. 26.

Murray, M.
1996 Economic Change in the Palaeoeskimo Prehistory of the Foxe Basin, N.W.T. Unpublished Ph.D. Dissertation, Department of Anthropology, McMaster University, Hamilton, Ontario.

Nadel, D.
2001 Indoor/outdoor flint knapping and minute debitage remains: the evidence from the Ohalo II submerged camp (19.5 K, Jordan Valley). Lithic Technology 26:118-137.

Nagy, M.
1994 A Critical Review of the Pre-Dorset/Dorset Transition. In Threads of Arctic Prehistory: Papers in Honour of William E. Taylor, Jr., eds. D. Morrison and J. Pilon, pp. 1-14. Archaeological Survey of Canada Mercury Series Paper No. 149. Canadian Museum of Civilization, Hull.

1996 Palaeoeskimo Cultural Transition: A Case Study from Ivujivik (Eastern Arctic). Doctoral Dissertation, Department of Anthropology, University of Alberta, Edmonton, Alberta.

2000 From Pre-Dorset Foragers to Dorset Collectors: Palaeo-Eskimo Culture Change in Ivujivik, Eastern Canadian Arctic. In Identities and Culture Contacts in the Arctic, eds. M. Appelt, J. Berglund, and H. C. Gullov, pp. 143-148. Danish Polar Centre Publication No. 8, Copenhagen, Denmark.

Nance, J. D.
1971 Functional Interpretations from Microscopic Analysis. American Antiquity 36:361-366.

Nash, S. E.
1996 Is Curation a Useful Heuristic? In Stone Tools: Theoretical Insights into Human Prehistory, ed. G. Odell, pp. 81-99. Plenum Press, New York.

Nelson, M. C.
1991 The Study of Technological Organization. In Archaeological Method and Theory, Vol. 3, ed. M. Schiffer, pp. 57-100. The University of Arizona Press, Tucson.

Newman, J. R.
1994 The effects of distance on lithic material reduction technology. Journal of Field Archaeology 21:491-501.

Noone, H. V.
1934 A Classification of Flint Burins or Gravers. Journal of the Royal Anthropological Institute 64:81-92

Norusis, M. J.
1997 SPSS 7.5 Guide to Data Analysis. Prentice Hall, New Jersey.

Odell, G. H.
1981 The Morphological Express and Function Junction: Searching for Meaning in Lithic Tool Types. Journal of Anthropological Research 37:319-342.

1989 Experiments in Lithic Reduction. In Experiments in Lithic Technology, eds. D. S. Amick and R. P. Mauldin, pp. 163-198. BAR International Series No. 528. Oxford.

1994 Assessing Hunter-Gatherer Mobility in the Illinois Valley: Exploring Ambiguous Results. In The Organization of North American Prehistoric Chipped Stone Tool Technologies, ed. P. J. Carr, pp. 70-86. International Monographs in Prehistory, Archaeological Series No. 7, Ann Arbor, Michigan.

1996 Economizing Behaviour and the Concept of "Curation". In Stone Tools: Theoretical Insights into Human Prehistory, ed. G. Odell, pp.51-80. Plenum Press, New York.

Odell, G. H., and F. Odell-Vereecken
1980 Verifying the Reliability of Lithic Use-Wear Assessments by 'Blind Tests': The Low Power Approach. Journal of Field Archaeology 7:87-120.

Odess, D.
1998 The Archaeology of Interaction: Views from Artifact Style and Material Exchange in Dorset Society. American Antiquity 63(3):417-435.

Orton, C.
2000 Sampling in Archaeology. Cambridge University Press, Cambridge.

Owen, L. R.
1988 Blade and Microblade Technology: Selected Assemblages from the North American Arctic and the Upper Paleolithic of Southwest Germany. BAR International Series No. 441, Oxford.

Park, R. W.
1996 Archaeological Investigations at Davidson Point, Baffin Island (Summer 1996). Unpublished Permit Report on File With the Prince of Wales Northern Heritage Centre, Yellowknife, NWT

1997 Archaeological Investigations at Davidson Point, Baffin Island (Summer 1997). Unpublished Permit Report on File With the Prince of Wales Northern Heritage Centre, Yellowknife, NWT

1998 Archaeological Investigations at the Tungatsivvik Site (KkDo-3), Baffin Island (Summer of 1998). Unpublished Permit Report on File with the Prince of Wales Northern Heritage Centre, Yellowknife, NWT

1999 Archaeological Excavations at the Tungatsivvik Site (KkDo-3), Baffin Island (Summer 1999). Permit Report on File with the Department of Culture, Language, Elders, and Youth, Igloolik, Nunavut.

Parry, W. J., and R. L. Kelly
1987 Expedient Core Technology and Sedentism. In The Organization of Core Technology, eds. J. K. Johnson and C. A. Morrow, pp. 285-304. Westview Press, Boulder.

Patterson, L., and J. B. Sollberger
1978 Replication and Classification of Small Sized Debitage. Plains Anthropologist 23:103-112

Pecora, A. M.
2001 Chipped stone tool production strategies and lithic debris patterns. In Lithic Debitage: Context, Form, Meaning, ed. W. Andrefsky, pp. 173-190. University of Utah Press, Salt Lake City.

Pigeot, N.
1990 Technical and Social Actors: Flintknapping Specialists at Magdalenian Etiolles. Archaeological Review From Cambridge 9(1):126-141

Polunin, N.
1948 Botany of the Eastern Canadian Arctic. Part III: Vegetation and Ecology. National Museum of Canada Bulletin No. 104. Department of Mines and Resources, Mines and Geology Branch, Ottawa.

Porsild, A. E.
1951 Plant Life in the Arctic. Reprinted by the National Museum of Canada, Ottawa.

Prentiss, W. C.
1998 The Reliability and Validity of a Lithic Debitage Typology: Implications for Archaeological Interpretation. American Antiquity 63(4):635-650.

Prentiss, W. C., and E. J. Romanski
1989 Experimental Evaluation of Sullivan and Rozen's Debitage Typology. In Experiments in Lithic Technology, eds. D. Amick and R. Mauldin, pp. 89-99. BAR International Series No. 528, Oxford.

Raab, L. M., R. F. Cande, and D. W. Stahle
1979 Debitage Graphs and Archaic Settlement Patterns in the Arkansas Ozarks. Mid-Continental Journal of Archaeology 4(2):167-182

Ramsden, P., and M. Murray
1995 Identifying Seasonality in Pre-Dorset Structures in Back Bay, Prince of Wales Island, N.W.T. Arctic Anthropology 32(2):106-117.

Reinhardt, G. A.
2002 Puzzling Out Gender-Specific "Sites" to a Prehistoric House in Barrow, Alaska. In The Many Faces of Gender: Roles and Relationships Through Time in Indigenous Northern Communities, eds. L. Frink, R. Shpard, and G. A. Reinhardt, pp. 121-150. University of Calgary Press, Calgary.

Renouf, M. A. P.
1994 Two Transitional Sites at Port Au Choix, Northwestern Newfoundland. In Threads of Arctic Prehistory: Papers in Honour of William E. Taylor, Jr., eds. D. Morrison and J-L. Pilon, pp. 165-195. Archaeological Survey of Canada, Mercury Series Paper No. 149. Canadian Museum of Civilization, Hull.

Ricklis, R., and K. Cox
1993 Examining Lithic Technological Organization as a Dynamic Cultural Subsystem: The Advantages of an Explicitly Spatial Approach. American Antiquity 58(3):444-461.

Robertson, J. A.
1984 Chipped stone and functional interpretations: a fort ancient example. Midcontinental Journal of Archaeology 9:251-267.

Rolland, N.
1981 The Interpretation of Middle Paleolithic Variability. Man 16:15-42.

Root, M. J.
1997 Production for exchange at the Knife River flint quarries, North Dakota. Lithic Technology 22:33-50.

Roth, W. E.
1924 An Introductory Study of the Arts, Crafts, and Customs of the Guiana Indians. Bureau of American Ethnology, 38th Annual Report. Washington, D. C.

Royer, D.
2003 Igloolik Airport Archaeology Project: Zooarchaeological Analysis. Report on File with the Department of Cultural, Language, Elders, and Youth, Government of Nunavut, Igloolik.

Rozen, K. C., and A. P. Sullivan III
1989a Measurement, Method, and Meaning in Lithic Analysis: Problems with Amick and Mauldin's Middle-Range Approach. American Antiquity 54(1):169-175

1989b The Nature of Lithic Reduction and Lithic Analysis: Stage Typologies Revisited. American Antiquity 54(1):179-184

Sassaman, K. E.
1998 Lithic Technology and the Hunter-Gatherer Sexual Division of Labour. In Reader in Gender Archaeology, K. Hays-Gilpin and D. S. Whitely, pp. 159-171. Routledge, New York.

2000 Agents of Change in Hunter-Gatherer Technology. In Agency and Archaeology, eds. M-A. Dobres and J. Robb, pp. 148-168. Routledge, New York.

Schreiber, K.
1996 Settlement Archaeology. In The Oxford Companion to Archaeology, ed. B. Fagan, pp. 635-636. University of Oxford Press, Oxford.

Schledermann, P.
1990 Crossroads to Greenland: 3000 Years of Prehistory in the Eastern Arctic. Komatic Series No. 2. Calgary: Arctic Institute of North America.

1996 Voices in Stone: A Personal Journey into the Arctic Past. Komatic Series No. 5. Calgary: Arctic Institute of North America.

Seeman, M.
1994 Intercluster Lithic Patterning at Nobles Pond: A Case Study for "Disembedded" Procurement Among Early Paleo-Indian Societies. American Antiquity 59(2):273-288.

Seddon, M. T.
1992 Sedentism, lithic technology, and debitage: an intersite debitage analysis. Midcontinental Journal of Archaeology 17:198-226.

Seivert, A. K., and K. Wise
2001 A Generalized Technology for a Specialized Economy: Archaic Period Chipped Stone at Kilometer 4, Peru. In Lithic Debitage: Context, Form, Meaning, ed. W. Andrefsky, Jr., pp. 80-105. University of Utah Press, Salt Lake.

Sellers, G. E.
1866 Observations of Stone-Chipping. In the Smithsonian Report for 1855 (1):871-891.

Shelley, P. H.
1990 Variation in Lithic Assemblages: An Experiment. Journal of Field Archaeology 17:187-193.

Shott, M. J.
1986 Technological Organization and Settlement Mobility: An Ethnographic Examination. Journal of Anthropological Research 42(1):15-51.

1989a On Tool-Class Use Lives and the Formation of Archaeological Assemblages. American Antiquity 54(1):9-30.

1989b Bipolar Industries: Ethnographic Evidence and Archaeological Implications. North American Archaeologist 10(1):1-24.

1994 Size and Form in the Analysis of Flake Debris: Review and Recent Approaches. Journal of Archaeological Method and Theory 1(1):69-110.

1996 An Exegesis of the Curation Concept. Journal of Anthropological Research 52(3):259-280

1997 Activity and Formation as Sources of Variation in Great Lakes Paleo-Indian Assemblages. Midcontinental Journal of Archaeology 22(2):197-236.

1999 On Bipolar Reduction and Splintered Pieces. North American Archaeologist 20(3):217-238.

2000 The Quantification Problem in Stone Tool Assemblages. American Antiquity 65:725-738.

Shott, M. J., A. P. Bradbury, P. J. Carr, and G. H. Odell

2000 Flake Size from Platform Attributes: Predictive and Empirical Approaches. Journal of Archaeological Science 27:877-894.

Sinclair, A.

2000 Constellations of Knowledge: Human Agency and Material Affordance in Lithic Technology. In Agency and Archaeology, eds. M-A. Dobres and J. Robb, pp. 196-212. Routledge, New York.

de Sonneville-Bordes, D., and J. Perrot

1956 Lexique Typologique du Paleolithique Superieur: Outillage Lithique - IV Burins. BSPF 53:408-412.

Soper, J. D.

1928 A Faunal Investigation of Southern Baffin Island. Canada Department of Mines Bulleting No. 53. National Museum of Canada, Ottawa.

Speth, J. D.

1972 The Mechanical Basis of Percussion Flaking. American Antiquity 37(1):34-60.

1987 Early Hominid Subsistence Strategies in Seasonal Habitats. Journal of Archaeological Science 14:13-29.

1989 Early Hominid Hunting and Scavenging: The Role of Meat as an Energy Source. Journal of Human Evolution 18:329-343.

Speth, J. D., and K. A. Speilmann

1983 Energy Source, Protein Metabolism, and Hunter-Gatherer Subsistence Strategies. Journal of Anthropological Archaeology 2:1-31.

Stahle, D. W., and J. E. Dunn

1982 An Analysis and Application of the Size Distribution of Waste Flakes from the Manufacture of Bifacial Tools. World Archaeology 14(1):84-97.

Statistica

1998 Statistica for Windows, Vol. III. Statsoft Inc., Tulsa.

Stenton, D. R.

1983 An Analysis of Faunal Remains From the Peale Point Site (KkDo-1), Baffin Island, N.W.T. Unpublished MA Thesis, Department of Anthropology, Trent University, Peterborough, Ontario.

1985 Archaeological Investigations in Burwash Bay, Baffin Island, NWT. Manuscript on File, Archaeological Survey of Canada, National Museum of Man, Ottawa.

1986 Mitigation of the Sandy Point Site (LlDv-10), Baffin Island, NWT. A Report Submitted to the Prince of Wales Northern Heritage Centre. Manuscript on File at the Prince of Wales Northern Heritage Centre, Yellowknife, NWT.

1987 Recent Archaeological Investigations Near Frobisher Bay, Baffin Island, N.W.T. Canadian Journal of Archaeology 11:13-48.

1989 Terrestrial Adaptations of Neo-Eskimo Coastal-Marine Hunters on Southern Baffin Island, NWT. Ph.D. Dissertation, Department of Anthropology, University of Alberta, Edmonton, Alberta.

1991a Caribou Population Dynamics and Thule Culture Adaptations on Southern Baffin Island, N.W.T. Arctic Anthropology 28(2):15-43.

1991b The Adaptive Significance of Caribou Winter Clothing for Arctic Hunter-Gatherers. Etudes/Inuit/Studies 15(1):3-28.

1997 Archaeology Glossary. Nunavut Arctic College, Iqaluit, Nunavut.

2000 Mitigation of the Shaymark Site (KkDn-2), Baffin Island, Nunavut. Manuscript on File with the Department of Sustainable Development, Iqaluit, Nunavut.

2001 Ideology and Site Formation Processes: An Example of Discard Behaviour from Baffin Island. Anthropological Papers of the University of Alaska 1(1):3-22.

Stenton, D. R., and R. W. Park

1998 Ancient Stone Tools of Nunavut: An Illustrated Guide. Parks Canada.

2003 Archaeological Excavations at Igloolik (NiHf-57) Summer 2002. Report on Work Covered Under Nunavut Archaeologist Permit No. 02-036A. Report on File with the Department of Culture, Language, Elders, and Youth, Government of Nunavut, Igloolik.

Stenton, D. R., and B. G. Rigby

1995 Community-Based Heritage Education, Training, and Research: Preliminary Report on the Tungatsivvik Archaeology Project. Arctic 48(1):47-56.

Stout, D.

2002 Skill and Cognition in Stone Tool Production: An Ethnographic Case Study from Irian Jaya. Current Anthropology 43(5):693-722.

Sullivan, A. P. III
1987 Probing Sources of Variability: A Regional Case Study Near Homolovi Ruins, Arizona. North American Archaeologist 8(1):41-71.

1992 Investigating the Archaeological Consequences of Short-Duration Occupations. American Antiquity 57(1):99-115

Sullivan, A. P. III, and K. C. Rozen
1985 Debitage Analysis and Archaeological Interpretation. American Antiquity 50(4):755-779.

Sutherland, P. D.
1991 Environmental Change and Prehistory in Arctic Canada. In Arctic Environment: Past, Present, and Future, eds. M. K. Woo and D. J. Gregor, pp. 139-153. Department of Geography, McMaster University, Hamilton, Ontario.

1996 Continuity and Change in the Paleo-Eskimo Prehistory of Northern Ellesmere Island. In The Paleo-Eskimo Cultures of Greenland, ed. B. Gronnow, pp. 271-294. Danish Polar Center Publication No. 1. Copenhagen.

Tankersley, K. B.
1995 Seasonality of Stone Procurement: An Early Paleo-Indian Example in Northwestern New York State. North American Archaeologist 16(1):1-16.

1998 Variation in the Early Paleoindian Economies of Late Pleistocene Eastern North America. American Antiquity 63(1):7-20

Taylor, W. E., Jr.
1968 The Arnapik and Tyara Sites: An Archaeological Study of Dorset Culture Origins. Memoirs of the Society for American Archaeology, No. 22.

Teltzer, P. A.
1991 Generalized Core Technology and Tool Use: A Mississippian Example. Journal of Field Archaeology 18(3):363-375.

Thacker, P. T.
1996 Hunter-Gatherer Lithic Economy and Settlement Systems: Understanding Regional Assemblage Variability in the Upper Paleolithic of Portuguese Estremadura. In Stone Tools: Theoretical Insights Into Human Prehistory, ed. G. Odell, pp.101-128. Plenum Press, Inc. New York.

Tixier, J.
1974 Glossary for the Description of Stone Tools With Special Reference to the Epipaleolithic of the Maghreb. Translation by M. H. Newcomer. Newsletter of Lithic Technology No. 1. Washington State University.

Tomka, S. A.
1989 Differentiating Lithic Reduction Techniques: An Experimental Approach. In Experiments in Lithic Technology, eds. D. S. Amick and R. P. Mauldin, pp. 137-161. BAR International Series No. 528, Oxford.

Torrence, R.
1983 Time Budgeting and Hunter-Gatherer Technology. In Hunter-Gatherer Economy in Prehistory: A European Perspective, ed. G. Bailey, pp. 11-22. Cambridge University Press, Cambridge.

1989 Retooling: Towards a Behavioural Theory of Stone Tools. In Time, Energy, and Stone Tools, ed. R. Torrence, pp. 57-65. Cambridge University Press, Cambridge.

2001 Hunter-Gatherer Technology: Macro- and Microscale Approaches. In Hunter-Gatherers: An Interdisciplinary Perspective, eds. C. Panter-Brick, R. H. Layton, and P. Rowley-Conwy, pp. 73- 98. Cambridge University Press, Cambridge.

Towner, R. H., and M. Warburton
1990 Projectile Point Rejuvenation: A Technological Analysis. Journal of Field Archaeology 17:311-321.

Tuck, J. A.
1975 Prehistory of Saglek Bay, Labrador: Archaic and Paleo-Eskimo Occupations. National Museum of Man Mercury Series Paper No. 32. Archaeological Survey of Canada, Ottawa.

1976 Paleo-Eskimo Cultures of Northern Labrador. In Eastern Arctic Prehistory: Paleo-Eskimo Problems, ed. M. Maxwell, pp. 89-102. Memoirs for the Society of American Archaeology, No. 31

Tuck, J. A., and P. Ramsden
2001 A Comment on the Pre-Dorset/Dorset Transition in the Eastern Arctic. In Anthropological Papers of the University of Alaska 1(1):7-11.

Vierra, B. J.
1995 Subsistence and Stone Tool Technology: An Old World Perspective. Arizona State University Anthropological Research Papers, No. 47.

Walthall, J. A., and B. Koldehoff
1998 Hunter-Gatherer Interaction and Alliance Formation: Dalton and the Cult of the Long Blade. Plains Anthropologist 43(165):257-273

Weedman, K. J.
2002 On the Spur of the Moment: Effects of Age and Experience on Hafted Stone Scraper Morphology. American Antiquity 67(4):731-744.

Wenzel, K. E., and P. H. Shelley
2001 What put the small in the Arctic Small Tool Tradition: raw material constraints on lithic technology at the Mosquito Lake Site, Alaska. In Lithic Debitage: Context, Form, Meaning, ed. W. Andrefsky, pp. 106-123. University of Utah Press, Salt Lake City.

Whittaker, J. C.
1994 Flintkapping: Making and Understanding Stone Tools. University of Texas Press, Austin.

Whittaker, J. C., and E. J. Kaldahl
2001 Where the Waste Went: A Knapper's Dump at Grasshopper Pueblo. In Lithic Debitage: Context, Form, Meaning, ed. W. Andrefsky, pp. 32-60. University of Utah Press, Salt Lake City.

Will, R. T.
2000 A tale of two flint-knappers: implications for lithic debitage studies in northeastern North America. Lithic Technology 25:101-119.

Wilmsen, E.
1968 Functional Analysis of Flaked Stone Artifacts. American Antiquity 33:156-161.

Wobst, M.
2000 Agency in (Spite of) Material Culture. In Agency and Archaeology, eds. M-A. Dobres and J. Robb, pp. 40-50. Routledge, New York.

Wright, J. G.
1944 Economic Wildlife of Canada's Eastern Arctic – Caribou. Canadian Geographic Journal 28/29:184-195.

Wright, J. V.
1995 A History of the Native Peoples of Canada, Vol. 1 (10,000 – 1,000 BC). Mercury Series Archaeological Survey of Canada Paper No. 152. Canadian Museum of Civilization.

Yamane, T.
1967 Elementary Sampling Theory. Prentice Hall, New Jersey.

