PREHISTORIC ARCHAEOLOGY OF THE PORT AU PORT PENINSULA, WESTERN NEWFOUNDLAND

DAVID N. SIMPSON

PREHISTORIC ARCHAEOLOGY OF THE PORT AU PORT PENINSULA, WESTERN NEWFOUNDLAND

by

© David N. Simpson

B.A.(H), University of Winnipeg, 1982

A Thesis Submitted to the School of Graduate Studies
in partial fulfillment of the requirements
for the Degree of
Master of Arts in Anthropology

Department of Anthropology
Memorial University of Newfoundland

August, 1986

St. John's Newfoundland

ISBN 0-315-36998-1

ABSTRACT

This work presents the results of an archaeological survey of the Port au Port Peninsula which recovered evidence of: the Dorset, or Late Palaeo-Eskimo tradition (1300+/-80 B.P., Beta 7779 and 1350+/-60 B.P, Beta 7778)[1], the Little Passage (790+/-70 B.P., Beta 7777) and Beaches complexes of the Recent Indian period, as well as two non-specific Palaeo-Eskimo occupations. Faunal remains indicate the season of occupation of the Port au Port site to be summer and possibly mid-winter for the Dorset, and summer, possibly extending through any of the other seasons for the Little Passage. The Dorset presence at the inland Long Pond site suggests that the Dorset seasonal round included spring or fall excursions into the interior. A paucity of data from the earlier periods is attributed to coastal flooding due to post-glacial sea level fluctuations.

A preliminary lithic source analysis indicates that the Little Passage populations utilized locally available chert resources, while the Dorset obtained flakable lithic materials from a variety of more distant sources. Regional variation in the style of Dorset end blades across Newfoundland is argued to be partly a function of differences in the quality of chert between regions. The greater extent to which end blades of finer chert would be

1 Radiocarbon dates are reported as RCYBP (radiocarbon years before 1950 A.D.), using a halflife of 5568 years and have not been corrected for the Devries effect, reservoir effect, or isotope fraction in nature.

reduced by resharpening (tip-fluting) is proposed as the mechanism to explain the differences. Variability in the Dorset expanding flake end scrapers from the Port au Port site is considered to relate to several factors: the reduction in size and change in shape of a tool through its period of functional utility as a result of resharpening, and hafting requirements.

ACKNOWLEDGMENTS

Funding for this project was generously provided by the Historic Resources Division, Department of Culture Recreation and Youth, Government of Newfoundland and Labrador, and the Institute of Social and Economic Research, Memorial University of Newfoundland. I would also like to thank the St. John's and Stephenville Provincial Parks offices for giving us permission to stay at Piccadilly Head Provincial Park during the field work. Kevin Jesso and his staff at the park were always hospitable and extremely helpful.

To Mrs. White and her family, the Hinks', the March's, Col. Abbott and the employees of Abbott and Haliburton's, and the rest of the residents of the Port au Port Peninsula, as well as, R.K. Strap and M. Leitch of Toronto, A. Leitch of Corner Brook, M. Leitch of Labrador City, and Boyd Winsor of Harbor Grace, I thank you for your interest and gracious support.

Invaluable guidance in the preparation of this manuscript was provided by my advisor, Dr. James A. Tuck, and Dr. M.A.P. Renouf. Dr. R. Stevens, of Memorial's Earth Sciences Department, was responsible for initiating and directing my interest in lithic source analysis. I also owe a great debt to Carol Krol, Doug Robbins, Shaun Austin, Zelda Cohen, Dr. Mary McDonald, the rest of the Archaeology

Unit, and especially Pat Wells, who acted as sounding boards for some often rather off beat ideas.

Additional thanks are extended to Mark Deichman, Sheila Grondin, and Fred Schwartz, who spent a great deal of their time cataloguing, Tip Evans, who produced a beautiful set of maps, David Black, who analyzed the faunal material, Terry Brace, who prepared lithic samples for the X-ray fluorescence analysis, and the Department of Earth Sciences at Memorial University of Newfoundland, who ran the XRF tests.

Finally, I would like to thank an exceptionally fine field crew, Jeannie House, Susan Kearsey, and Ken Renolds. Their perseverance, especially with regard to 'the car', made this project possible.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF MAPS

LIST OF FIGURES

LIST OF PLATES

LIST OF APPENDICES

CHAPTER I

INTRODUCTION

Background and Primary Objective

Archaeology is currently recognized as having three goals; the description of culture history, the explication of past lifeways and the explanation of culture process (Binford 1968; Thomas 1974, 1979). These goals are not mutually exclusive but are hierarchically organized. Research in a given area will, for example, generally proceed from the construction of a culture history for the area, to an investigation of how these populations lived, and ultimately to comparative and/or diachronic studies of culture process.

It is not necessary that a body of research achieve these goals in a step by step fashion. There will often be data from previous research available which will allow one to proceed directly to lifeways or culture process. Further, it is sometimes necessary to proceed on more than one front simultaneously, for example, to refine a regional chronology while collecting comparative data on lifeways.