Appendix A

Lithic Artifact States and Attribute Definitions

Introduction

All metrical attributes, including length, width, and thickness, assessed for each tool category in this analysis are measured in millimetres using digital callipers, rounding up to the nearest one millimetre. Lengths are measured on complete specimens only. Widths are taken on complete or near complete specimens only. Weights taken for all maximal artifact categories are measured in grams using an electronic scale, rounding up to the nearest decigram (Bradbury and Carr 1999; Wenzel and Shelly 2001). Scraper edge angles are measured using a contact goniometer, rounding up to the nearest degree. Evidence of use-wear on informal and formal tools is assessed using low power magnification in the form of a 20x magnifying glass (see Moss 1983:231). The shape or outline of all formal artifact elements is determined by placing the element in question (i.e. margin, base) against a flat surface (i.e. a table) and subjectively assessing the shape of the element in relation to that surface. The symmetry of formal tool elements is assessed in relation to the longitudinal axis of each tool type. This axis is the longest dimension exhibited by a tool when measured at right angles to the medial axis or point of maximum width. Attribute values for those debitage or tool artifacts displaying evidence of intentional retouch on more than one surface or in more than one area on a given specimen are averaged to avoid complications with maintaining open fields during statistical analysis. Finally, it should be noted that assessment of post-depositional disturbance in formal and core tool categories using flake termination states outlined by Cotterell and Kamminga (1987, 1990) is not readily applicable in some cases given the degree of post-detachment modification undergone by some specimens. In instances where distal, proximal, and/or marginal states cannot be assessed, a zero is entered to represent an indeterminable observation.

Identification: All Artifacts

A. Site designation: This entry indicates what site assemblage the artifact belongs to. An arbitrarily chosen number is assigned to distinguish each site and they are recorded as:

(1)	Sandy Point
(2)	Mosquito Ridge
(3)	Shaymark
(4)	Davidson Point
(5)	Tungatsivvik

B. Component Classification: Because Sandy Point, Mosquito Ridge, and Tungatsivvik, have multiple Pre-Dorset site components, this entry refers to which component the artifact belongs. They are recognized and recorded as:

Not applicable	(0) For those sites with only a single component
Sandy Point	(1) Mainland
	(2) Channel
	(3) Island
Mosquito Ridge	(4) Main site proper
	(5) Mosquito Ridge West
Tungatsivvik	(6) Area Q
	(7) Area D

C. Unit Classification: This entry refers to the unit from which the artifact was recovered. Each unit within each site component is coded numerically and recorded as follows:

Sandy Point (LlDv-10)

Island Component

(1)	West Beach
(2)	East Beach
(3)	S3.00/W3.00
(4)	S7.00/E1.00
(5)	S42.00/ W0.00
(6)	S4.00/W2.00
(7)	N0.00/W1.00
(8)	S9.00/W2.00
(9)	S19.00/E2.00

Mainland Component

(16)	West Beach
(17)	East Beach

Channel Component

(18)	Channel

(10)	S7.00/W6.00
(11)	S14.00-15.50/W5.50
(12)	N1.00/W1.00
(13)	S13.00-14.00/W5.50
(14)	S7.00-8.00/W6.00
(15)	S8.00-9.00/W6.50

Mosquito Ridge (MaDv-11) – 2000 excavations

Main Site Proper – Grid 1

(19)	A2
(20)	A4
(21)	A5
(22)	A6
(23)	A7
(24)	A8
(25)	A9
(26)	A10
(27)	B1
(28)	B2
(29)	B3
(30)	B4
(31)	B5
(32)	B6
(33)	B7
(34)	B8
(35)	B9
(36)	B10
(37)	C1
(38)	C2
(39)	C3
(40)	C5
(41)	C6
(42)	C7
(43)	C8
(44)	C9
(45)	C10
(46)	D2
(47)	D3
(48)	D4
(49)	D5
(50)	D6
(51)	D7
(52)	D8
(53)	D9
(54)	D10
(55)	E1
(56)	E2
(57)	E3
(58)	E5
(59)	E6
(60)	E7
(61)	E8
(62)	E9
(63)	F2
(64)	F7
(65)	F8
(66)	G1
(67)	G6
(68)	H8
(69)	West Margin
(70)	South Margin
(71)	Scatter 1
(72)	Scatter 2
(73)	Scatter 5

Main Site Proper – Grid 2

(74)	Scatter 3
(75)	Scatter 4
(76)	1N/2W
(77)	1N/3W
(78)	1N/4W
(91)	0N/9W
(92)	0N/0E
(93)	0N/3E
(94)	1S/3W
(95)	1S/4W

(79)	1N/5W
(80)	1N/6W
(81)	2N/6W
(82)	1N/0E
(83)	1N/1E
(84)	0N/1W
(85)	0N/2W
(86)	0N/3W
(87)	0N/4W
(88)	0N/5W
(89)	0N/6W
(90)	0N/7W
(96)	1S/5W
(97)	1S/6W
(98)	1S/7W
(99)	1S/8W
(100)	1S/12W
(101)	1S/2E
(102)	1S/3E
(103)	1S/8E
(104)	1S/9E
(105)	2S/5W
(106)	2S/8W
(107)	2S/14W
(108)	2S/8E

Mosquito Ridge West (MaDv-11) – Grid 3

(109)	A1
(110)	A2
(111)	A3
(112)	A4
(113)	A5
(114)	A6
(115)	A7
(116)	B0
(117)	B1
(118)	B2
(119)	B3
(120)	B4
(121)	B5
(122)	B6
(123)	B8
(124)	B10
(125)	B11
(126)	CO
(127)	C1
(128)	C2
(129)	C3
(130)	C4
(131)	C5
(132)	C6
(133)	C10
(134)	D0
(135)	D1
(136)	D2
(137)	D3
(138)	D4
(139)	D5
(140)	D6
(141)	D8
(142)	E3
(143)	E4
(144)	F3
(145)	Scatter 1
(146)	Test 1
(295)	Test 2
(147)	Test 3
(148)	Test 4
(149)	Test 5

Mosquito Ridge (MaDv-11) – 1986 excavations

(150)	S2.00/E1.00
(151)	S2.00/E4.00 – Tent ring 11
(152)	S4.00/E4.00 – Tent ring 11
(153)	S3.00/E1.00 – Tent ring 9
(154)	S3.00/W1.00 – Tent ring 9
(160)	E133.00/N3.00
(161)	E170.00/N2.00
(162)	E170.00/N3.00
(163)	E171.00/N3.00
(164)	Lithic scatter A

(155)	S3.00/W0.00	(165)	Lithic scatter B
(156)	S4.00/W0.00 – House 2	(166)	Lithic scatter C
(157)	S3-4.00/W3.00	(167)	Lithic scatter D
(158)	S4.00/W1.00	(168)	Lithic scatter E
(159)	S5.00/E2.00		

Shaymark (KkDn-2) – 1999 excavations

(169)	A1	(188)	D3
(170)	A2	(189)	D4
(171)	A3	(190)	D5
(172)	A4	(191)	D6
(173)	A5	(192)	E1
(174)	A6	(193)	E2
(175)	A7	(194)	F1
(176)	B1	(195)	F2
(177)	B2	(196)	G1
(178)	B4	(197)	G2
(179)	B5	(198)	H1
(180)	C1	(199)	East Margin
(181)	C2	(200)	West Margin
(182)	C3	(201)	North Margin
(183)	C4	(202)	North Picnic Area
(184)	C5	(203)	Shaymark North
(185)	C6	(204)	South Picnic Area
(186)	D1	(205)	Shaymark East
(187)	D2	(206)	Entrance Area

Shaymark (KkDn-2) – excavations prior to 1999

(207)	1962 and 1966 Fieldwork Seasons
(208)	1967 Fieldwork Season
(209)	1970 Fieldwork Season
(210)	1971 Fieldwork Season

Davidson Point (KkDn-31) – 1996 and 1997 excavations

(211)	C2	(246)	K4
(212)	C3	(247)	K5
(213)	C5	(248)	L5
(214)	C6	(249)	L6
(215)	D5	(250)	L7
(216)	D6	(251)	L8
(217)	D7	(252)	M4
(218)	E2	(253)	M5
(219)	E3	(254)	M6

(220)	E4	(255)	M7
(221)	E5	(256)	M8
(222)	E6	(257)	M10
(223)	E7	(258)	M13
(224)	E9	(259)	N4
(225)	F2	(260)	N5
(226)	F3	(261)	N6
(227)	F4	(262)	N7
(228)	F5	(263)	N8
(229)	F7	(264)	N9
(230)	F9	(265)	N10
(231)	F11	(266)	O5
(232)	G2	(267)	O6
(233)	G3	(268)	Q5
(234)	G4	(269)	Q6
(235)	G5	(270)	Q7
(236)	H2	(271)	Q8
(237)	H3	(272)	R4
(238)	H4	(273)	R5
(239)	H5	(274)	R6
(240)	I2	(275)	R7
(241)	I3	(276)	R8
(242)	I4	(277)	S5
(243)	J4	(278)	S6
(244)	J3	(279)	S7
(245)	K3	(294)	K7

Tungatsivvik (KkDo-3) – Area Q, 1999 excavations

(280)	12N/0W	(282)	13N/0W
(281)	12N/1E	(283)	13N/1E

Tungatsivvik (KkDo-3) – Area D, 1998 and 1999 excavations

(284)	9N/3E	(289)	17N/0W
(285)	10N/2E	(290)	18N/1W
(286)	11N/1E	(291)	19N/1W
(287)	12N/0W	(292)	20N/3W
(288)	13N/1W	(293)	9N/5E

D. Artifact Number: This entry refers to the number assigned to each artifact contained in each of the six site components included in this study. Formal artifacts are listed according to their respective catalogue numbers while debitage flakes are listed according to arbitrarily chosen numbers corresponding to each excavation unit.

E. Maximal Artifact Category: Five maximal artifact categories are defined (Andrefsky 1998:79; Sullivan 1987:46-49; Rozen and Sullivan 1989b:181). They include:

(1) Core: Flaked stone artifacts exhibiting only negative percussion features.

(2) Debitage: Flaked stone artifacts displaying single interior surfaces evidenced by positive percussion features such as ripple marks, force lines, or a bulb of percussion.

(3) Utilized flake: Flake stone artifacts displaying positive percussion features with evidence of use-wear on one or more margins but lacking formal retouch. These specimens are selectively removed from the debitage for immediate use without post-detachment modification.

(4) Informal tool: Flaked stone artifacts displaying positive percussion features with evidence of intentional retouch as indicated by negative flake scars along an artifact's margins or minimal modification of some kind to form some kind of desired edge morphology. These tools are generally viewed as expedient and in many instances, the original flake morphology may not have been significantly changed.

(5) Formal tool: Flaked stone artifacts that have undergone more extensive post-detachment modification or shaping than informal tools. They may display both positive and negative percussion features unless the implement has been so extensively retouched that only negative features are discernible. Formal tools tend to be transportable, flexible, and standardized in form.

F. Artifact Provenience: This entry refers to the location where the artifact was recovered during excavation. These entries are dependent on the recovery strategy used at each site. There are nine possible locations:

(1)	Surface
(2)	Northeast quadrant
(3)	Northwest quadrant
(4)	Southeast quadrant
(5)	Southwest quadrant
(6)	1/4 inch screen
(7)	1/8 inch screen

(8) 1/4 inch screen from rock fill
(9) 1/8 inch screen from rock fill
(10) Screened fill using unknown mesh size
(11) Excavation unit (i.e. artifacts bagged by unit)
(12) Three-dimensional coordinates (i.e. x-axis, y-axis, and depth)
(13) Submerged in water

Raw Material Attributes: All Categories

1. Lithic Raw Material: This entry refers to the type of lithic raw material from which the artifact is made. They range of types include:

(1) Chert: A compact, cryptocrystalline or microcrystalline, siliceous sedimentary rock composed primarily of quartz and displaying a glassy, lustrous, or waxy surface (Andrefsky 1998:xxii; Luedtke 1992:149)

(2) Chalcedony: A variety of chert in which quartz particles take the form of fibres (Luedtke 1992:149) whose intercrystalline pores are very small thus giving it an amorphous appearance (Whittaker 1994:71). It is frequently characterized by concentric rings and is usually light coloured and translucent (Andrefsky 1998:xxii).

(3) Crystal Quartz: A type of hard, clear, glassy rock formed of essentially pure silicon dioxide (SiO_2). This type of quartz forms in prismatic crystals that were often used as raw material for the manufacture of stone tools (Stenton 1997:65).

(4) Quartzite: A type of rock consisting of metamorphosed (transformed by heat and pressure) sandstone. It ranges from coarse to fine grained and individual grains are visible with the naked eye (Whittaker 1994:72). Quartzite was used as a raw material for stone tool manufacture although it is more difficult to work than other types of stone and often yields crude looking tools (Stenton 1997:65).

(5) Slate: A relatively soft, fine-grained and typically dark coloured metamorphic rock that can be broken into thin plates and shaped by grinding into tools and weapons (Stenton 1997:73).

(6) Ramah Chert: A Precambrian age variety of chert that is sedimentary to volcanic in origin (Gramly 1978) found in localized distribution in the Ramah Bay Region along the Labrador coast. Ramah chert is similar in texture and composition to chalcedony and varies in colour from jet-black and greenish-black to translucent grey or white (Gramly 1978).

(7) Jadeite: A hard, fine-grained metamorphic stone that is relatively rare in its worldwide distribution and often found as small nodules in alluvial deposits (Stenton and Park 1998:14). This stone occurs frequently in different shades of green.

2. Lithic Raw Material Texture: This entry refers to the texture of each raw material type observed. Texture considers the macroscopic and microscopic appearance of a rock (Luedtke 1992:154). Four states are observed and recorded as:

(1) Vitreous: When the individual grains making up the rock are so homogeneous, small, and tightly packed together that they are not visible with a 10X hand lens.

(2) Fine Grained: When the individual grains making up the rock are larger and less homogeneous in size, shape, and arrangement, and are visible with a 10x hand lens but not with the 'naked eye'.

(3) Coarse Grained: When the individual grains making up a rock are heterogeneous in size, shape, and arrangement thus making them visible with the 'naked eye'.

(4) Very Coarse Grained: When the individual grains making up a rock are noticeably heterogeneous in size, shape, and arrangement thus making them easy to see without the need for close inspection. This rough texture appreciably alters the flaking quality of the stone.

3. Lithic Raw Material Colour: This entry refers to the colour of the lithic raw material from which the artifact is made. Colours comply with the charts published in the 2000 edition of the Munsell Colour Chart.

(1) Light gray (hue 10YR, 7/1)
(2) Gray (hue 10YR, 6/1)
(3) White
(4) Colourless
(5) Light brownish gray/pinkish gray (hues 5YR, 7.5YR, 10YR, 6/2)
(6) Pale brown (hue 10YR, 6/3)
(7) Grayish brown (hue 10YR, 5/2)
(8) Black (hue ranges from 5YR, 7.5 YR, 10YR, 2/1)
(9) Very pale brown (hue 10YR, 8/2)
(10) Light gray/pale brown (hue 10YR, 7/2)
(11) Brown (hue 10YR, 5/3)
(12) Gray (hue 10YR, 5/1)
(13) Dark gray (hue 10YR, 4/1)
(14) Combination of white and orange
(15) Combination of white and gray (hue 10YR, 6/1)
(16) Light yellowish brown (hue 10YR, 6/4)
(17) Combination of grayish brown and dark bluish gray (gley 2, 4/1)
(18) Dark grayish brown (hue 10YR, 4/2)

(19) Dark bluish gray (gley 2, 4/1)
(20) Combination of light gray and gray (hue 10YR, 7/1 and 6/1)
(21) Combination of pale brown and gray (hue 10YR, 6/3 and 7/1)
(22) Very pale brown (hue 10YR, 7/3)
(23) Combination of white and light brownish gray/pinkish gray
(24) Combination of gray and gray (hue 10YR, 6/1 and 5/1)
(25) Combination of gray and light gray (hue 10YR, 6/1 and 7/2)
(26) Combination of gray and grayish brown (hue 10YR, 6/1 and 5/2)
(27) Reddish gray (hue 5YR, 5/2)
(28) Combination of gray and light brownish gray/pinkish gray
(29) Very dark gray (hue 10YR, 3/1)
(30) Combination of light gray and light brownish gray/pinkish gray
(31) Combination of white and light gray (hue 10YR, 7/2)
(32) Combination of white and dark grayish brown
(33) Combination of light grayish brown/pinkish gray and grayish brown
(34) Combination of very pale brown/brown
(35) Light reddish brown (hue 2.5YR, 7/3)
(36) Reddish brown (hue 2.5YR, 4/4)
(37) Pinkish gray (hue 5YR, 7.5YR, 7/2)
(38) Yellowish brown (hue 10YR, 5/4)
(39) Combination of very pale brown and light brownish gray/pinkish gray
(40) Pinkish white (hue 5YR, 8/2)
(41) Pink (hue 5YR, 7.5 YR, 7/4)
(42) Dark yellowish brown (hue 10YR, 4/4)
(43) Combination of light gray and light brownish gray/pinkish gray
(44) Reddish yellow (hue 5YR, 7/6)
(45) Combination of light gray and gray (hue 10YR, 7/1 and 5/1)
(46) Combination of very pale brown and light gray (hue 10YR, 8/2 and 7/1)
(47) Combination of pinkish gray and light brownish gray/pinkish gray
(48) Yellow (hue 10YR, 7/6)
(49) Light brown (hue 7.5YR, 6/3)
(50) Combination of light gray, gray, and light brownish gray/pinkish gray
(51) Light reddish brown (hue 5YR, 6/3)
(52) Combination of pinkish gray and gray
(53) Light bluish gray (gley 2, 7/1)
(54) Dark greenish gray (gley 1, 4/1)
(55) Light red (hue 10R, 6/6)
(56) Very dark greenish gray (gley 1, 3/1)
(57) Reddish Yellow (hue 5YR, 6/8)
(58) Bluish gray (gley 2, 5/1)

4. Lithic Raw Material Quality: This entry refers to the presence (1) or absence (0) of inclusions, vugs, voids, and/or fossils within the raw material from which the flake or tool artifact is made. This attribute provides a rough measure of the homogeneity versus

heterogeneity of lithic raw materials. It also determines the overall quality of the toolstone. Those raw materials that contain these types of inclusions are deemed poor quality since internal flaws of this nature can/do compromise the successful detachment of a flake or completion of an artifact (Andrefsky 1994a; Goodyear 1989). Those raw materials that lack inclusions are considered high quality because the risk of failure due to natural flaws is drastically, if not entirely, reduced (Andrefsky 1994a; Goodyear 1989).

5. Cortex: This entry refers to the amount of cortex present on the dorsal surface and/or platform an individual flake or tool. Cortex is defined as "any observable rind or outer surface of the original piece of raw material that can be distinguished from a surface created by human flake removals of fracture processes" (Ahler 1989b:90). Following Bradbury and Carr (1995:101, 115) cortex cover is recorded as an ordinal variable and five categories are recognized:

(0)	Absent
(1)	1-49%
(2)	50-99%
(3)	100%
(4)	Platform only

Technological Attributes: Debitage, Used Flakes, and Informal Tool Categories

6. Size Grade: This entry refers to the maximum dimension of an artifact, in millimetres, measured using wire mesh stacking screens. Six size grades are recorded:

(1)	< 5 mm (1/8 inch)
(2)	6 to 12 mm (1/4 inch)
(3)	13 to 19 mm (1/2 inch)
(4)	20 to 25 mm (3/4 inch)
(5)	26 to 30 mm (1 inch)
(6)	> 31 mm (1 1/4 inch)

7. Weight: This entry refers to the weight of debitage, informal, and formal artifacts in all categories, rounded up to the nearest decigram (Bradbury and Carr 1999; Wenzel and Shelly 2001).

8. Initiation Face or Striking Platform Modification: This entry refers to whether or not the initiation face of the debitage or tool has been modified prior to flake removal or during flake removal and details the type(s) of modification. Seven states and combinations of them are recognized and recorded:

(0) Absent/Indeterminable

(1) Unprepared (i.e. cortical): The initiation face is unmodified cortex. This state is commonly associated with initial core reduction or the testing of nodules (Andrefsky 1998:93; Fish 1981:374).

(2) Crushed, Shattered, or Pointed: The initiation face displays evidence of crushing or fragmentation. This state indicates bipolar reduction and/or hard hammer percussion or, more rarely, soft hammer percussion used with excessive force and speed (Ahler 1989:210; Hayden and Hutchings 1989:247; Kuijt et al. 1995:119).

(3) Single Flake Removal: The initiation face is a single flake scar (i.e. flat platform) (Andrefsky 1998:94; Shott 1994:80). This state is commonly associated with the earlier stages of core reduction (Tomka 1989:146).

(4) Multiple Flake Removal: More than one flake scar is present on the initiation face but they do not represent the lateral junction of a bifacially retouched edge. Flake removals are oriented perpendicular, parallel, or transverse to the initiation face. This state is commonly associated with the extensive platform preparation necessary for effective pressure and soft hammer reduction strategies (Odell 1989:176; Tomka 1989:145-146).

(5) Faceted: The initiation face retains the lateral juncture of a bifacially retouched edge.

(6) Abraded or Ground: The initiation face displays evidence of parallel, perpendicular, or transversely oriented abrasion or grinding. These treatments normally require a greater investment of time and energy and are indicative of later stages of reduction (Cotterell and Kamminga 1987:690; Will 2000:106).

(7) Combination of multiple flake removals and abraded or ground initiation face.

(8) Combination of single flake removal and abraded or ground initiation face.

(9) Combination of faceted and abraded or ground initiation face

(10) Combination of crushed, shattered, and multiple flake removals on initiation face.

(11) Combination of single flake scar and crushed or shattered initiation face.

(12) Combination of unprepared cortical and crushed or shattered initiation face.

(13) Combination of single flake removal and abraded or ground initiation face.

(14) Combination of single flake removal and cortical striking platform.

(15) Combination of multiple flake removal and cortical striking platform.

9. Flake Detachment Below Striking Platform: This entry refers to the presence of flake detachment below the striking platform on the dorsal surface of the flake. These flake scars may result from the use of excessive force loads during detachment resulting in stacked step or hinge terminations below the platform. This state is associated with low skill level and results when successive blows are applied in the same location (Shelley 1990). Trimming the platform overhang also results in flake detachment below the striking platform; however, these scars are not stacked, they typically have feather terminations, and are more localized directly below the platform (Shelley 1990). Three states are recognized and recorded as:

(0) Absent/Indeterminable
(1) Stacked terminations resulting from successive blows using excessive force loads.
(2) Feather terminations resulting from platform trimming.

10. Interior Surface Lipping: This entry refers to the presence (1) or absence (0) of a "lip", which consists of a projection on the ventral surface of a flake near the initiation face or striking platform (Andrefsky 1998:xxiv).

11. Eraillure Scar: This entry refers to the presence (1) or absence (0) of a small scar detached from the bulb of force on the interior surface of a flake, just below the striking platform.

12. Dorsal Scar Count: This entry refers to the number of flake scars observed on the dorsal surface of the debitage or tool artifact. Specimens are oriented with their interior surface facing down and the distal margin of the flake placed closest to the observer. This attribute is measured as a continuous variable. The lowest value is zero indicating dorsal scars are absent or indeterminable.

13. Bulb of Percussion: This entry refers to the subjective appraisal of the presence and location of a bulb of percussion on the ventral side at the proximal and/or distal end of a flake. Salient bulbs of percussion are typically the remnant part of a Hertzian cone commonly produced in hard hammer percussion. More diffuse bulbar protrusions, when discernible, are commonly associated with bipolar reduction and bending initiations produced in soft hammer percussion. Salient or diffuse bulbs of percussion do occur on bipolar flakes at both the proximal and distal ends, however. In the event that the striking platform and resulting bulb of force are crushed or shattered during bipolar reduction, the distal bulb will still indicate a bipolar reduction strategy was used. Four states are recognized and recorded as:

(0) Absent/Indeterminable
(1) Proximal end only
(2) Distal end only
(3) Proximal and Distal ends

14. Compression Rings: This entry refers to the presence (1) or (0) absence of pronounced ripples radiating from the point of applied force or the initiation surface (Crabtree 1972:52). They can be both positive (protruding out) and negative (protruding in) on the ventral surface.

15. Secondary Distal Crushing or Flaking: This entry refers to the presence (1) or absence (0) of secondary distal crushing and/or flake detachment exhibited at the distal end of the flake that rests against an anvil during impact (Leaf 1979:39; Root 1997:37). This modification is produced by pressure being applied to both ends of a core during flake detachment and is considered a diagnostic indicator of bipolar reduction (Kuijt et al. 1995; Root 1997).

Functional Variability: Used Flakes and Informal Tools

Functional variation observed on stone tools is largely a product of post-detachment modification, whether it is through resharpening or rejuvenation, to make an implement more efficient in the performance of certain tasks (Wilmsen 1968:156). Further alteration of utilized edges can occur under the stress of use (Wilmsen 1968:156). The shape of a tool and its functional edges seem to be conditioned primarily by the intensity of edge use and whether the edge was "linearly extensive or concentrated in small areas" (Barton 1990:57). Assessing functional variability in lithic analysis is vital since the effects of edge modification over the course of an artifact's use-life are cumulative and directly influence the tool's overall morphology (Frison 1968; Hayden 1989; Jelinek 1976; Shott 1989a). Functional variability for the informal tool category is measured by assessing the location of retouch and use wear along a artifact's edge and/or margins, its extent and intensity, and the total number of utilized edges per artifact (Barton 1988:57). Utilized flakes do not display any post-detachment modification since they are selectively removed from the debitage assemblage for immediate use. However, cumulative use-wear can alter flake margins through attrition (Andrefsky 1998:79). Evidence of retouch and/or use-wear on the flake perimeter(s) is described using four possible locations (see Figure A.1).

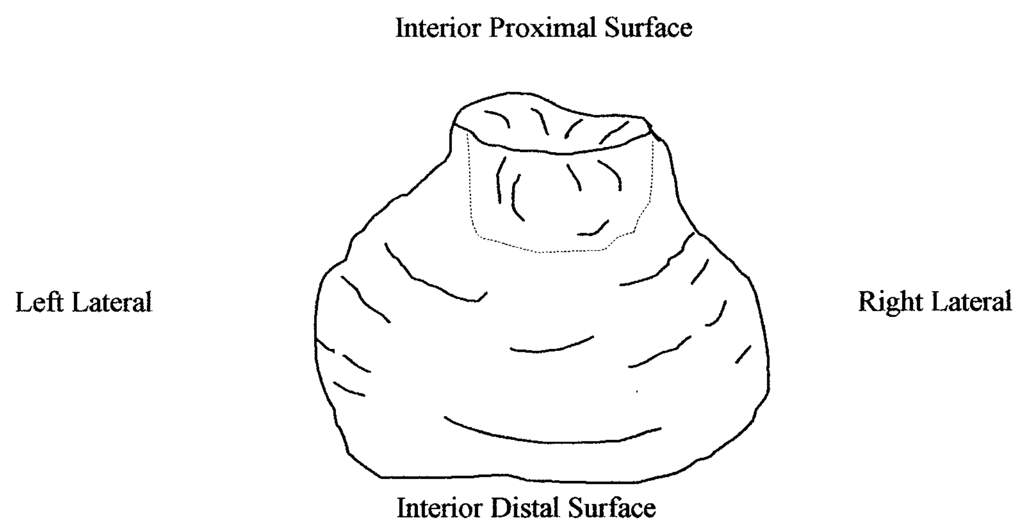


Figure A.1 Location points on used to identify use-wear and/or modification on utilized flakes and informal tools.

<u>Functional Attributes: Utilized Flakes and Informal Tools</u>

16. Use-wear Edge Modification: This entry refers to the presence of micro-flaking along the margin(s) of a flake or informal tool produced from use-wear. Four states of use-wear are recognized and recorded as:

(0) Absent/Indeterminable
(1) Edge Rounding
(2) Step Fracture Terminations
(3) Edge Rounding and Step Fracture Terminations

17. Location of Use-Wear Modification: This entry refers to the location(s) of edge rounding and/or step fracturing on the flake or informal tool. The flake or tool is oriented using the standard lithic locational criteria with the interior surface of the specimen facing upwards and the distal margin placed closest to the observer. Four individual retouch surfaces and combinations of them are recognized and recorded as:

(0) Absent/Indeterminable
(1) Distal
(2) Proximal
(3) Distal/proximal
(4) Distal/proximal/left lateral
(5) Distal/proximal/right lateral
(6) Distal/proximal/left lateral/right lateral
(7) Distal/right lateral
(8) Distal/left lateral
(9) Distal/left lateral/right lateral
(10) Proximal/left lateral
(11) Proximal/right lateral
(12) Proximal/left lateral/right lateral
(13) Right lateral
(14) Left lateral
(15) Right/left lateral

Functional Attributes: Informal Tools

18. Retouch Initiation Surface: This entry refers to the location of retouch on the interior or exterior surface of the tool. Four retouch locations are recognized and recorded as:

(0) Absent/Indeterminable
(1) Interior surface only
(2) Exterior surface only
(3) Non-contiguous Interior and Exterior surfaces (i.e. alternate)
(4) Contiguous Interior and Exterior surfaces (i.e. bifacial)

19. Interior Retouch Location on the Flake Perimeter: This entry refers to the location of the interior (ventral) retouch surface. The tool is oriented using the standard lithic location criteria with the dorsal surface facing upwards, the proximal end closest to the observer, and the distal end furthest away. Four individual retouch surfaces and combinations of them are recognized and recorded as:

(0)	Absent/Indeterminable
(1)	Distal
(2)	Proximal
(3)	Distal/proximal
(4)	Distal/proximal/left lateral
(5)	Distal/proximal/right lateral
(6)	Distal/proximal/left lateral/right lateral
(7)	Distal/right lateral
(8)	Distal/left lateral
(9)	Distal/left lateral/right lateral
(10)	Proximal/left lateral
(11)	Proximal/right lateral
(12)	Proximal/left lateral/right lateral
(13)	Right lateral
(14)	Left lateral
(15)	Right/left lateral

20. Extent of Interior Retouch: This entry refers to the extent or length(s), in millimetres, of the interior retouch location(s) (Barton 1988:65).

21. Number of Retouch Scars per Interior Retouch Location: This entry refers to the number of flake scars concentrated on the interior retouch surface(s) indicating the successive removal of excess material for the purpose of resharpening an edge or forming a desired shape (Sinclair 2000:202-203).

22. Invasiveness of Interior Retouch Scars per Retouch Location: This entry refers to the deepest flake scar(s), in millimetres, present at the interior retouch location(s) (Barton 1988:65).

23. Interior Retouch Intensity Index: Following Barton (1988), Dibble (1995), Kuhn (1990, 1992), Sinclair (2000), and Handly (1994), this entry refers to the retouch intensity index derived for each interior retouch location. This index combines three attribute states to provide an approximate measure of the degree and quality of retouch present on a tool.

$$RII = \frac{\text{Number of Retouch Scars per Interior Retouch Location X Invasiveness of Retouch}}{\text{Length of Interior Retouch Location}}$$

24. Exterior Retouch Location on the Flake Perimeter: This entry refers to the location of the exterior retouch surface(s). The tool is oriented using the standard lithic location criteria with the dorsal surface facing upwards, the proximal end closest to the observer, and the distal end furthest away. Four individual retouch surfaces and combinations of them are recognized and recorded as:

(0) Absent/Indeterminable
(1) Distal
(2) Proximal
(3) Distal/proximal
(4) Distal/proximal/left lateral
(5) Distal/proximal/right lateral
(6) Distal/proximal/left lateral/right lateral
(7) Distal/right lateral
(8) Distal/left lateral
(9) Distal/left lateral/right lateral
(10) Proximal/left lateral
(11) Proximal/right lateral
(12) Proximal/left lateral/right lateral
(13) Right lateral

(14) Left lateral
(15) Right/left lateral

25. Extent of Exterior Retouch: This entry refers to the extent or length(s), in millimetres, of the exterior retouch location(s) (Barton 1988:65).

26. Number of Retouch Scars per Exterior Retouch Location: This entry refers to the number of flake scars concentrated on the exterior retouch surface(s) indicating the successive removal of excess material for the purpose of resharpening an edge or forming a desired shape (Sinclair 2000:202-203).

27. Invasiveness of Exterior Retouch Scars per Retouch Location: This entry refers to the deepest flake scar(s), in millimetres, present at the exterior retouch location(s) (Barton 1988:65).

28. Exterior Retouch Intensity Index: Following Barton (1988), Dibble (1995), Kuhn (1990, 1992), Sinclair (2000), and Handly (1994), this entry refers to the retouch intensity index derived for each exterior retouch location. This index combines three attribute states to provide an approximate measure of the degree and quality of retouch present on a tool.

$$\text{RII} = \frac{\text{Number of Retouch Scars per Exterior Retouch Location X Invasiveness of Retouch}}{\text{Length of Exterior Retouch Location}}$$

Morphological Attributes: Informal Tools

29. Interior Retouched Edge Morphology: This entry refers to a subjective appraisal of the shape(s) of the interior retouch location(s). Five states are recognized and recorded as:

(0)	Absent/indeterminable
(1)	Concave
(2)	Convex
(3)	Straight
(4)	Concavoconvex

30. Exterior Retouched Edge Morphology: This entry refers to a subjective appraisal of the shape(s) of the interior retouch location(s). Five states are recognized and recorded as:

(0)	Absent/indeterminable
(1)	Concave
(2)	Convex
(3)	Straight
(4)	Concavoconvex

31. Modification of Non-Working Edge Tool Portion: This entry refers to the presence (1) or absence (0) of intentional patterned removal of flakes on the non-working edge portion of the tool. These intentional flake scars are distinguished from those acquired as a result of the reduction process, which are more randomly patterned. The non-working edge portion of an informal tool is not designed to have impact on matter (Wobst 2000:46) and informal tools do not adhere to any formal design criteria (Andrefsky 1998). However, these factors do not preclude this portion of the tool from displaying intentional modification of some kind. Specimens that are modified on the non-working edge portion are ideal for examining agency (Wobst 2000).

Burin Spalls

Burin spalls are among the most ubiquitous artifacts found in Pre-Dorset sites. Together with microblades, they typically account for 60 - 80 % of the total artifact inventory in Pre-Dorset lithic assemblages (Maxwell 1985:91). Burin spalls, and especially modified spall tools, are considered "guide fossils" for Pre-Dorset (Maxwell 1985:109; Taylor 1968:39). While burin spalls are treated as a discrete artifact type in Pre-Dorset archaeology, they are classified as informal tools in this analysis because they conform to the definition in Chapter 5. As such, attributes used to analyze technological and functional variability for this tool class are the same as those listed above. However, a number of morphological and functional attributes particular to Pre-Dorset burin spalls are also assessed.

Morphological Variability: Burin Spalls

32. Shape of the Burin Spall: This entry refers to the shape of the burin spall, which is directly related to the order in which it was removed from the working edge of the burin. Three states are recognized and recorded:

(0) Indeterminable
(1) Primary Spall
(2) Secondary Spall

33. Burin Spall Completeness Index: This entry refers to the completeness of all burin spalls. Six states are recognized and recorded:

(0) Indeterminable
(1) Complete
(2) Proximal End only
(3) Proximal and Medial Sections only
(4) Basal Section only
(5) Basal and Medial Sections only

34. Maximum Length: This entry refers to the maximum length measured on complete specimens only.

35. Maximum Width: This entry refers to the maximum width measured for the burin spall.

36. Maximum Thickness: This entry refers to the maximum thickness measured for the burin spall.

<u>Technological Variability: Burin Spalls</u>

37. Intensity of Flaking on the Dorsal Surface: This entry refers to the subjective appraisal of the intensity of flaking on the dorsal surface of the burin spall. This value reflects the degree of preparation the burin has undergone prior to spall removal. Five states are recognized and recorded as:

(0)	Indeterminable
(1)	None
(2)	Minimal
(3)	Moderate
(4)	Intensive

<u>Functional Variability: Burin Spalls</u>

38. Burin Spall Modification: This entry refers to the presence (1) or absence (0) of secondary modification in the form of spalling, flaking, polish, or grinding (Maxwell 1985:91) on the burin spall. Specimens displaying these forms of modification are known as burin spall tools. Since not all spalls are intentionally modified, these specimens also provide an arena in which to examine agency.

Bifaces

Bifacial implements, specifically projectile points and endblades, are viewed as important culture-historical markers in most archaeological assemblages because they embody stylistic information. Explicit type lists are used to classify and place these implements within regional cultural chronologies. For Pre-Dorset bifaces, these type lists, if present, are variable (Maxwell 1973) and may be difficult to understand and apply (e.g. Helmer and Robertson 1990). Pre-Dorset bifacial tools comprise several subtypes including ovate bifaces; stemmed, notched and triangular endblades; and symmetrical and asymmetrical bifaces, which are often lumped in the functional category of 'knives' (Stenton 1986:26-28). This analysis addresses morphological, technological, and functional variability observed on these tools using Binford's (1963) typology. All attributes are discussed in accordance with three structural elements: the blade, the haft, and the basal element (Binford 1963; see Figure A.2).

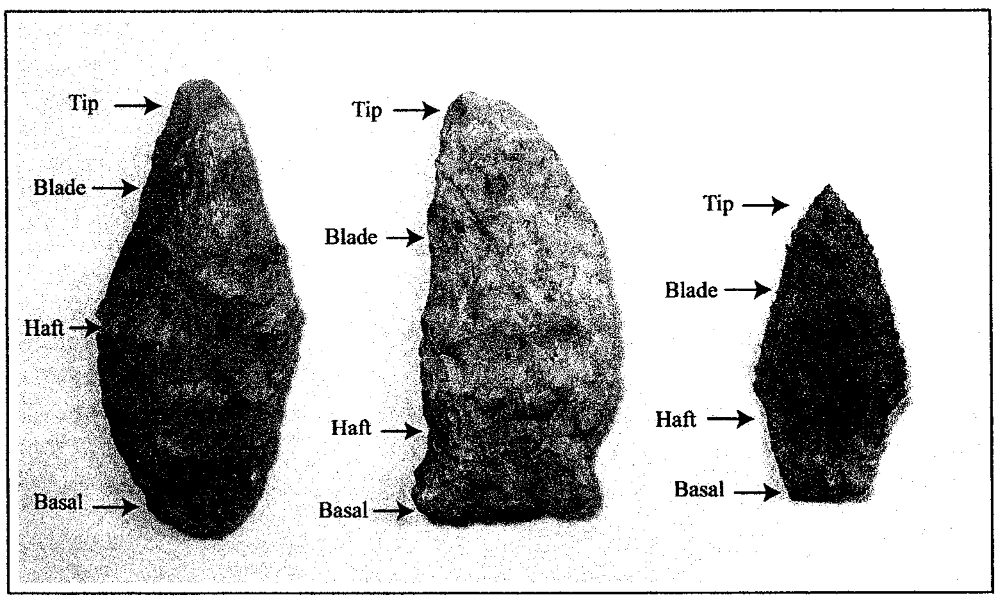


Figure 6.2 Illustration of blade, haft, and basal elements for Pre-Dorset biface types (i.e. ovate bifaces, bifacial knives, and endblades).

Morphological Variability: Bifaces

39. Completeness Index: This entry refers to the completeness of all bifacial implements.

Eight states are recognized and recorded as:

(0)	Indeterminable
(1)	Complete
(2)	Tip Element Missing
(3)	Tip and Blade Elements Missing
(4)	Basal and Hafting Elements Missing
(5)	Tip, Basal, and Hafting Elements Missing
(6)	Longitudinal Split
(7)	Blade, Basal, and Hafting Elements Missing
(8)	Bifacial Edge
(9)	Tip and Basal Elements Missing
(10)	Basal Element Missing
(11)	Tip, Blade, and Basal Element Missing
(12)	Lateral Margin(s) Missing

40. Right Blade Element Outline: This entry refers to the subjective appraisal of the shape of the right blade element outline. Five states are recognized (Binford 1963:200) and recorded as:

(0)	Incomplete or Missing
(1)	Straight
(2)	Convex
(3)	Concave

41. Left Blade Element Outline: This entry refers to the subjective appraisal of the shape of the left blade element outline. Five states are recognized (Binford 1963:200) and recorded as:

(0)	Incomplete or Missing
(1)	Straight
(2)	Convex
(3)	Concave

42. Transverse Cross-Section of the Blade Element: This entry refers to the subjective appraisal of the shape of the transverse cross-section of the blade element, viewed at the shoulder width measurement. Six states are recognized (Binford 1963:201-203) and recorded as:

(0)	Absent/Indeterminable
(1)	Plano-convex
(2)	Plano-triangular
(3)	Biplano
(4)	Biconvex
(5)	Bitriangular

43. Symmetry of the Blade Element: This entry refers to the subjective appraisal of the symmetry of the blade element. Three states are recognized (Binford 1963:202) and recorded as:

(0)	Incomplete
(1)	Symmetrical: Both the lateral edges of the blade element are geometrically complimentary.
(2)	Asymmetrical: The two lateral edges of the blade element are not geometrically complimentary.

44. Degree of Edge Sinuosity: This entry refers to the subjective appraisal of the degree of sinuosity observed for the lateral margins of the biface. Those bifaces with very sinuous margins are associated with low skill level (Shelley 1990:188). The biface margin is compared to a hypothetical straight line and five states are recognized and recorded as:

(0)	Absent/Indeterminable
(1)	Straight
(2)	Slightly Sinuous
(3)	Moderately Sinuous
(4)	Very Sinuous

45. Stacked Surface Terminations: This entry refers to the presence (1) or absence (0) of stacked terminations on the surface of the biface. These stacks may comprise multiple hinged or step fractures that are the result of repeatedly failed attempts to shape and/or thin the biface (Shelley 1990:188). These stacks can give the resulting biface an exaggerated triangular cross-section.

46. Hafting Element Morphology: This entry refers to the shape of hafting element present on the basal portion of the biface. Four states are recognized and recorded as:

(0) Absent/Incomplete/Indeterminable

(1) Notched: The biface displays an intentionally manufactured indentation or intrusion on its lateral margins near the proximal end of the artifact.

(2) Stemmed: The biface displays a parallel or roughly parallel hafting element that begins at the shoulder width measurement and continues to the basal element.

(3) Pointed: The biface display a convergent hafting element that begins at the shoulder width measurement and continues to the basal element forming a point. Endblades that display these hafting elements typically possess pointed tips as well, forming a diagnostic bipointed endblade.

(4) Laterally Thinned: The right or left margin of the biface has been bifacially or unifacially thinned to facilitate hafting.

47. Hafting Element Notch Orientation: This entry refers to the direction of notching, if present, on the hafting element. Three states are recognized (Handly 1994:257) and recorded as:

(0) Absent

(1) Side Orientation: A side-oriented notch originates on the lateral margins of the artifact, but does not extend to the laterodistal juncture of the basal element.

(2) Corner Orientation: A corner-oriented notch originates at the laterodistal juncture of the basal element, but does not originate solely on the basal element.

48. Basal Element Outline: This entry refers to the subjective appraisal of the shape of the basal outline. Four states are recognized (Binford 1963:207-209) and recorded as:

(0) Missing/Indeterminable

(1) Straight: An edge that describes a straight line between the two defining points of the base.

(2) Convex: An edge that describes a convex line between the two defining points of the base.

(3) Concave: An edge that describes a concave line between the defining points of the base.

(4) Triangulo-Concave: An edge that describes a concave line between the defining points of the base that is symmetrically triangular in form and converges at the midline of the biface.

49. Symmetry of the Basal Element: This entry refers to the subjective appraisal of the symmetry of the basal element outline (Binford 1963:208) and is recorded as:

(0) Incomplete/Indeterminable

(1) Symmetrical: The right and left segments of the basal element, as defined by division along the longitudinal axis, are geometrically complimentary.

(2) Asymmetrical: The right and left segments of the basal element, as defined by division along the longitudinal axis, are not geometrically complimentary.

50. Maximum Length: This entry refers to the maximum length of the biface measured from the distal tip of the artifact to its basal margin along the longitudinal axis.

51. Maximum Width: This entry refers to the point of maximum width of the biface measured when a defined shoulder element is absent. Width is measured on those implements that are complete or near complete when missing only the basal element.

52. Maximum Thickness: This entry refers to the point of maximum thickness of the biface or biface fragment.

<u>Technological Attributes: Bifaces</u>

53. Placement of Primary Flake Scars: This entry refers to the placement of primary flake scars on the biface or biface fragment. Primary flake scars are defined as those produced during the initial alteration of the flake to achieve a desired shape (Binford 1963:202). They may extend to the midline or less of the biface (Binford 1963:204). Three placement locations are recognized and recorded as:

(0)	Indeterminable
(1)	Unifacial: Primary scars present on only one face of the biface
(2)	Bifacial: Primary scars present on both faces of the biface

54. Placement of Secondary Scars: This entry refers to the placement of secondary scars on the biface or biface fragment. These scars originate along the lateral edge of the blade element and tend to obscure the points of origin of primary scars (Binford 1963:205). Typically, secondary scars extend only partially to the midline of the blade element (Handly 1994:260). Three placement locations are recognized and recorded as:

(0) Absent/Indeterminable
(1) Unifacial: Secondary scars present on only one face of the biface
(2) Bifacial: Secondary scars present on both faces of the biface

55. Patterns of Occurrence of Secondary Flake Scars along the Lateral Margins: This entry refers to the pattern of secondary scar placement on the lateral margins of the blade element (Binford 1963:205-206). Three patterns are recognized and recorded as:

(0) Absent/Indeterminable
(1) Continuous: Secondary flake scars occur sequentially along the entire lateral edge
(2) Discontinuous: Secondary scars occur non-sequentially along the lateral edge as a function of the thickness irregularities resulting from primary flaking or because of randomness.

56. Intensity of Flaking on the Biface: This entry refers to the subjective appraisal of the intensity and quality of flaking observed on surfaces of the biface. Five states are recognized and recorded as:

(0) Indeterminable
(1) None
(2) Minimal
(3) Moderate
(4) Intensive

57. Form of the Lateral Edges: This entry refers to the form of the lateral edges of the blade element (Binford 1963:207). Two states are recognized and recorded as serrated (1) and non-serrated (0).

58. Presence and Location of Grinding or Abrasion: This entry refers to the presence, and location(s) of grinding or abrasion on the blade element. Seven locations are recognized and recorded as:

(0)	Absent/Indeterminable
(1)	Proximal
(2)	Right Lateroproximal
(3)	Right Lateral
(4)	Right Laterodistal
(5)	Left Lateroproximal
(6)	Left Lateral
(7)	Left Laterodistal
(8)	Distal
(9)	Dorsal
(10)	Ventral
(11)	Dorsal/Ventral
(12)	Ventral/Dorsal/Distal
(13)	Ventral/Dorsal
(14)	Dorsal/Distal
(15)	Right/Left Lateral Margins

Technological Variability: Basal Element

59. Basal Element Modification: This entry refers to the presence of intentional modification of the basal element. It is presumed these modifications facilitate hafting of the biface and serve to reduce and/or remove the bulb of force present on the original flake from which the biface was made. Seven states are recognized and recorded as:

(0)	Absent/Indeterminable
(1)	Unmodified
(2)	Unifacially Thinned by Flaking
(3)	Bifacially Thinned by Flaking
(4)	Unifacially Ground
(5)	Bifacially Ground
(6)	Unifacially Thinned by Flaking and Grinding
(7)	Bifacially Thinned by Flaking and Grinding

Functional Variability: Bifaces - Blade Element

60. Presence of Use-Wear: This entry refers to the presence of use-wear on the blade element of the biface as indicated by step fracturing or edge rounding. Four states of use-wear are recognized and recorded as:

(0)	Absent/Indeterminable
(1)	Rounding Present
(2)	Step Fracturing Present
(3)	Both Rounding and Step Fracturing Present

61. Location of Use-Wear: This entry refers to the location(s) of use-wear on the blade element as indicated by step fracturing or edge rounding. Tools are oriented with the basal element closest to the observer and the blade tip furthest away. Five individual locations and combinations of them are recognized and recorded as:

(0)	Absent/Indeterminable
(1)	Distal
(2)	Proximal
(3)	Distal/proximal
(4)	Distal/proximal/left lateral
(5)	Distal/proximal/right lateral
(6)	Distal/proximal/left lateral/right lateral
(7)	Distal/right lateral
(8)	Distal/left lateral
(9)	Distal/left lateral/right lateral
(10)	Proximal/left lateral
(11)	Proximal/right lateral
(12)	Proximal/left lateral/right lateral
(13)	Right lateral
(14)	Left lateral
(15)	Right/left lateral

62. Evidence of Tool Rejuvenation: This entry refers to the presence (1) or absence (0) of evidence indicating reworking or rejuvenation of the blade element has taken place as a result of breakage or attrition (Binford 1963:207; Michie 1973; Flenniken and Raymond 1987; Towner and Warburton 1990).

Burins

Attempts to construct morphological typologies for Pre-Dorset burins (e.g. Maxwell 1973) have proved ineffective to date. Some researchers attribute morphological variability to different burin functions like graving, planing, and scraping (Maxwell 1985:92) while others believe that individual skill is responsible (McGhee 1980). Upper Palaeolithic archaeologists have long tried to establish standardized burin typologies yet their efforts have also produced inconsistent and incomparable type lists (e.g. Bardon and Bouyssonie 1903, 1906; Bordes 1947; Gunn 1975; Movius et al. 1968; Noone 1934; de Sonneville-Bordes and Perrot 1956). Because of this, analysis of the burins included in this study follows a modified version of Binford's (1963) typology. Burins are described according to their working edge or bit, lateral edges, haft, and basal structural elements (see Figure A.3). Attributes used to measure morphological, technological, and functional variability are discussed in accordance with these four elements.

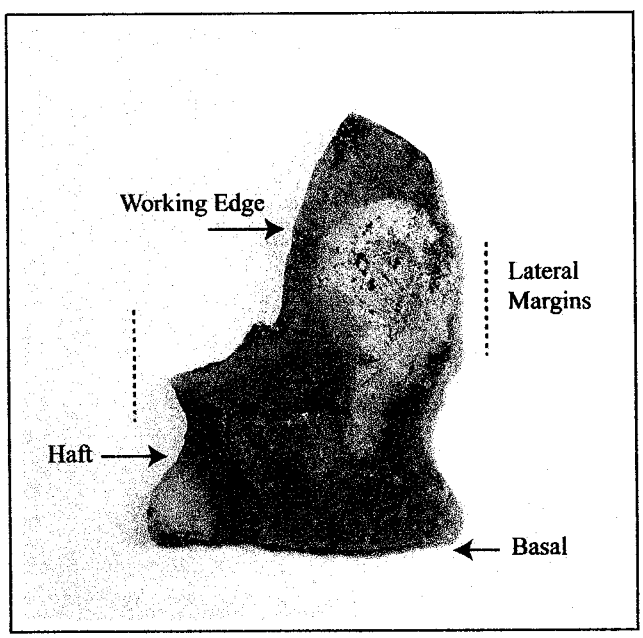


Figure A.3 Structural Elements of Pre-Dorset Burins

Morphological Variability: Burins

63. Burin Completeness Index: This entry refers the completeness of all burins. Eight states are recognized and recorded:

(0) Indeterminable
(1) Complete
(2) Working Edge missing
(3) Haft Element missing
(4) Haft and Basal Elements missing
(5) Haft, Basal, and Marginal Elements missing
(6) Basal Element missing
(7) Longitudinally Split

64. Orientation of the Working Edge: This entry refers to the orientation(s) or angle(s) of the working edge(s). This attribute is determined by the angle(s) at which the burin blow(s) was (were) administered to the working edge platform. Five states are recognized and recorded as:

(0) Indeterminable
(1) Obtuse or Oblique
(2) Acute
(3) Arcing
(4) Perpendicular

65. Shape of the Left Lateral Margin: This entry refers to the subjective appraisal of the shape of the left lateral margin observed on the burin. In instances where the working edge is on the left side of the tool, the left lateral margin will be observed from base of the working edge. Burins are oriented with the dorsal surface facing up and the basal element closest to the observer. Five states are recognized (Binford 1963:200) and recorded as:

(0) Incomplete or missing
(1) Straight
(2) Concave
(3) Convex

66. Shape of the Right Lateral Margin: This entry refers to the subjective appraisal of the shape of the right lateral margin observed on the burin. In instances where the working edge is on the right side of the tool, the right lateral margin will be observed from base of the working edge. Burins are oriented with the dorsal surface facing up and the basal element closest to the observer. Five states are recognized (Binford 1963:200) and recorded as:

(0) Incomplete or missing
(1) Straight
(2) Concave
(3) Convex

67. Symmetry of the Burin: This entry refers to the subjective appraisal of the symmetry of the burin as indicated by the shape of the left and right lateral margins. Three states are recognized (Binford 1963:202) and recorded as:

(0) Incomplete

(1) Symmetrical: Both the lateral edges of the burin are geometrically complimentary

(2) Asymmetrical: The two lateral edges of the burin are not geometrically complimentary

68. Hafting Element Morphology: This entry refers to the type of hafting element, when present and discernible, on the basal portion of the burin. Five states are recognized and recorded as:

(0) Incomplete/Absent/Indeterminable

(1) Notched: The burin displays an intentionally manufactured indentation or intrusion on its lateral margins near the proximal end or basal element of the artifact.

(2) Stemmed: The burin displays a parallel or roughly parallel hafting element that begins below the base of the working edge and continues to the basal element.

(3) Pointed: The burin displays a convergent hafting element that begins at the base of the working edge and continues to the basal element forming a point.

(4) Laterally thinned: The right or left margin of the burin has been bifacially or unifacially thinned to facilitate hafting.

69. Hafting Element Notch Orientation: This entry refers to the direction of notching, if present, on the hafting element. Three states are recognized (Handly 1994:257) and recorded as:

(0) Absent

(1) Side Orientation: A side-oriented notch originates on the lateral margins of the artifact, but does not extend to the laterodistal juncture of the basal element.

(2) Corner Orientation: A corner-oriented notch originates at the laterodistal juncture of the basal element, but does not originate solely on the basal element.

70. Basal Element Outline: This entry refers to the subjective appraisal of the shape of the basal outline. Five states are recognized (Binford 1963:207-209) and recorded as:

(0) Missing

(1) Straight: An edge that defines a straight line between the two defining points of the base.

(2) Convex: An edge that describes a convex line between the two defining points of the base.

(3) Concave: An edge that describes a concave line between the two defining points of the base.

(4) Bivectoral: The proximal segment of a tang that is described by the two lateral edges and the line drawn across the point from the proximal points of juncture of the haft element.

71. Symmetry of the Basal Element: This entry refers to the subjective appraisal of the symmetry of the basal element outline (Binford 1963:208) and is recorded as:

(0) Incomplete

(1) Symmetrical: The right and left segments of the basal element, as defined by division along the longitudinal axis, are geometrically complimentary.

(2) Asymmetrical: The right and left segments of the basal element, as defined by division along the longitudinal axis, are not geometrically complimentary.

72. Maximum Length: This entry refers to the maximum length of the burin.

73. Maximum Width: This entry refers to the point of maximum width of the burin.

74. Maximum Thickness: This entry refers to the point of maximum thickness of the burin.

Technological Attributes: Burins

75. Preparation of the Working Edge Platform: This entry refers to the type of preparation observed at the tip of the working edge platform of the burin. This preparation is typically done to facilitate and control spall detachment. Three states are recognized and recorded as:

(0) Absent/Indeterminable
(1) Flaked
(2) Polished or Ground

76. Placement of Primary Flake Scars: This entry refers to the placement of primary flake scars on the lateral margins of the burin. Primary flake scars are defined as those produced

during the initial alteration of the flake to achieve a desired shape (Binford 1963:202). Three placement locations are recognized and recorded as:

(0) Indeterminable
(1) Unifacial: Primary scars present on only one face of the burin
(2) Bifacial: Primary scars present on both faces of the burin

77. Placement of Secondary Flake Scars: This entry refers to the placement of secondary scars on the lateral margins of the burin. These scars originate along the lateral edges and tend to obscure the points of origin of primary scars (Binford 1963: 205). Three placement locations are recognized and recorded as:

(0) Absent/Indeterminable
(1) Unifacial: Secondary scars present on only one face of the burin
(2) Bifacial: Secondary scars present on both faces of the burin

78. Patterns of Occurrence of Secondary Flake Scars Along the Lateral Margins: This entry refers to the pattern of secondary scar placement on the lateral margins of the burin. Three patterns are recognized (Binford 1963:205-206) and recorded as:

(0) Absent/Indeterminable

(1) Continuous: Secondary flake scars occur sequentially along the entire lateral edge

(2) Discontinuous: Secondary scars occur non-sequentially along the lateral edge as a function of the thickness irregularities resulting from primary flaking or because of randomness.

79. Intensity of Flaking on the Burin: This entry refers to the subjective appraisal of the intensity and quality of flaking observed on surfaces of the burin. Five states are recognized and recorded as:

(0)	Indeterminable
(1)	None
(2)	Minimal
(3)	Moderate
(4)	Intensive

80. Presence and Location of Grinding or Polish: This entry refers to the presence and location of grinding or polish on the burin. Burins are oriented with the ventral surface facing upwards, the tip of the working edge closest to the observer, and the original flake striking platform furthest away. Seven locations are recognized and recorded as:

(0)	Absent/Indeterminable
(1)	Proximal
(2)	Right Lateroproximal
(3)	Right Lateral
(4)	Right Laterodistal
(5)	Left Lateroproximal
(6)	Left Lateral
(7)	Left Laterodistal
(8)	Distal
(9)	Dorsal
(10)	Ventral
(11)	Ventral/Distal
(12)	Ventral/Dorsal/Distal
(13)	Ventral/Dorsal
(14)	Dorsal/Distal
(15)	Right/Left Lateral Margins

Technological Attributes: Basal Element

81. Basal Element Modification: This entry refers to the presence of intentional modification of the basal element. It is presumed these modifications facilitate hafting of the burin serve to reduce and/or remove the bulb of force present on the original flake from which the burin was made. Seven states are recognized and recorded as:

(0)	Absent/indeterminable
(1)	Unmodified
(2)	Unifacially Thinned by Flaking

(3) Bifacially Thinned by Flaking
(4) Unifacially Ground
(5) Bifacially Ground
(6) Unifacially Thinned by Flaking and Grinding
(7) Bifacially Thinned by Flaking and Grinding

Functional Variability: Burins - Working Edge

82. Spalling Locations: This entry refers to the number of spalling locations present on a burin in addition to the primary working edge. Five classes of numbers are recognized and recorded as:

(0) Unspalled working edge. This tool would be considered a burin pre-form
(1) Primary Working Edge only
(2) Primary Working Edge plus one additional spalling location
(3) Primary Working Edge plus two additional spalling locations
(4) Primary Working Edge plus three or more additional spalling locations

83. Number of Burin Spall Scars: This entry refers to the number of times the working edge of the burin has been rejuvenated through the removal of burin spalls. Small scars left at the base of the working edge from each spall removal should be discernible. This attribute state is recorded as a continuous variable ranging from the lowest observed value of 0 upwards.

Scrapers

According to Maxwell (1973:29, 31), the two most common types of scrapers found in Pre-Dorset assemblages are side scrapers and end scrapers. Side scrapers have a retouched, steeply bevelled scraping edge on one lateral margin or at one corner. End scrapers have one retouched, steeply bevelled scraping edge on the distal margin. There is, however, significant variability within these two types in terms of edge shape, size, angle, location, shape of lateral margins, flaking patterns and location, polishing and grinding, and hafting modifications. Many subclasses have been defined within the side and end scraper categories (e.g. Gordon 1996; Le Blanc 1994; Maxwell 1973; Taylor 1968). Descriptions and selected attributes are particular to individual researchers hence, there are no standard criteria to classify and analyze these tools. Variability among Pre-Dorset scrapers may have been determined by different task functions (Maxwell 1985:95) or different stages of scraper reduction (Dibble 1987:116). Attributes chosen in this analysis attempt to isolate morphological, technological, and functional variability among scrapers. To facilitate scraper analysis and comparison, four structural elements (Binford 1963) are identified: the scraping edge, lateral margins, hafting element, and basal element (see Figure A.4).

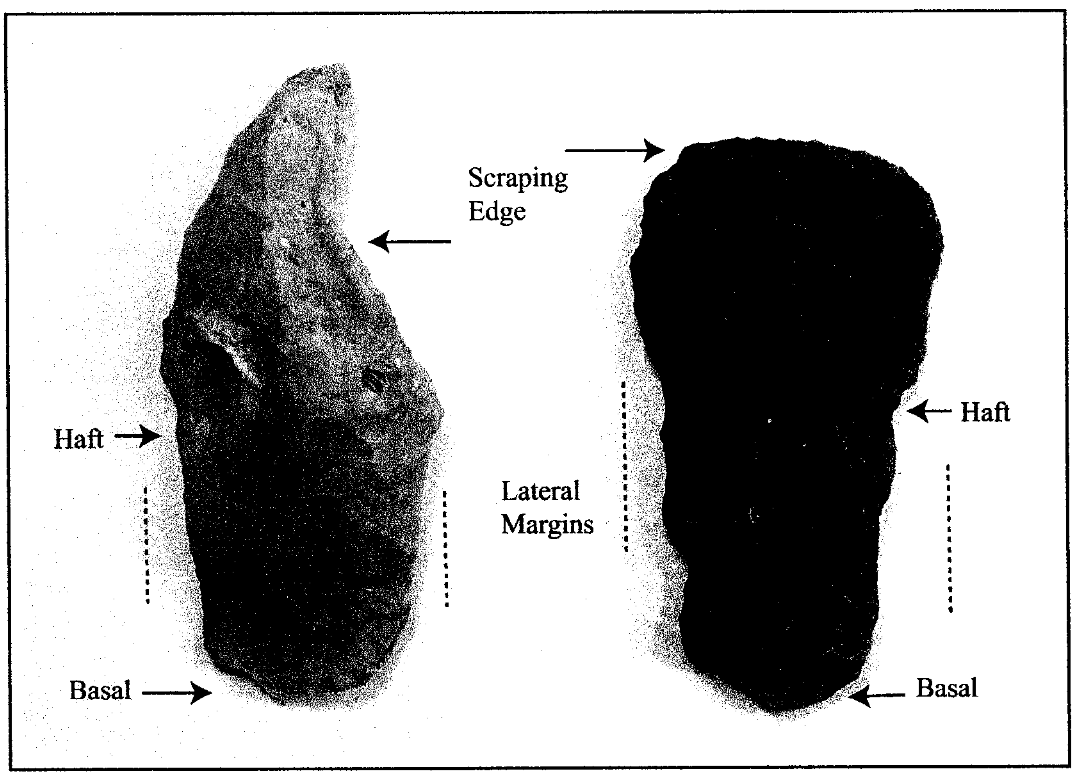


Figure A.4. Structural elements of Pre-Dorset side and end scrapers.

Morphological Attributes: Scrapers

84. Completeness Index: This entry refers to the completeness of all scrapers. Eight states are recognized and recorded:

(0)	Indeterminable
(1)	Complete
(2)	Basal Element missing
(3)	Hafting Element missing
(4)	Basal and Hafting Elements missing
(5)	Basal, Hafting, and Marginal Elements missing
(6)	Scraping Edge missing
(7)	Longitudinally Split

85. Right Scraper Margin Outline: This entry refers to the subjective appraisal of the shape of the right lateral margin of the scraper. Scrapers are oriented with their dorsal surface facing up and the scraping edge oriented away from the observer. Five states are recognized (Binford 1963:200) and recorded:

(0)	Incomplete or missing
(1)	Straight
(2)	Convex
(3)	Concave

86. Left Scraper Margin Outline: This entry refers to the subjective appraisal of the shape of the left lateral margin of the scraper. Scrapers are oriented with their dorsal surface facing up and the scraping edge oriented away from the observer. Five states are recognized (Binford 1963:200) and recorded:

(0)	Incomplete or missing
(1)	Straight
(2)	Convex
(3)	Concave

87. Symmetry of Scraper Margins: This entry refers to the subjective appraisal of the symmetry of the right and left lateral margins of the scraper. Three states are recognized (Binford 1963: 202) and recorded:

(0)	Incomplete
(1)	Symmetrical: Both the lateral margins of the scraper are geometrically complimentary.
(2)	Asymmetrical: The two lateral margins of the scraper are not geometrically complimentary.

88. Location of the Scraping Edge: This entry refers to the location(s) of the scraping edge(s) on the scraper tool. Nine locations are recognized and recorded:

(0)	Indeterminable
(1)	Proximal
(2)	Right Lateroproximal
(3)	Right Lateral
(4)	Right Laterodistal
(5)	Distal
(6)	Left Laterodistal
(7)	Left Lateral
(8)	Left Laterproximal

89. Shape of the Scraping Edge: This entry refers to the subjective appraisal of the shape of the scraping edge on the scraper tool. Eight states are recognized based on Maxwell's (1973) discussion of scraper morphology and are recorded:

(0)	Indeterminable
(1)	Straight
(2)	Straight Oblique
(3)	Concave
(4)	Convex
(5)	Concavoconvex
(6)	Convexoconcave
(7)	Arcing or "Hooked"

90. Scraping Edge Symmetry: This entry refers to the subjective appraisal of the symmetry of the scraping edge. Seven states are recognized based on Maxwell's (1973) description of scraper morphology and are recorded:

(0) Indeterminable

(1) Symmetrical: The right and left lateral extent of the scraper edge is geometrically complimentary.

(2) Asymmetrical: The right and left lateral extent of the scraper edge is not geometrically complimentary.

(3) Symmetrical Expanding: The left and right lateral extent of the scraper edge is geometrically complimentary and expands beyond the laterodistal juncture of the scraper edge and scraper lateral margins. Scrapers possessing this attribute are typologically referred to as expanding end scrapers.

(4) Asymmetrical Expanding: The left and right lateral extent of the scraper edge is not geometrically complimentary and expands beyond the laterodistal juncture of the scraper edge and scraper lateral margins.

(5) Symmetrical Contracting: The left and right lateral extent of the scraping edge is geometrically complimentary and contract towards the longitudinal axis of the scraper.

(6) Asymmetrical Contracting: The left and right lateral extent of the scraping edge is not geometrically complimentary and contract either to the left or right of the longitudinal axis.

90. Hafting Element Morphology: This entry refers to the type of hafting element, when present and discernible, on the basal portion of the scraper. Three states are recognized and recorded as:

(0) Absent/Incomplete

(1) Notched: The scraper displays intentionally manufactured indentation or intrusion on its lateral margins near the proximal end of the artifact.

(2) Stemmed: The scraper displays a parallel or roughly parallel hafting element that begins at the shoulder width measurement and continues to the basal element.

91. Hafting Element Notch Orientation: This entry refers to the type of notching, if present, on the hafting element. Three states are recognized (Handly 1994:257) and recorded as:

(0) Absent

(1) Side Orientation: A side-oriented notch originates on the lateral margins of the scraper, but does not extend to the laterodistal juncture of the basal element.

(2) Corner Oriented: A corner-oriented notch originates at the laterodistal juncture of the basal element, but does not originate solely on the basal element.

92. Basal Element Outline: This entry refers to the subjective appraisal of the shape of the basal outline. Six states are recognized (Binford 1963:207-209) and recorded as:

(0) Missing

(1) Straight: An edge that describes a straight line between the two defining points of the base.

(2) Convex: An edge that describes a convex line between the two defining points of the base.

(3) Concave: An edge that describes a concave line between the defining points of the base.

(4) Bivectoral: The proximal segment of a tang which is described by the two lateral edges and line drawn across the point from the proximal points of juncture of the haft element.

93. Basal Element Symmetry: This entry refers to the subjective appraisal of the symmetry of the basal element outline. Three states are recognized (Binford 1963:208) and recorded as:

(0)	Incomplete
(1)	Symmetrical: The right and left segments of the basal element, as defined by division along the longitudinal axis, are geometrically complimentary.
(2)	Asymmetrical: The right and left segments of the basal element, as defined by division along the longitudinal axis, are not geometrically complimentary.

94. Maximum Length: This entry refers to the maximum length of the scraper.

95. Maximum Width: This entry refers to the maximum width of the scraper perpendicular to the longitudinal axis when a defined shoulder element is absent.

96. Maximum Thickness: This entry refers to the point of maximum thickness of the scraper.

<u>Technological Attributes: Scrapers</u>

97. Placement of Primary Flake Scars: This entry refers to the placement of primary flake scars on the lateral margins of the scraper. Primary flake scars are defined as those produced during the initial alteration of the flake to achieve a desired shape (Binford 1963:202). Three placement locations are recognized and recorded as:

(0)	Indeterminable
(1)	Unifacial: Primary scars present on only one face of the scraper
(2)	Bifacial: Primary scars present on both faces of the scraper

98. Placement of Secondary Flake Scars: This entry refers to the placement of secondary scars on the lateral margins of the scraper. These scars originate along the lateral edges and

tend to obscure the points of origin of primary scars (Binford 1963: 205). Three placement locations are recognized and recorded as:

(0)	Absent/Indeterminable
(1)	Unifacial: Secondary scars present on only one face of the scraper
(2)	Bifacial: Secondary scars present on both faces of the scraper

99. Patterns of Occurrence of Secondary Flake Scars Along the Lateral Margins: This entry refers to the pattern of secondary scar placement on the lateral margins of the scraper. Three patterns are recognized (Binford 1963:205-206) and recorded as:

(0)	Absent/Indeterminable
(1)	Continuous: Secondary flake scars occur sequentially along the entire lateral edge
(2)	Discontinuous: Secondary scars occur non-sequentially along the lateral edge as a function of the thickness irregularities resulting from primary flaking or because of randomness.

100. Presence and Location of Grinding or Polish: This entry refers to the presence and location of grinding or polish on the scraper. Seven locations are recognized and recorded as:

(0)	Absent/Indeterminable
(1)	Right Lateroproximal
(2)	Right Lateral
(3)	Right Laterodistal
(4)	Left Lateroproximal
(5)	Left Lateral
(6)	Left Laterodistal

Technological Attributes: Basal Element

101. Basal Element Modification: This entry refers to the presence of intentional modification of the basal element. It is presumed these modifications facilitate hafting of the scraper (Maxwell 1973) serve to reduce and/or remove the bulb of force present on the original flake from which the scraper was made. Seven states are recognized and recorded as:

(0)	Absent
(1)	Unmodified
(2)	Unifacially Thinned by Flaking
(3)	Bifacially Thinned by Flaking
(4)	Unifacially Ground
(5)	Bifacially Ground
(6)	Unifacially Thinned by Flaking and Grinding
(7)	Bifacially Thinned by Flaking and Grinding

Functional Attributes: Scrapers

102. Scraping Edge Angle(s): This entry refers to the measurement of the scraper edge angle(s).

103. Spurs on Scraper Margins: This entry refers to the presence (1) or absence (0) of spurs or projections on the margins of the scraper. These features are most frequently produced by inexperienced knappers (Weedman 2002).

104. Retouch Initiation Surface(s) on the Scraping Edge(s): This entry refers to the location(s) of retouch (or use-wear) on the interior or exterior surface of the scraping edge(s). Five surfaces for retouch are recognized and recorded as:

(0) Absent/Indeterminable
(1) Interior Surface only
(2) Exterior Surface only
(3) Non-contiguous Interior and Exterior surfaces (i.e. alternate)
(4) Contiguous Interior and Exterior surfaces (i.e. bifacial)

105. Extent of Retouch on the Interior Surface(s) of the Scraping Edge(s): This entry refers to the extent(s) or length(s), in millimetres, of the interior retouch location(s) on the scraping edge(s) (Barton 1988:65).

106. Number of Scars per Retouch Area on the Interior Scraping Edge(s): This entry refers to the number of flake scars concentrated on the interior surface(s) of the scraping edge(s) indicating the successive removal of excess material for the purpose of resharpening a scraping edge or forming a desired shape (Sinclair 2000:202-203).

107. Invasiveness of Retouch Scars per Retouch Location on the Interior Scraping Edge(s): This entry refers to the deepest flake scar(s), in millimetres, present at the interior retouch location(s) on the scraping edge(s) (Barton 1988:65).

108. Retouch Intensity Index for the Interior Surface of the Scraping Edge(s): Following Barton (1988), Dibble (1995), Handly (1994:252), and Kuhn (1992), this entry refers to the retouch intensity index derived for the interior retouch location(s) on the scraping edge(s).

$$\text{RII} = \frac{\text{Number of Retouch Scars per Interior Retouch Location X Invasiveness of Retouch}}{\text{Length of Interior Retouch Location}}$$

109. Extent of Retouch on the Exterior Surface(s) of the Scraping Edge(s): This entry refers to the extent(s) or length(s), in millimetres, of the exterior retouch location on the scraping edge(s) (Barton 1988:65).

110. Number of Scars per Retouch Area on the Exterior Scraping Edge(s): This entry refers to the number of flake scars concentrated on the exterior surface(s) of the scraping edge(s) indicating the successive removal of excess material for the purpose of resharpening a scraping edge or forming a desired shape (Sinclair 2000:202-203).

111. Invasiveness of Retouch Scars per Retouch Location on the Exterior Scraping Edge(s): This entry refers to the deepest flake scar, in millimetres, present at each exterior retouch location on the scraping edge (Barton 1988:65).

112. Retouch Intensity Index for the Exterior Surface(s) of the Scraping Edge(s): Following Barton (1988), Dibble (1995), Handly (1994:252), and Kuhn (1992) this entry refers to the retouch intensity index derived for the exterior retouch location(s) on the scraping edge(s).

$$\text{RII} = \frac{\text{Number of Retouch Scars per Exterior Retouch Location X Invasiveness of Retouch}}{\text{Length of Exterior Retouch Location}}$$

113. Intensity of Retouch on the Scraper: This entry refers to the subjective appraisal of the intensity and quality of flaking observed on surfaces of the scraper. Five states are recognized and recorded as:

(0) Indeterminable

(1) None
(2) Minimal
(3) Moderate
(4) Intensive

114. Presence of Use-Wear on the Scraping Edge(s): This entry refers to the presence of micro-flaking along the scraping edge(s) of the tool produced from use-wear. Four states of use-wear are recognized and recorded as:

(0) Absent/Indeterminable
(1) Edge Rounding
(2) Step Fracture Terminations
(3) Edge Rounding and Step Fracture Terminations

115. Evidence of Tool Rejuvenation: This entry refers to the presence (1) or absence (0) of evidence indicating the scraper has been reworked or rejuvenated as a result of breakage or attrition (Flenniken and Raymond 1987; Michie 1973; Towner and Warburton 1990).

Microblades

Microblades are among the most ubiquitous tool type found in Pre-Dorset sites. These multi-purpose implements are highly standardized in form, easily transportable, and frequently side notched to facilitate hafting (Maxwell 1985:90; Schledermann 1990:336). In general, all of these traits point to a greater investment of energy in tool manufacture (see Andrefsky 1994a:22). Accordingly, microblades are classified as formal tools. Discussion of variability in this tool class has been generally restricted to metrical attributes like length, width, and thickness, completeness of specimens, and raw material type (e.g. McGhee 1981; Maxwell 1985; Owen 1988; Schledermann 1990; Taylor 1962; Wright 1995). This variability is largely attributed to cultural differences over time and space (Maxwell

1976b:74; Owen 1988:67, 80, 125; Schledermann 1990:335-336). To facilitate analysis, microblades are broken down into three structural elements (Tixier 1974): distal end, lateral margins (which define the central or medial part), and proximal end (see Figure A.5).

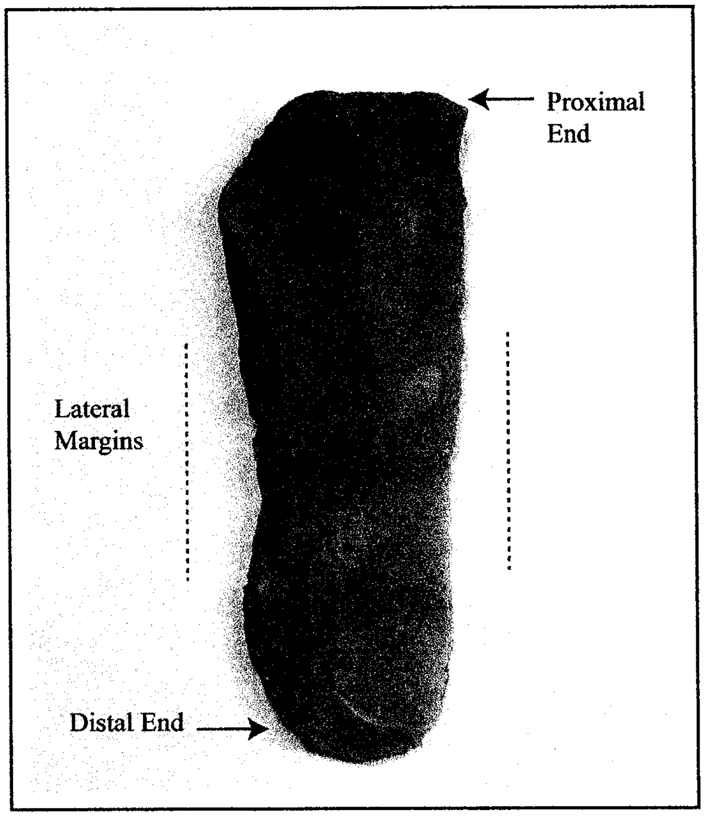


Figure A.5 Structural elements of Pre-Dorset microblades.

Morphological Attributes: Microblades

116. Completeness Index: This entry refers to the completeness of all microblades. Seven states are recognized and recorded as:

(0) Indeterminable
(1) Complete
(2) Proximal section only
(3) Medial section only
(4) Distal section only

(5)	Proximal and medial section present with distal section missing
(6)	Medial and distal section present with proximal section missing
(7)	Longitudinal split

117. Shape of Right Lateral Margin: This entry refers to the subjective appraisal of the shape of the right lateral margin of the microblade. Microblades are oriented with their dorsal surface up and the distal end closest to the observer. Five states are recognized (Binford 1963:200) and recorded as:

(0)	Incomplete or Missing
(1)	Straight
(2)	Convex
(3)	Concave

118. Shape of Left Lateral Margin: This entry refers to the subjective appraisal of the shape of the left lateral margin of the microblade. Five states are recognized (Binford 1963:200) and recorded as:

(0)	Incomplete or Missing
(1)	Straight
(2)	Convex
(3)	Concave

119. Symmetry of Microblade Margins: This entry refers to the subjective appraisal of the symmetry of the microblade margins. Three states are recognized (Binford 1963:202) and recorded as:

(0)	Incomplete
(1)	Symmetrical: Both of the lateral margins of the microblade are geometrically complimentary.
(2)	Asymmetrical: The two lateral margins of the microblade are not geometrically complimentary.

120. Hafting Element Morphology: This entry refers to the type of hafting element on the proximal end of the microblade. Four states are recognized and recorded as:

(0) Absent/Incomplete

(1) Notched: When the microblade displays intentionally manufactured indentation or intrusion on its lateral margins near the proximal end or basal element of the artifact.

(2) Stemmed: The microblade displays a parallel or roughly parallel hafting element that usually begins within one centimetre of the proximal end. Stems are formed by heavy retouch which tends to alter the form of the microblade (Owen 1988:67).

(3) Tanged: The microblade displays a narrow, blunt-edged end formed by bilateral retouch, usually within one centimetre of the proximal end (McGhee 1970:95).

121. Hafting Element Notch Orientation: This entry refers to the type of notching on the hafting element. Three states are recognized (Handly 1994:257) and recorded as:

(0) Absent

(1) Side Orientation: A side-oriented notch originates on the lateral margins of the artifact, but does not extend to the laterodistal juncture of the proximal end.

(2) Corner Orientation: A corner-oriented notch originates at the laterodistal juncture of the proximal end, but does not originate solely on the proximal end.

122. Maximum Length: This entry refers to the maximum length of the microblade measured from the proximal end to the distal end along the longitudinal axis.

123. Maximum Width: This entry refers to the maximum width measured perpendicular to the longitudinal axis.

124. Maximum Thickness: This entry refers to the maximum thickness.

Technological Attributes: Microblades

125. Number of Dorsal Arrises on the Microblade: This entry refers to the number of dorsal arrises observed on the microblade. Four classes of numbers are recognized (Owen 1988:13) and recorded as:

(0)	Absent
(1)	One
(2)	Two
(3)	Three or more

126. Symmetry of Dorsal Arrises on the Microblade: This entry refers to the subjective appraisal of the shape of the dorsal arrises on the microblade. Five states are recognized (Owen 1988:13) and recorded as:

(0)	Absent/Indeterminable
(1)	Parallel: The dorsal arris(es) run roughly parallel to the longitudinal axis of the microblade .
(2)	Irregular: The dorsal arris(es) do(es) not run roughly parallel to the longitudinal axis of the microblade.
(3)	Regular Converging: The dorsal arrises run roughly parallel to the longitudinal axis of the microblade and converge towards the distal and/or the proximal end.
(4)	Regular Diverging: The dorsal arrises run roughly parallel to the longitudinal axis of the microblade and diverge towards the distal and/or proximal end.

127. Presence and Location(s) of Grinding or Polish: This entry refers to the presence of grinding or polish on the microblade. This kind of treatment is rare on microblades and its presence may be attributable to core preparation before microblade removal, use-wear, or to dull the edges of a microblade for hafting purposes (Owen 1988). Nine locations are recognized and recorded as:

(0) Absent/Indeterminable
(1) Proximal
(2) Right Lateroproximal
(3) Right Lateral
(4) Right Laterodistal
(5) Left Lateroproximal
(6) Left Lateral
(7) Left Laterodistal
(8) Distal

128. Proximal End Modification: This entry refers to the presence (1) or absence (0) of intentional modification of the proximal end of the microblade. Modification is usually restricted to thinning the bulb of percussion, which is presumed to facilitate hafting (Owen 1988).

Functional Attributes: Microblades

129. Retouch Initiation Surface(s) on the Microblade: This entry refers to the location(s) of retouch (or use-wear) on the interior or exterior surface of the microblade. Five surfaces for retouch are recognized and recorded as:

(0) Absent/Indeterminable
(1) Interior Surface only
(2) Exterior Surface only
(3) Non-contiguous Interior and Exterior surfaces (i.e. alternate)
(4) Contiguous Interior and Exterior surfaces (i.e. bifacial)

130. Extent of Retouch on the Interior Surface(s) of the Microblade: This entry refers to the extent(s) or length(s), in millimetres, of the interior retouch location(s) on the microblade (Barton 1988:65).

131. Number of Scars per Retouch Area on the Interior Surface(s) of the Microblade: This entry refers to the number of flake scars concentrated on the interior surface(s) of the microblade indicating the successive removal of excess material for the purpose of resharpening an edge or forming a desired shape (Sinclair 2000:202-203).

132. Invasiveness of Retouch Scars per Retouch Location on the Interior Surface(s) of the Microblade: This entry refers to the deepest flake scar(s), in millimetres, present at the interior retouch location(s) on the microblade (Barton 1988:65).

133. Retouch Intensity Index for the Interior Surface of the Microblade: Following Barton (1988), Dibble (1995), Handly (1994:252), and Kuhn (1992), this entry refers to the retouch intensity index derived for the interior retouch location(s) on the microblade.

$$\text{RII} = \frac{\text{Number of Retouch Scars per Interior Retouch Location X Invasiveness of Retouch}}{\text{Length of Interior Retouch Location}}$$

134. Extent of Retouch on the Exterior Surface(s) of the Microblade: This entry refers to the extent(s) or length(s), in millimetres, of the exterior retouch location on the microblade (Barton 1988:65).

135. Number of Scars per Retouch Area on the Exterior of the Microblade: This entry refers to the number of flake scars concentrated on the exterior surface(s) of the microblade indicating the successive removal of excess material for the purpose of resharpening an edge or forming a desired shape (Sinclair 2000:202-203).

136. Invasiveness of Retouch Scars per Retouch Location on the Exterior Surface(s) of the Microblade: This entry refers to the deepest flake scar, in millimetres, present at each exterior retouch location on the microblade (Barton 1988:65).

137. Retouch Intensity Index for the Exterior Surface(s) of the Microblade: Following Barton (1988), Dibble (1995), Handly (1994:252), and Kuhn (1992) this entry refers to the retouch intensity index derived for the exterior retouch location(s) on the microblade.

$$RII = \frac{\text{Number of Retouch Scars per Exterior Retouch Location X Invasiveness of Retouch}}{\text{Length of Exterior Retouch Location}}$$

138. Intensity of Retouch on the Microblade: This entry refers to the subjective appraisal of the intensity and quality of flaking observed on surfaces of the microblade. Five states are recognized and recorded as:

(0) Indeterminable
(1) None
(2) Minimal
(3) Moderate
(4) Intensive

Cores

Stone cores are typically classified as generalized or standardized. Generalized core technologies are characterized as being raw material wasteful, expedient and requiring little if any skill to produce (Parry and Kelly 1987:298; Teltzer 1991:393). These cores do not require extensive performing or modification, and flake removal tends to be almost random in fashion (Parry and Kelly 1987:287; Teltzer 1991:363). Poor quality raw material can be used and the costs involved in producing and using a generalized technology are relatively low (Parry and Kelly 1987:299).

In contrast, standardized core technologies are raw material conservative, require advance planning and time to produce, produce highly standardized flakes and blades, and require a great deal of skill (Clark 1987:269; Parry and Kelly 1987:298-299). These cores are more extensively modified and force applications are consistently patterned as unidirectional or bidirectional. Given the greater skill required to make these objective pieces, they are most commonly made by specialists (Clark 1987:269). Higher quality raw materials are needed when using a standardized core technology and the costs associated with its production and use are considerably higher than those incurred using a generalized technology (Parry and Kelly 1987:299-301).

<u>Technological Variability: Cores</u>

139. Core Completeness: This entry refers to the subjective appraisal of the state of completeness for the core. Two states are recognized: (1) complete and (2) fragmented.

140. Direction of Force Application: This entry refers to the direction force was applied to the core. The pattern of flake scar removals should indicate this. Four directional states for force application are recognized (Sullivan 1987:49) and recorded as:

(1) Unidirectional
(2) Bipolar
(3) Multidirectional
(4) Bifacial

141. Platform Preparation: This entry refers to the type of modification present on the platform of the core. Six states are recognized and recorded as:

(0)	Unprepared (i.e. cortical)
(1)	Chipped
(2)	Abraded or Ground
(3)	Combination of Chipping, Abrasion, or Grinding
(4)	Chipped and Crushed (2)
(5)	Cortical and Chipped (14)

142. Stacked Terminations Below the Striking Platform: This entry refers to the presence (1) or absence (0) of stacked terminations located below the striking platform. These stacks may comprise multiple hinged or step fractures that result when successive attempts to remove a flake from the same point of impact on the striking platform fail (Shelley 1990:188). Generally these stacks include at least five in-line factures giving the striking platform a tiered appearance.

143. Number of Flake Scars: This entry refers to the number of flake scars observed on the surface of the core. This attribute state is recorded as a continuous variable ranging from the lowest observed value of 0 upwards.

144. Secondary Distal Crushing or Flaking: This entry refers to the presence (1) or absence (0) of secondary distal crushing and/or flake detachment exhibited at the distal end of the core that rests against an anvil during impact (Leaf 1979:39; Root 1997:37). This modification is produced by pressure being applied to both ends of the core during flake detachment and is considered a diagnostic indicator of bipolar reduction (Kuijt et al. 1995; Root 1997).

Functional Attributes: Cores

145. Secondary Use: This entry refers to the presence (1) or absence (0) of secondary use of the core or core fragment. This use does not include any intentional post-detachment modification or shaping and is limited to the expedient use of the core or core fragment prior to abandonment resulting in the same use-wear states observed for the other tool categories discussed.

Post-Depositional Attributes: Debitage and Tool Categories

146. Debitage Completeness Index: This entry refers to the completeness of debitage and tool artifacts as defined by Sullivan and Rozen (1985), Sullivan (1987), Prentiss and Romanski (1989), and Rozen and Sullivan (1989a, 1989b). Five subclasses are recognized and recorded as:

(1) Debris: a single interior surface is not discernible.

(2) Medial/Distal Flake: a single interior surface is discernible, but the initiation surface is not.

(3) Split Flake: a single interior surface is discernible, the initiation surface is present but axially sheared.

(4) Proximal Flake: a single interior surface is discernible, the initiation surface is present and complete, but the lateral or distal margins of the flake are not present.

(5) Complete Flake: a single interior surface is discernible, the initiation surface is present and complete, and the lateral or distal margins of the flake are complete.

147. Distal Termination Type: This entry refers to the type of flake termination observed on the distal end of the debitage or tool artifact. Artifacts are oriented with the interior surface

facing face down and the distal margin closest to the observer. Seven termination states are recognized (Cotterell and Kamminga 1987, 1990) and recorded as:

(0) Absent/Indeterminable

(1) Feather: Occurs when the crack forming the flake that has been propagating parallel to a side face of the nucleus turns slightly to meet it at a very acute angle.

(2) Step: Occurs when there is an abrupt change in the direction of the crack. The flake either detaches completely or part of the formed flake remains attached to the nucleus in a type of step termination.

(3) Hinge: Occurs when the crack turns to approach the side face of the nucleus roughly at right angles to form a hinge termination. The resultant flake has a blunt end rounded in cross section.

(4) Outrepasse: Occurs when a crack running near an edge of a nucleus intraflexes, and plunges into the distal end of the nucleus and detaches is as part of the flake.

(5) Snap: Occurs when a crack initiated on a very acute edge propagates straight down from one face to the other to create a fracture that is nearly at right angles to both faces.

148. Proximal Termination Type: This entry refers to the flake termination observed at the proximal end of the medial/distal fragment of the debitage or tool artifact. Artifacts are oriented with the interior surface facing face down and the proximal margin pointing away from the observer. Four terminations are possible (Cotterell and Kamminga 1987, 1990) and recorded as:

(0) Absent/Indeterminable

(1) Step: Occurs when there is an abrupt change in the direction of the crack. The flake either detaches completely or part of the formed flake remains attached to the nucleus in a type of step termination.

(2) Hinge: Occurs when the crack turns to approach the side face of the nucleus roughly at right angles to form a hinge termination. The resultant flake has a blunt end rounded in cross section.

(3) Snap: Occurs when a crack initiated on a very acute edge propagates straight down from one face to the other to create a fracture that is nearly at right angles to both faces.

149. Left Lateral Termination Type: This entry refers to the type of flake termination observed on the left lateral margin of the debitage or tool artifact. Artifacts are oriented with the interior surface facing face down and the distal margin closest to the observer. Five termination states are recognized (Cotterell and Kamminga 1987, 1990) and recorded as:

(0) Absent/Indeterminable

(1) Feather: Occurs when the crack forming the flake that has been propagating parallel to a side face of the nucleus turns slightly to meet it at a very acute angle.

(2) Step: Occurs when there is an abrupt change in the direction of the crack. The flake either detaches completely or part of the formed flake remains attached to the nucleus in a type of step termination.

(3) Hinge: Occurs when the crack turns to approach the side face of the nucleus roughly at right angles to form a hinge termination. The resultant flake has a blunt end rounded in cross section.

(4) Outrepasse: Occurs when a crack running near an edge of a nucleus intraflexes, and plunges into the distal end of the nucleus and detaches is as part of the flake.

(5) Snap: Occurs when a crack initiated on a very acute edge propagates straight down from one face to the other to create a fracture that is nearly at right angles to both faces.

150. Right Lateral Termination Type: This entry refers to the type of flake termination observed on the right lateral margin of the debitage or tool artifact. Artifacts are oriented

with the interior surface facing face down and the distal margin closest to the observer. Five termination states are recognized (Cotterell and Kamminga 1987, 1990) and recorded as:

(0) Absent/Indeterminable

(1) Feather: Occurs when the crack forming the flake that has been propagating parallel to a side face of the nucleus turns slightly to meet it at a very acute angle.

(2) Step: Occurs when there is an abrupt change in the direction of the crack. The flake either detaches completely or part of the formed flake remains attached to the nucleus in a type of step termination.

(3) Hinge: Occurs when the crack turns to approach the side face of the nucleus roughly at right angles to form a hinge termination. The resultant flake has a blunt end rounded in cross section.

(4) Outrepasse: Occurs when a crack running near an edge of a nucleus intraflexes, and plunges into the distal end of the nucleus and detaches is as part of the flake.

(5) Snap: Occurs when a crack initiated on a very acute edge propagates straight down from one face to the other to create a fracture that is nearly at right angles to both faces.

Appendix B

Lithic Analysis – Data Discussed in Chapter 5

Table B1.1 Flake frequencies in each size grade category from 1/4" and 1/8" screen proveniences in the Mosquito Ridge, Mosquito Ridge West, and Shaymark debitage assemblages. The figures for Shaymark also include the four sampled surface units.

Site	Size 1	Size 2	Size 3	Size 4	Size 5	Size 6	Totals
Mosquito Ridge 1/4" Screen	26	1195	199	24	0	0	1444
1/8" Screen	7249	1409	0	0	0	0	8658
Mosquito Ridge West 1/4" Screen	11	453	92	7	0	0	563
1/8" Screen	2726	685	0	0	0	0	3411
Shaymark 1/4" Screen	2	727	197	26	2	1	955
1/8" Screen	1582	408	0	0	0	0	1990
Sampled Surface Units	676	325	86	13	3	0	1103

Table B1.2 Mean weights (g) and mean dorsal scar values for the size grade categories in the Mosquito Ridge, Mosquito Ridge West, and Shaymark debitage assemblages. The standard deviation (S) for each category is listed in parentheses.

Mean Weight	**Size 1**	**Size 2**	**Size 3**	**Size 4**	**Size 5**	**Size 6**
Mosquito Ridge (Grids 1, 2, 3) (S)	0.09 (0.004)	0.16 (0.09)	0.65 (0.34)	1.44 (0.71)	2.03 (0.85)	4.33 (1.1)
Shaymark (S)	0.10 (0.01)	0.15 (0.09)	0.54 (0.25)	0.20 (0.53)	1.84 (0.81)	2.75 (0.81)
Mean Dorsal Scar Count	**Size 1**	**Size 2**	**Size 3**	**Size 4**	**Size 5**	**Size 6**
Mosquito Ridge (Grids 1, 2, 3) (S)	1.90 (1.01)	2.20 (1.02)	2.21 (1.13)	2.22 (1.44)	2.13 (1.46)	2.31 (1.40)
Shaymark (S)	1.64 (1.03)	2.20 (1.15)	2.29 (1.27)	2.28 (1.28)	2.50 (1.41)	1.75 (2.06)

Table B1.3 Coefficient of Variation calculations for weight and dorsal scar count for all size grade categories in Mosquito Ridge, Mosquito Ridge West, and Shaymark debitage assemblages. The cv for each attribute demonstrating the greater degree of variation is highlighted and the raw figures are listed in parentheses.

Site	Size 1	Size 2	Size 3	Size 4	Size 5	Size 6
Mosquito Ridge (Grids 1, 2, 3) cv for weight	4% (0.04)	**58% (0.58)**	**53% (0.53)**	50% (0.50)	42% (0.42)	37% (0.37)
cv for dorsal scar count	**53% (0.53)**	46% (0.46)	51% (0.51)	**65% (0.65)**	**68% (0.68)**	**61% (0.61)**
Shaymark cv for weight	9% (0.09)	**61% (0.61)**	46% (0.46)	53% (0.53)	44% (0.44)	30% (0.30)
cv for dorsal scar count	**63% (0.63)**	52% (0.52)	**55% (0.55)**	**56% (0.56)**	**57% (0.57)**	100% (1.18)

Table B1.4 Calculated samples for size grade categories in units from Mosquito Ridge (Grids 1 and 2), Mosquito Ridge West (Grid 3), and Shaymark. Actual flake numbers from which the samples were drawn are listed in parentheses.

Site	Unit		Size 1	Size 2	Size 3	Size 4	Size 5	Size 6	Sample Total
Mosquito Ridge (Grids 1,2)	**A5**	1/4	0	4	0	0	0	0	4
		1/8	25(28)	13	0	0	0	0	38
	A7	1/4	0	34(36)	4	0	0	0	38
		1/8	90(159)	49(54)	0	0	0	0	144
	A8	1/4	0	39(52)	4	0	0	0	43
		1/8	90(167)	60(66)	0	0	0	0	150
	A9	1/4	0	10	0	1	0	0	11
		1/8	60(83)	27(28)	0	0	0	0	87
	B2	1/4	0	4	2	0	0	0	6
		1/8	40(49)	16	0	0	0	0	56
	B7	1/4	0	44(48)	3	0	0	0	47
		1/8	123(303)	81(95)	0	0	0	0	204
	B8	1/4	0	73(84)	7	1	0	0	81
		1/8	164(779)	94(113)	0	0	0	0	258
	B9	1/4	0	101(123)	21	1	0	0	123
		1/8	165(851)	111(138)	0	0	0	0	276
	B10	1/4	0	3	5	0	0	0	8
		1/8	35(42)	16	0	0	0	0	51
	C7	1/4	0	16(17)	1	0	0	0	17
		1/8	66(107)	26	(27)	0	0	0	92

Unit		Size 1	Size 2	Size 3	Size 4	Size 5	Size 6	Sample Total
C8	1/4	0	36(45)	11	0	0	0	47
	1/8	138(427)	57(67)	0	0	0	0	195
C9	1/4	0	51(56)	5	0	0	0	56
	1/8	148(541)	70(148)	0	0	0	0	218
C10	1/4	11	5	1	0	0	0	17
	1/8	58(82)	11	0	0	0	0	69
D2	1/4	0	4	0	0	0	0	4
	1/8	25(29)	8	0	0	0	0	33
D3	1/4	0	49(54)	3	0	0	0	52
	1/8	101(195)	57(64)	0	0	0	0	158
D7	1/4	0	20(21)	2	0	0	0	22
	1/8	64(93)	28(32)	0	0	0	0	92
D8	1/4	0	8	2	0	0	0	10
	1/8	36(46)	25(26)	0	0	0	0	61
D9	1/4	0	21(22)	7	0	0	0	28
	1/8	48(63)	25(27)	0	0	0	0	73
E2	1/4	0	16(17)	2	0	0	0	18
	1/8	72(110)	19(20)	0	0	0	0	91
E3	1/4	0	17	3	0	0	0	20
	1/8	67(98)	36(38)	0	0	0	0	105
E7	1/4	0	22(23)	6	0	0	0	28
	1/8	56(76)	17(18)	0	0	0	0	73
F7	1/4	2	36(39)	6	3	0	0	47
	1/8	54(75)	11	0	0	0	0	65
F8	1/4	0	80(94)	19	0	0	0	99
	1/8	81(133)	44(50)	0	0	0	0	125
1N/2W	1/4	0	23(24)	3	2	0	0	28
	1/8	71(110)	13	0	0	0	0	84
1N/3W	1/4	0	30(32)	7	1	0	0	38
	1/8	115(259)	17(18)	0	0	0	0	132
1N/4W	1/4	0	38(41)	13	0	0	0	51
	1/8	121(286)	38(41)	0	0	0	0	159
1N/5W	1/4	0	22(23)	2	0	0	0	24
	1/8	127(324)	27(28)	0	0	0	0	154
1N/6W	1/4	0	6	0	1	0	0	7
	1/8	49(64)	5	0	0	0	0	69
0N/2W	1/4	0	6	2	0	0	0	8
	1/8	45(57)	12	0	0	0	0	57
0N/3W	1/4	0	32(34)	9	1	0	0	42
	1/8	125(313)	50(56)	0	0	0	0	175
0N/4W	1/4	0	42(45)	17	2	0	0	61
	1/8	133(366)	40(43)	0	0	0	0	173
0N/5W	1/4	0	53(59)	7	0	0	0	60
	1/8	132(361)	43(47)	0	0	0	0	175

	Unit	Size 1	Size 2	Size 3	Size 4	Size 5	Size 6	Sample Total
	0N/6W 1/4	0	5	0	0	0	0	5
	1/8	16(17)	3	0	0	0	0	19
	0N/7W 1/4	0	2	0	0	0	0	2
	1/8	11(12)	7	0	0	0	0	18
	0N/3E 1/4	0	10	0	2	0	0	12
	1/8	19(21)	7	0	0	0	0	26
	1S/4E 1/4	4	32(34)	6	0	0	0	42
	1/8	68(101)	19(20)	0	0	0	0	87
	1S/3E 1/4	6	33(35)	9	2	0	0	50
	1/8	78(124)	14(15)	0	0	0	0	92
	1S/5W 1/4	0	11	1	0	0	0	12
	1/8	63(91)	12	0	0	0	0	75
	1S/8E 1/4	0	9	2	0	0	0	11
	1/8	36(43)	7	0	0	0	0	43
	1S/2E 1/4	0	7	6	2	0	0	15
	1/8	23(26)	2	0	0	0	0	25
Mosquito Ridge West (Grid 3)	**Unit**	**Size 1**	**Size 2**	**Size 3**	**Size 4**	**Size 5**	**Size 6**	**Sample Total**
	A1 1/4	0	9	2	0	0	0	11
	1/8	22(23)	6	0	0	0	0	28
	A2 1/4	0	17(18)	4	0	0	0	21
	1/8	51(68)	14	0	0	0	0	65
	A3 1/4	0	35(37)	4	0	0	0	39
	1/8	76(120)	33 (35)	0	0	0	0	109
	A4 1/4	0	8	2	0	0	0	10
	1/8	20(22)	6	0	0	0	0	25
	A5 1/4	0	2	5	0	0	0	7
	1/8	18(20)	13	0	0	0	0	31
	A6 1/4	0	3	1	0	0	0	4
	1/8	35(42)	21(22)	0	0	0	0	56
	B1 1/4	0	3	3	0	0	0	6
	1/8	25(28)	15	0	0	0	0	40
	B2 1/4	0	15	5	0	0	0	20
	1/8	81(132)	30(32)	00	0	0	0	111
	B3 1/4	0	20(21)	3	0	0	0	23
	1/8	78(124)	43(46)	0	0	0	0	121
	B4 1/4	0	6	4	0	0	0	10
	1/8	52(69)	15	0	0	0	0	67
	B5 1/4	1	8	5	1	0	0	15
	1/8	60(85)	26(28)	0	0	0	0	86
	B6 1/4	0	17(18)	1	0	0	0	18
	1/8	52(69)	30(32)	0	0	0	0	52
	C0 1/4	0	3	1	0	0	0	4
	1/8	16(17)	2	0	0	0	0	18

	Unit		Size 1	Size 2	Size 3	Size 4	Size 5	Size 6	Sample Total
	C1	1/4	0	30(32)	4	0	0	0	34
		1/8	112(242)	56(62)	0	0	0	0	168
	C2	1/4	0	20(21)	2	0	0	0	22
		1/8	100(191)	38(41)	0	0	0	0	138
	C3	1/4	0	36(39)	6	0	0	0	42
		1/8	123(302)	29(31)	0	0	0	0	152
	C4	1/4	0	7	4	0	0	0	11
		1/8	68(100)	21(22)	0	0	0	0	89
	C5	1/4	0	4	2	2	0	0	8
		1/8	44(56)	11	0	0	0	0	55
	C6	1/4	9	25(26)	3	1	0	0	38
		1/8	92(170)	38(41)	0	0	0	0	130
	C10	1/4	0	9	1	1	0	0	11
		1/8	24(27)	5	0	0	0	0	29
	D1	1/4	0	13	0	0	0	0	13
		1/8	70(106)	15(18)	0	0	0	0	85
	D2	1/4	0	20(21)	4	1	0	0	25
		1/8	63(90)	28(30)	0	0	0	0	91
	D3	1/4	0	31(33)	7	0	0	0	38
		1/8	97(182)	36(39)	0	0	0	0	133
	D4	1/4	0	9	2	0	0	0	11
		1/8	38(47)	13	0	0	0	0	51
	D6	1/4	0	7	1	0	0	0	8
		1/8	22(23)	5	0	0	0	0	27
	E3	1/4	0	30(32)	5	1	0	0	36
		1/8	81(133)	29(31)	0	0	0	0	110
	E4	1/4	0	3	2	0	0	0	5
		1/8	22(25)	5	0	0	0	0	27
	F3	1/4	1	18(19)	2	0	0	0	21
		1/8	36(44)	9	0	0	0	0	45
Shaymark (1999)	**Unit**		**Size 1**	**Size 2**	**Size 3**	**Size 4**	**Size 5**	**Size 6**	**Sample Total**
	A1	1/4	0	31(33)	14	2	0	0	47
		1/8	103(135)	51(56)	0	0	0	0	154
	A2	1/4	0	48(53)	8	1	0	0	57
		1/8	73(85)	47(52)	0	0	0	0	120
	A3	1/4	0	14	6	0	0	0	20
		1/8	29(31)	13	0	0	0	0	42
	A4	Sur	1	1	2	4	0	0	8
	A5	Sur	0	0	1	0	0	0	1
	A6	Sur	1	3	1	0	0	0	5
	A7	1/4	0	15	8	0	2	0	25
		1/8	54(56)	0	0	0	0	0	54

	Unit	Size 1	Size 2	Size 3	Size 4	Size 5	Size 6	Sample Total
	B1 1/4	0	56(63)	17(18)	3	0	0	76
	1/8	88(110)	49(55)	0	0	0	0	137
	B2 1/4	0	63(71)	14	2	0	0	79
	1/8	104(131)	21(22)	0	0	0	0	125
	B4 Sur	0	1	0	0	0	0	1
	B5 1/4	0	18	5	1	0	0	24
	1/8	25(27)	8	0	0	0	0	33
	C1 1/4	0	68(78)	16	2	0	0	86
	1/8	114(154)	41(44)	0	0	0	0	155
	C2 1/4	1	40(43)	16	1	0	1	58
	1/8	91(115)	28(28)	0	0	0	0	99
	C3 Sur	5	7	2	0	0	0	14
	C4 1/4	0	16	10	4	0	0	30
	1/8	28	0	0	0	0	0	28
	C5 Sur	3	0	0	1	0	0	4
	C6 1/4	0	1	3	1	1	0	6
	1/8	4	0	0	0	0	0	4
	D1 1/4	0	72(83)	20(21)	0	1	0	93
	1/8	137(195)	36(39)	0	0	0	0	173
	D2 1/4	0	39(42)	9	2	0	0	50
	1/8	74(90)	15	0	0	0	0	89
	D3 Sur	10	4	0	0	0	0	14
	D4 Sur	6	0	0	0	0	0	6
	D5 Sur	4	11	1	0	0	1	17
	D6 Sur	12	6	0	0	0	0	18
	E1 1/4	0	68(78)	21(22)	2	0	0	91
	1/8	114(153)	37(40)	0	0	0	0	151
	E2 1/4	0	31(33)	9	3	0	0	43
	1/8	62(70)	14	0	0	0	0	76
	F1 1/4	0	47(50)	14	1	0	0	62
	1/8	109(148)	19(20)	0	0	0	0	128
	F2 1/4	1	37(40)	6	2	0	0	46
	1/8	66(76)	0	0	0	0	0	66
	G1 Sur	4	4	0	0	0	0	8
	G2 Sur	16	8	2	0	0	0	26
	H1 Sur	4	4	0	0	0	0	8
	NPA Sur	6	13	9	3	1	1	33
	NM Sur	40(44)	52(58)	14	4	0	0	110
	WM Sur	4	20	5	3	1	0	33
	EM Sur	2	3	0	0	0	0	5
	SN Sur	77(94)	67(76)	26(28)	5	1	0	176
	SPA Sur	89(112)	94(115)	26(27)	2	2	0	213
	SE Sur	213(426)	67(76)	16(17)	2	0	0	298

Appendix C

Mosquito Ridge Faunal Analysis

The faunal assemblage recovered from Mosquito Ridge in 2000 derives from the three separate excavation grids and totals 2092 bones and bone fragments. Donnelly (2002) analyzed the Mosquito Ridge assemblage in the Archaeology Lab at McMaster University with assistance from Aubrey Cannon. Given the limited variety of wildlife in this Arctic region, we did not expect to find more than five or six different species represented in this assemblage, including: Snow Goose *(Chen hyperboreous hyperboreous)*, Canada Goose *(Branta canadensis)*, Caribou *(Rangifer tarandus)*, Ringed Seal *(Phoca hispada)*, Arctic Fox *(Alopex lagopus)*, and Polar Bear *(Ursus maritimus)*. Identifications were made using osteological texts (Gilbert 1990; Gilbert et al. 1985) and comparative zooarchaeological specimens housed at McMaster University.

While preservation conditions at Mosquito Ridge are better than those observed for other Pre-Dorset sites on southern Baffin Island, the recovered faunal assemblage has been affected by several taphonomic processes including trampling by caribou, root etching, pitting from carnivores (i.e. Arctic fox), and annual freeze-thaw cycles. Consequently, some identifications were made on only one or two landmarks.

A notable number of goose humeri, radii, and ulnas in the assemblage are split in half lengthwise. While it would be tempting to attribute these patterns to human agency, it makes little sense that the Pre-Dorset would go to the trouble of splitting these bones to obtain the minute amounts of marrow they might contain. Moreover, it would be very difficult to fracture these elements in such a regular manner. The more likely explanation for this pattern is the bones may have split because of high moisture levels present at the site. If water entered the bone and then froze during the cold season, it would cause the bone to expand and fracture. Bonnichsen and Will (1990) cite freeze-thaw cycling as a cause of split-line cracks but not complete fracture. However, over time, the continual expansion and contraction of water in these elements would result in their fracturing. This process would explain the strikingly similar breakage patterns observed for these bones in each of the excavation grids. If animal agents caused these splits, we would expect that the epiphyseal ends would be eaten away since, as Binford (1981) notes, gnawing animals attack the ends of long bones first. But few goose bones in the assemblage are pitted and none of them display chewing or gnawing marks. While there are a few obviously immature specimens of snow goose in the assemblage, tallies were not made since many specimens were too damaged to determine their relative age.

Many of the large mammal bones were also highly fragmented and could not be clearly identified. As such, they have been categorized as Class size V based on bone thickness measurements. This follows the procedure used by Schmitt and Lupo (1995). Those avian fragments too small to be identified were simply classed as 'Avian.' The Class II (small mammal) specimens consist of lemming bones (*Dicrostonyx groenlandicus)*. These remains likely derive from animals that died naturally within the site area.

Of the bones present in the Mosquito Ridge assemblage, 1331 were positively identified to class (Figure C.1). Additionally, 514 were further identified to 3 different species including snow goose, caribou, and polar bear. Figure C.2 summarizes the percentage frequencies for the number of individual specimens per taxon (NISP) as they are represented in each respective excavation grid while Figure C.3 summarizes the percentage frequencies for the minimum number of individuals (MNI).

Based on these data, Pre-Dorset subsistence practices at this site were focused on the intense exploitation of snow geese. The overall NISP percentage frequency for the Mosquito

Ridge site indicates 85% of the identified elements consist of snow goose remains (see Figure C.4). These results are similar to those found by Stenton during his investigation of the Neo-Eskimo component at the site. The faunal remains he recovered from one of the excavated Thule features were also dominated by snow geese, which account for 75% of the total assemblage (Stenton 1989:330). This similarity further points to the importance and seasonal abundance of this bird species in this area. Moreover, the absence of other bird species in this assemblage, namely ducks, also suggests a focused exploitation of snow geese by the occupants of this site over time.

While there is evidence of caribou in the faunal assemblage from the Pre-Dorset component, it is rather limited. Cranial bones, teeth, mandibles, and vertebra are present in comparatively high frequencies. There are also several long bone fragments displaying evidence of cut marks from butchering activities. Given the nature of these remains, it does not appear as though the Pre-Dorset were hunting and processing these caribou at a separate location and then returning to the site with only meat bearing elements. Rather, it seems these animals were killed and butchered within the site area. Since caribou are available in this vicinity prior to the mosquito infestation and again in late summer, it should not be surprising to find some evidence indicating these animals were hunted and consumed by the Pre-Dorset at the site. The recovered polar bear remains are meager, consisting of just 3 phalanges. This indicates bears were not being consumed for subsistence purposes. These bones may derive from a polar bear skin or some other object that was brought to the site by the Pre-Dorset and abandoned.

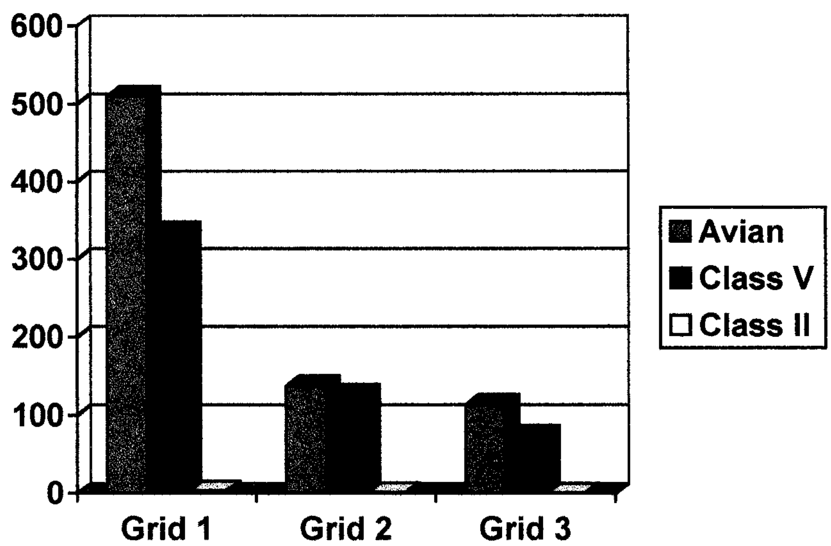


Figure C.1 Frequencies of Mosquito Ridge faunal assemblage identified by class: Avian, Class V (large mammal), and Class II (small mammal) (Donnelly 2002).

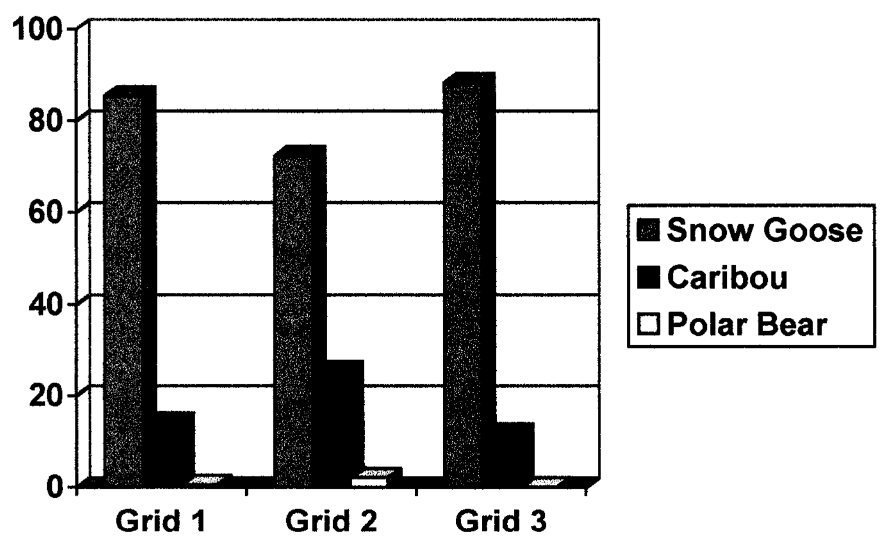


Figure C.2 NISP faunal percentage frequencies calculated for each excavation grid at the Mosquito Ridge site.

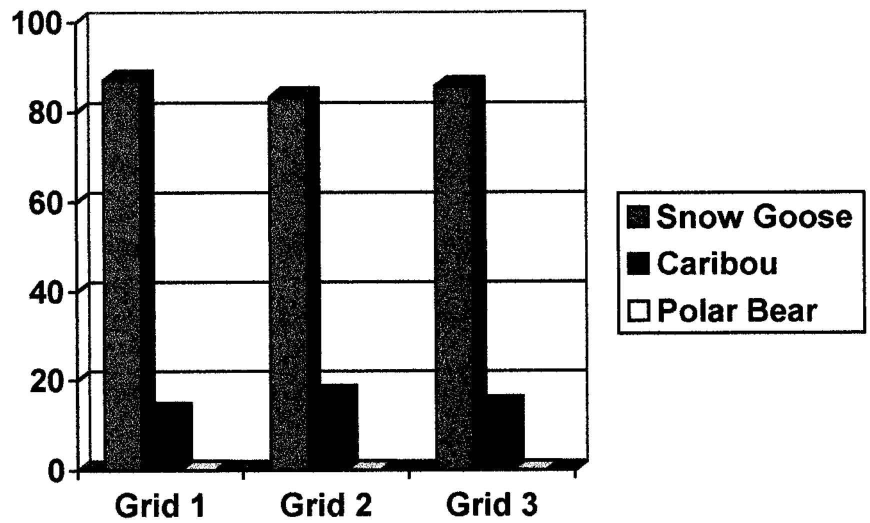


Figure C.3 MNI faunal percentage frequencies calculated for each excavation grid at the Mosquito Ridge site.

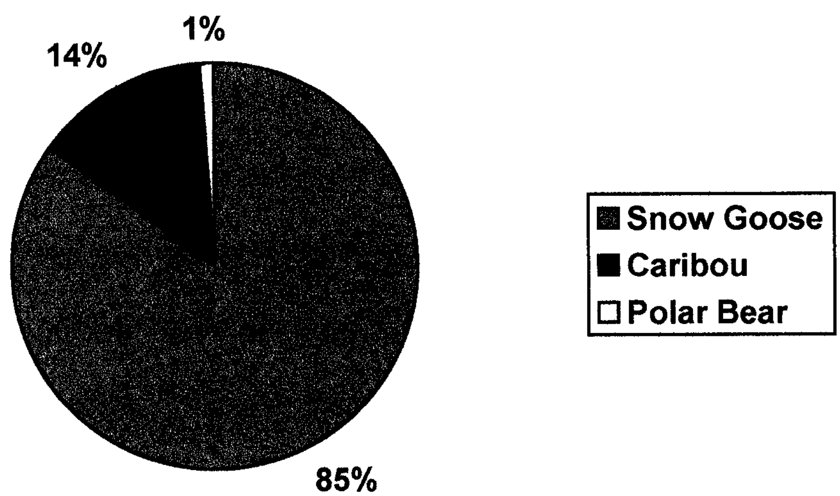


Figure C.4 Total NISP faunal percentage frequencies including all three excavation grids at the Mosquito Ridge site.

Faunal Assemblages from other Pre-Dorset Sites

None of the Pre-Dorset sites from the southern Baffin region have faunal assemblages that are large enough or are sufficiently preserved to make comparisons to the Mosquito Ridge assemblage. In the absence of this information, we have drawn on data from sites excavated on Igloolik Island, which do have good preservation conditions and can offer some interpretive context for the Mosquito Ridge assemblage (see Figure C.5). It should be noted that the Igloolik Island sites are coastal occupations where subsistence resources differ compared to those available in the interior of southern Baffin Island. Moreover, these coastal sites likely represent different seasonal occupations.

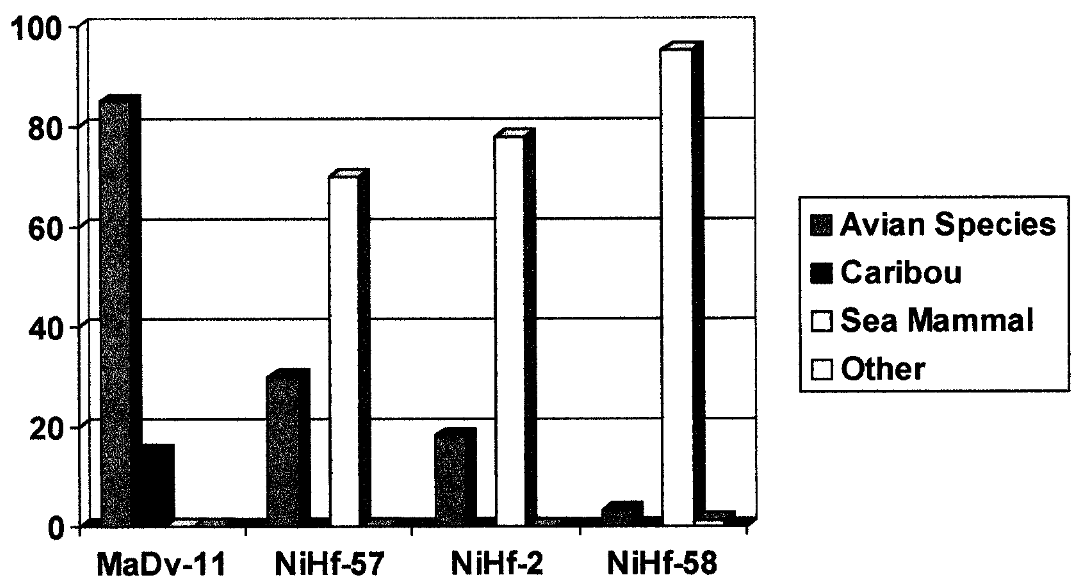


Figure C.5 NISP percentage frequencies for the Mosquito Ridge assemblage and sites from Igloolik Island (Murray 1996; Royer 2003; Stenton and Park 2003).

At the NiHf-57 site (Stenton and Park 2003), birds make up 30% of the faunal assemblage, and of this, only 12% (N=18) are snow goose (Royer 2003:9). Similarly, other Igloolik Island Pre-Dorset sites analyzed by Murray (1996) indicate avian species are present but in comparatively low numbers for most site features. The NiHf-2 assemblage derives from three excavated features and a sample of 938 bones was drawn for analysis. Of those bones identified to species, 18.2% are eider duck (N=50) and snow goose (N=3) (Murray 1996:Table 4.7). The NiHf-58 assemblage was excavated from 5 features and avian remains are near non-existent (3.2%) (Murray 1996:Table 4.3). Eider ducks account for 1.7% of the species frequencies while snow goose accounts for 0.4%.

While limited, this comparison does indicate that the faunal assemblage from Mosquito Ridge is somewhat unusual given the very high frequency of snow goose remains. Based on the restricted seasonal availability of these birds in the interior of southern Baffin Island, it is very likely the season of occupation for this inland component was in the late spring or early summer since this is when the birds' fat stores are highest and they begin their annual moult.

Speth (1989), Speth and Speilmann (1983), and Cachel (2000) have examined the nutritional requirements of the human body in relation to subsistence strategies and note the problems inherent in a diet of primarily lean meat where little or no carbohydrates are consumed. When the human body is deprived of carbohydrates or fats for an extended period of time, a form of "protein poisoning" results and the metabolism increases (Cachel 2000). It is for this reason that hunter-gatherers seek sources of fat in their subsistence activities. Because carbohydrates in the form of plant resources are not readily available year round in the Arctic environment, the consumption of fat by human populations becomes essential. Therefore, based on this dietary requirement, it would make sense that the Pre-Dorset populations traveling to the inland areas during the warm season would take full advantage of this available source of fat. And, given the abundance of these birds and the predictability of their arrival and location, they would further provide a degree of food security for the Pre-Dorset after a long journey from the coastal regions.

Despite the dietary need for fat and this local abundance of birds, there remains a question as to why the Pre-Dorset would make such a long journey to the interior region to hunt birds when these species are available, albeit in lower numbers, in most every coastal area on southern Baffin Island during the Arctic warm season. The lithic assemblage excavated in association with these faunal remains provides the answer to this question. The analysis of the Mosquito Ridge lithics provides a clear indication of the functional purpose of this site within the Pre-Dorset seasonal round in this region. But more importantly, it provides a crucial interpretive context for understanding the role of bird hunting in the activities of the site's occupants. Snow geese provided these people with a rich and reliable food source that was easy to acquire since it entailed minimal planning and energy investment. This, in turn, afforded the Pre-Dorset more time to exploit another critical resource: lithic raw material.

When the faunal and lithic assemblages from Mosquito Ridge are considered together they demonstrate why this site was occupied repeatedly by the Pre-Dorset. The location is ideal for raw material acquisition and birds are readily available. The confluence of these critical resources at this location makes the site attractive for human occupation, so the fact people went there for a period of roughly 4000 years is hardly fortuitous. Effectively, the Pre-Dorset came to the interior to acquire toolstone. They then brought these stones to the Mosquito Ridge site to work because the availability of birds could provide them with an easily acquired food source to sustain them while they engaged in tool production activities. The season of occupation would necessarily be in the late spring or early summer since this is when the birds are in the interior, their fat stores are rich, and they are starting to moult. Moreover, there is no snow and ice on the ground to impede access to local lithic raw materials. Simply stated, the Pre-Dorset were not really traveling inland just for the birds, but the abundance of fat-rich, flightless geese at Mosquito Ridge certainly contributed to making it an easy and stress free trip to get the rocks.

Appendix D

Artifact Assemblage Photographs

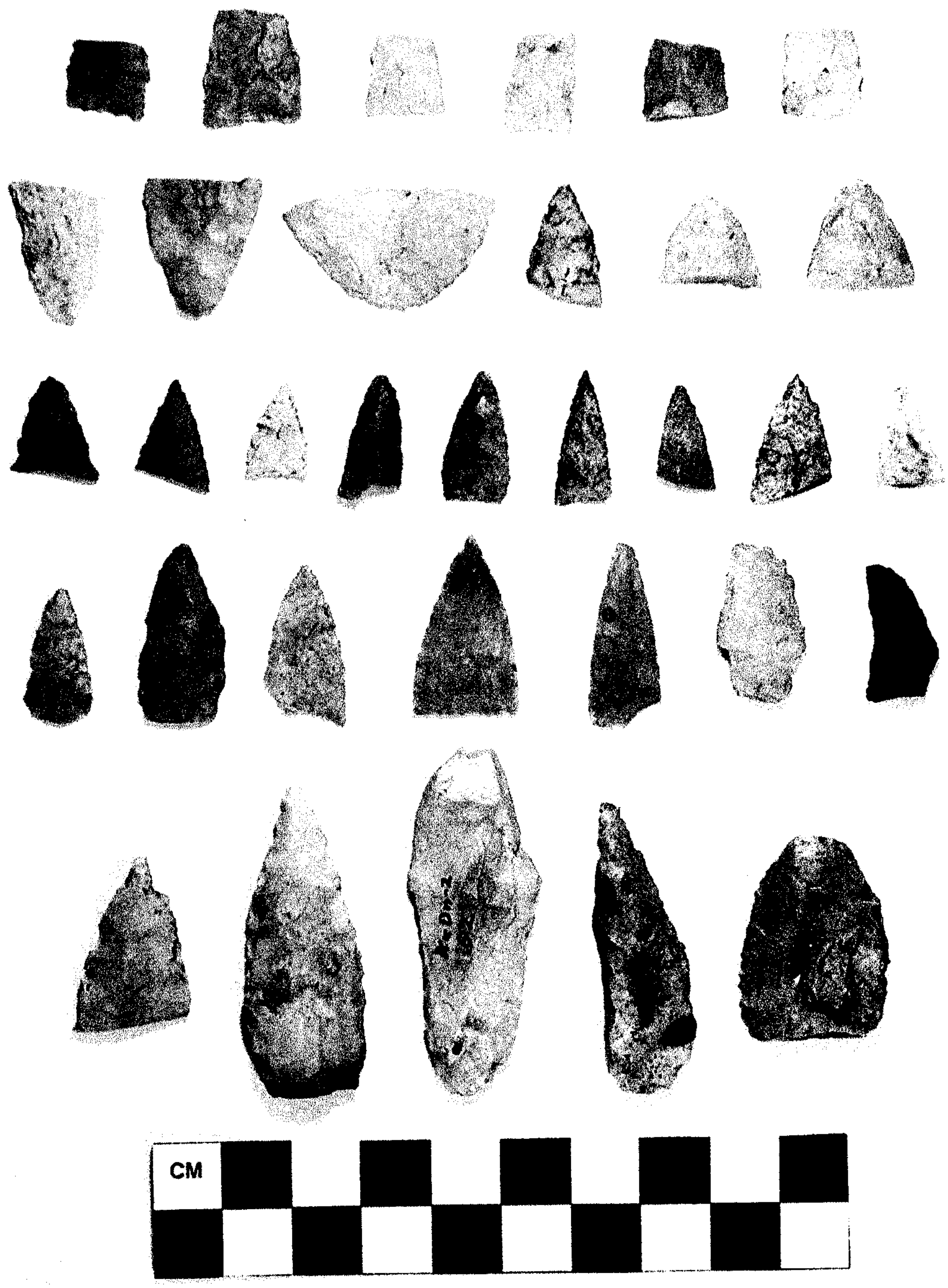


Figure D.1 Sample of the Shaymark (KkDn-2) bifaces.

Figure D.2 Sample of the Shaymark (KkDn-2) burins.

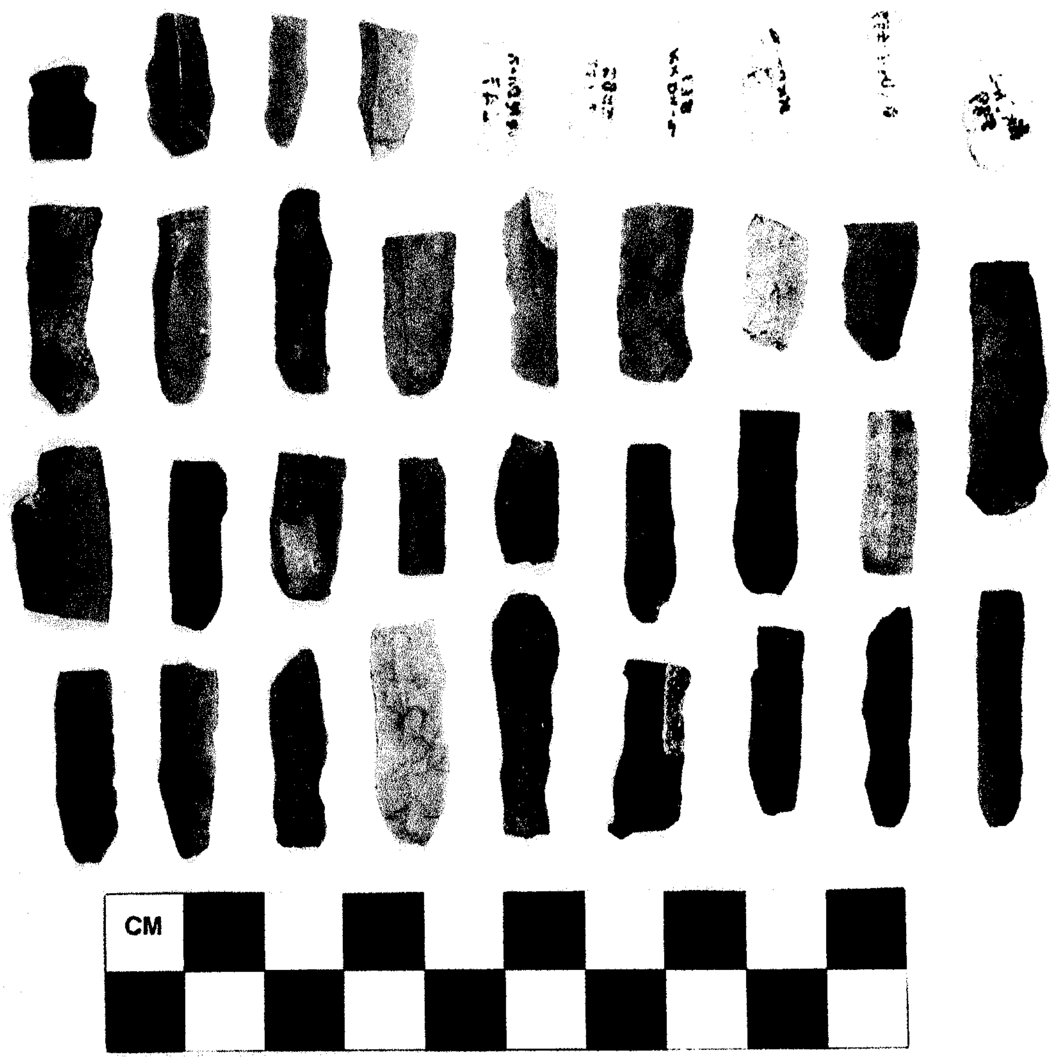


Figure D.3 Sample of the Shaymark (KkDn-2) microblades.

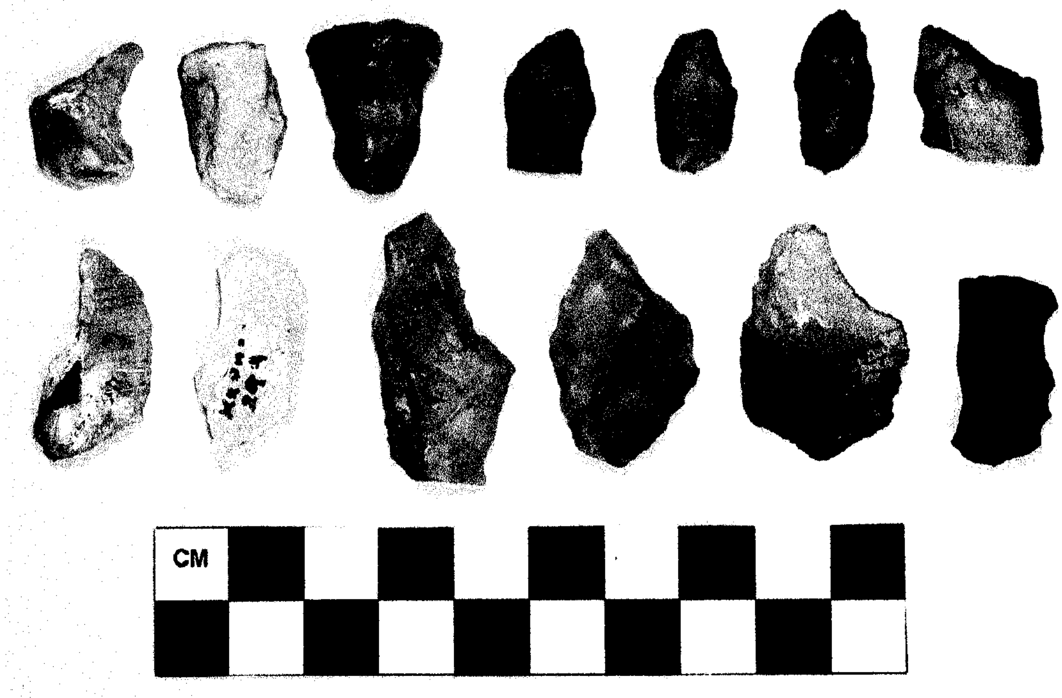


Figure D.4 Sample of the Shaymark (KkDn-2) scrapers.

Figure D.5 Sample of the Shaymark (KkDn-2) burin spalls.

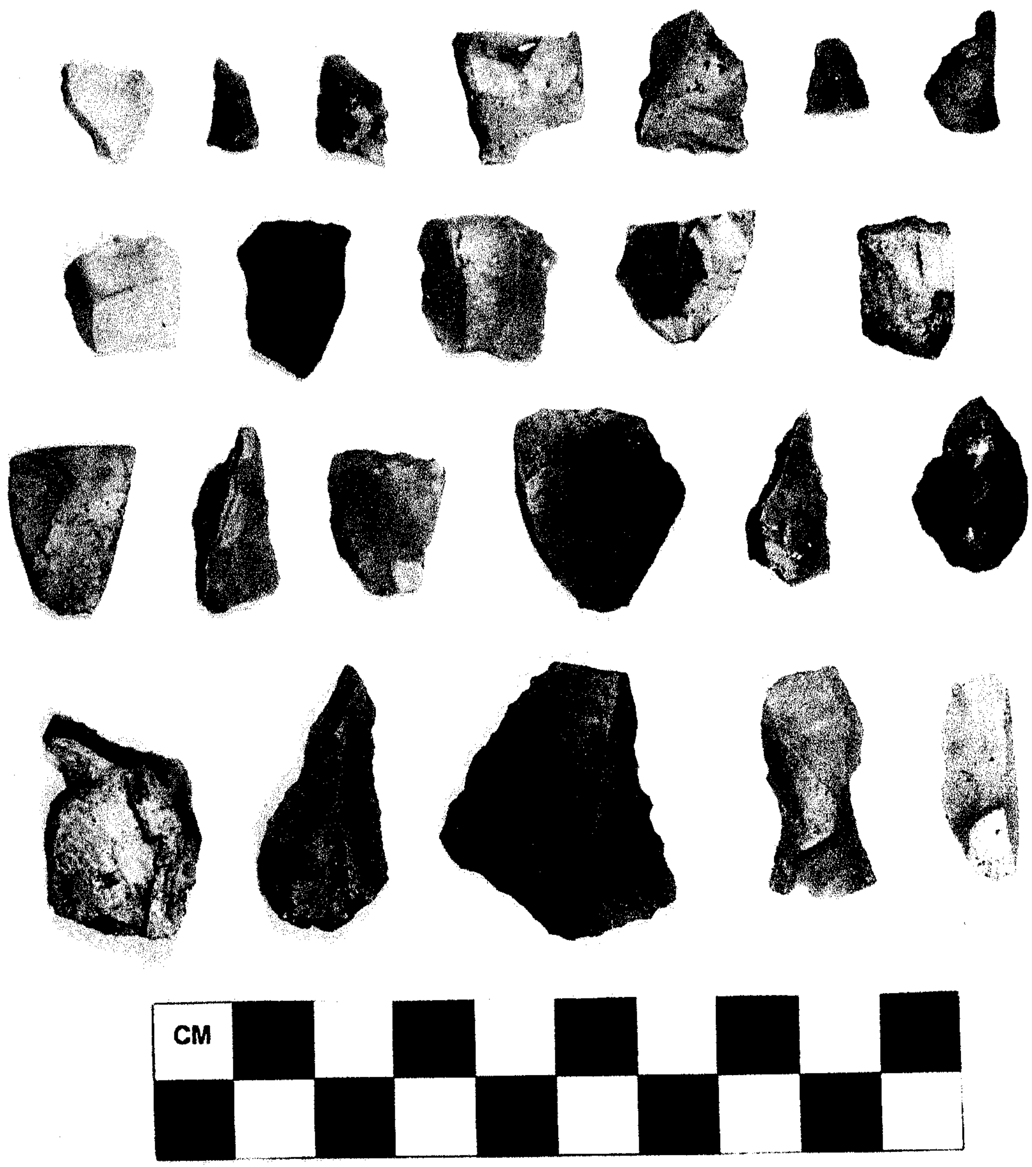


Figure D.6 Sample of the Shaymark (KkDn-2) informal tools and used flakes.

Figure D.7 Sample of the Shaymark (KkDn-2) cores and core fragments.

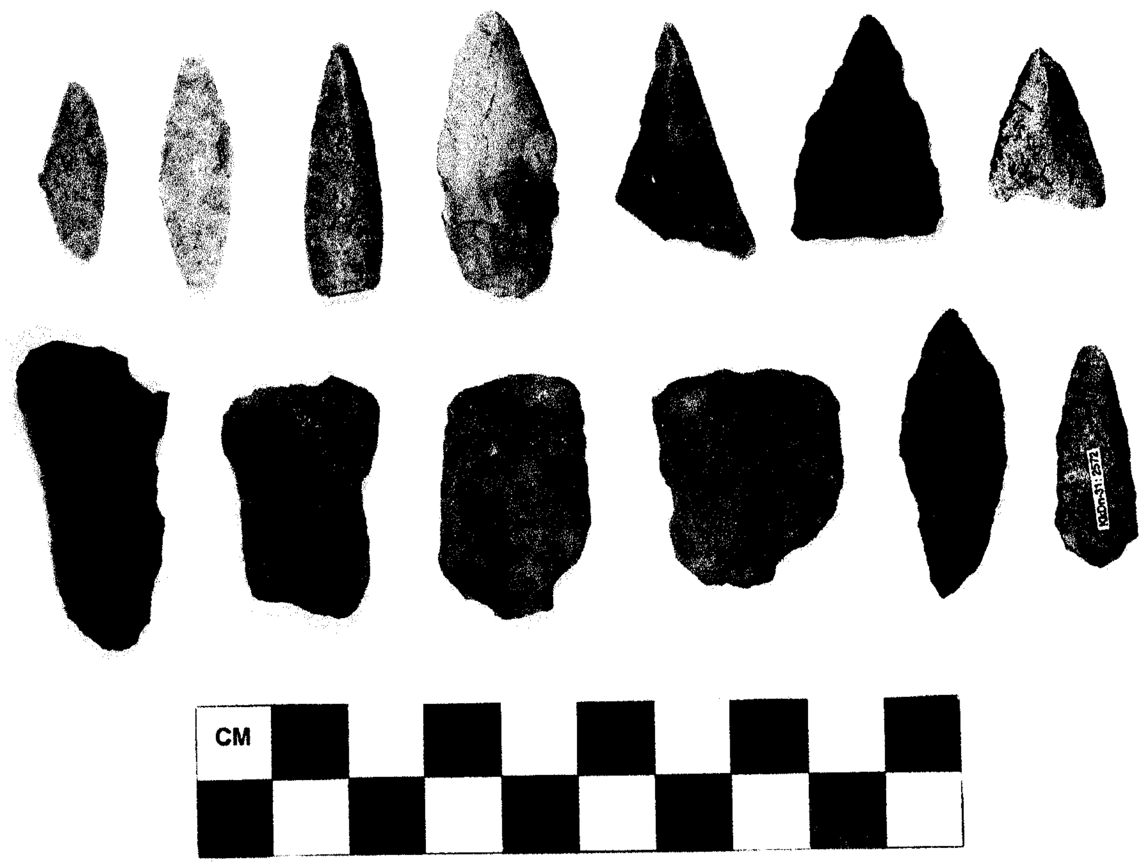


Figure D.8 Sample of the Davidson Point (KkDn-31) bifaces.

Figure D.9 Sample of the Davidson Point (KkDn-31) microblades, burins, and burin spalls.

Figure D.10 Sample of the Davidson Point (KkDn-31) scrapers.

Figure D.11 Sample of the Davidson Point (KkDn-31) informal tools, used flakes, cores, and core fragments.

Figure D.12 Sample of the Area Q (KkDo-3) artifacts.

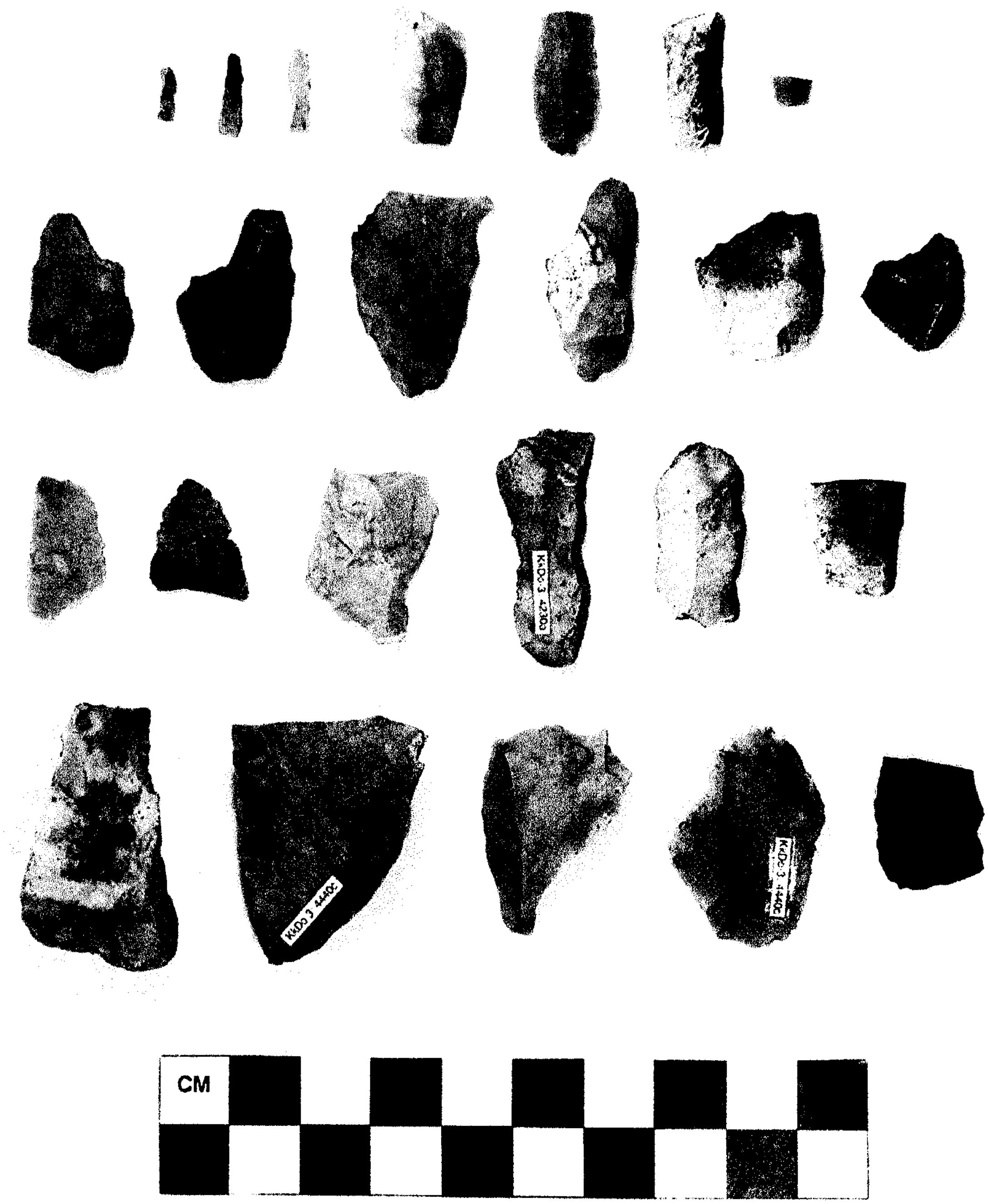


Figure D.13 Sample of the Area D (KkDo-3) artifacts.

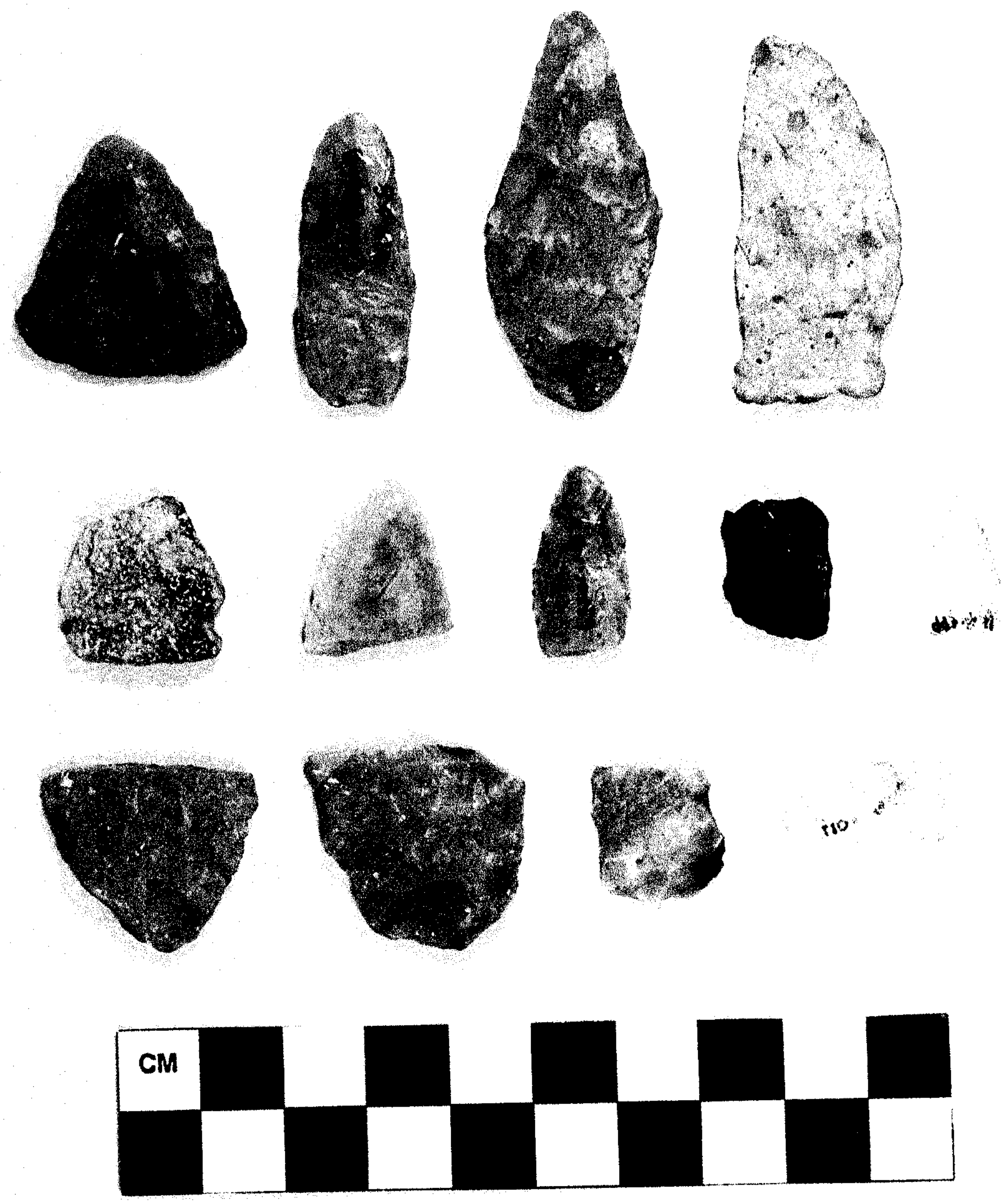


Figure D.14 Sample of the Sandy Point (LlDv-10) bifaces and biface fragments.

Figure D.15 Sample of the Sandy Point (LlDv-10) microblades, burins, and burin spalls.

Figure D.16 Sandy Point (LlDv-10) scrapers.

Figure D.17 Sample of the Sandy Point (LlDv-10) informal tools and used flakes.

Figure D.18 Sample of the Sandy Point (LlDv-10) cores and core fragments.

Figure D.19 Sample of the Mosquito Ridge and Mosquito Ridge West (MaDv-11) bifaces.

Figure D.20 Sample of artifacts from Mosquito Ridge and Mosquito Ridge West (MaDv-11) made of high quality lithic raw material.

Figure D.21 Sample of the Mosquito Ridge and Mosquito Ridge West (MaDv-11) burins.

Figure D.22 Sample of the Mosquito Ridge and Mosquito Ridge West (MaDv-11) scrapers.

Figure D.23 Sample of the Mosquito Ridge and Mosquito Ridge West (MaDv-11) microblades and burin spalls.

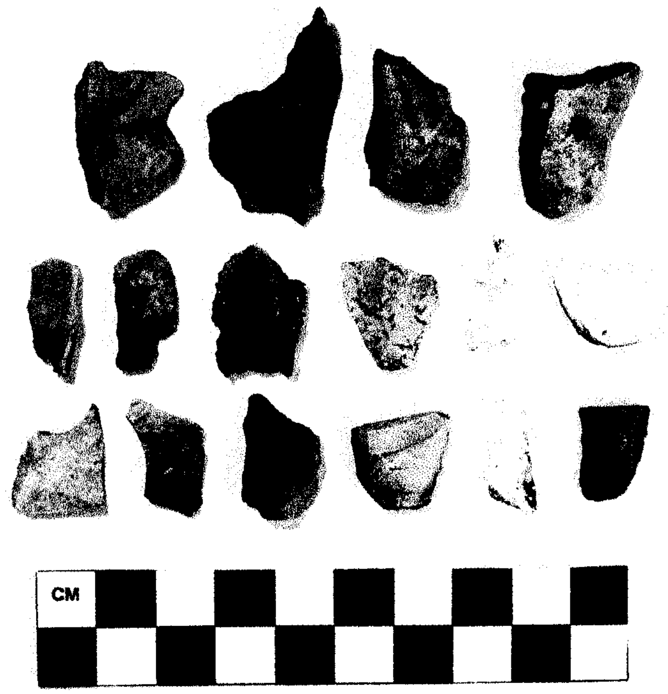


Figure D.24 Sample of the Mosquito Ridge and Mosquito Ridge West (MaDv-11) informal tools and used flakes.

Figure D.25 Sample of the Mosquito Ridge and Mosquito Ridge West (MaDv-11) cores and core fragments.