Archaeological research in Newfoundland[1] of necessity has been for the most part restricted to culture history. The intent of this present research is to generate data and

1. For the purposes of this research the term Newfoundland will be used to denote only insular Newfoundland, when discussion relates to Labrador as well this will be indicated in the text.

interest in the explication of the lifeways of Newfoundland's prehistoric inhabitants in order that research directed toward culture process will follow.

By lifeways, the archaeologist means:

> population, density, settlement pattern, cultural ecology, technology, economy, social organization, kinship, legal systems, social stratification, ritual, sanctity, art. (Thomas 1979:238).

The 'subsistence-settlement system' provides archaeologists with a framework within which they may organize their observations regarding many of these elements of lifeways.

> The core of this system consists of a set of techniques used to extract biological energy from the environment, combined with a settlement system adapted to maximize the harvest of this energy as it shifts seasonally or geographically within the environment. Although primarily determined by technology, economy and resource potential, other factors contribute to the formation of a distinctive seasonal pattern, or "round," in an annual cycle. Weather and geography are important determinants of settlement locations, as is also the need for social interaction with a larger group (Fitzhugh 1972:7).

Subsistence-settlement systems, in that they relate to a major part of a group's technology, are considered to be the "most accessible aspect" (Struever 1968:134) of lifeways to the archaeologist. It is thus not surprising that they have come to dominate research directed toward explication of lifeways in some parts of the world. As a reflection of this general trend, a number of subsistence-settlement studies have been conducted in Labrador. At Hamilton Inlet (Fitzhugh 1972), central Labrador, a systematic regional survey has resulted in the recognition of a set of culturally specific subsistence-settlement systems. The systems have been grouped into types recognizing a dichotomy between marine and terrestrial resources. Fitzhugh (1972:158-161) defines these types as; Interior, Modified-Interior, Interior-Maritime and Modified-Maritime (Table 1). A similar study conducted by Cox (1977) at Okak, northern Labrador, concurs with these interpretations and recognizes the existence of three of Fitzhugh's types at Okak, -Modified-Interior, Interior-Maritime and Modified-Maritime. With a slightly different approach, Stephen Loring (1983) addresses not a single bay, but an inner bay zone cross-cutting the highly indented coast between Nain and Davis Inlet, Labrador.

Farther north, at Saglek Bay (Tuck 1975) a regional survey which was primarily culture historical in scope found evidence of subsistence-settlement systems consistent with the Interior-Maritime and Modified-Maritime patterns. An additional survey to recover settlement pattern data in Newfoundland, conducted by R. Pastore (1982, 1986) in Notre Dame Bay, has also employed Fitzhugh's typology.

All of these studies, however, were conducted in essentially similar geographic regions. That is, each examined a deep bay or inlet with many islands affording

Table 1 Hamilton Inlet subsistence-settlement system types

Type	Description
Interior	Interior-restricted subsistence-settlement system; caribou winter economy on interior, lake and river fishing during summer. Generalized interior adaptation.
Modified-Interior	Interior-coastal subsistence-settlement system: Generalized interior adaptation; limited to generalized coastal adaptation. Winter caribou hunting on interior; summer lake and coastal hunting and fishing.
Interior-Maritime	Interior-coastal subsistence-settlement system: Generalized winter adaptation, specialized coastal adaptation during summer.
Modified-Maritime	Coastal-restricted subsistence-settlement system: Specialized coastal adaptation to marine resources. Some use of coastal land resources. (adapted from Fitzhugh 1972:158)

protection from the open ocean or a section of coast indented with such bays. A major factor figuring in the choice of these bays as study areas was that they provide access to a wide variety of quite different resource zones within a relatively small area.

> Hamilton inlet was chosen as the area of study because it represents in microcosm, many of these contrasts within an inlet barely 150 miles in length. The inlet delimits the northern boundary of the continuous close-crown boreal forest and contains a wide variety of microenvironments of potential usefulness to man. Its geographic position suggests it would have been an important transportation route between the coast and the interior during prehistoric times, just as it is today (Fitzhugh 1972:4).

Similarly, Cox states:

> Finally, the Okak region provided a wide range of ecozones and resources within a relatively limited area, allowing for year-round habitation within the area and making it possible that most or all of a prehistoric culture's seasonal round could lie within the proposed survey area (1977:7).

Loring's (1983) focus was not on the interplay between a variety of resource zones, but rather the richness of one particular zone as opposed to those which surrounded it.

> The inner bay region of the central coast is its own unique ecotone, a forested swath between the tundra of the outer islands to the east and the barrenlands of the Labrador plateau to the north and west ....
>
> In this distinctive biotic zone, the faunal resources include elements of terrestrial and marine fauna that are

> unique to it, as well as other elements that are more highly concentrated here than elsewhere (Loring 1983:32-33)

It was expected that the populations inhabiting these research universes would have been able to schedule their subsistence activities to intercept resource peaks in a manner which minimized the effort expended in travel, thus concentrating sites of different types within the region. Such regions have been the primary foci of archaeological research directed towards subsistence-settlement system analysis, largely a result of the archaeologist's desire to maximize the diversity of their site samples with a minimum of effort.

Not all areas where prehistoric populations are known to have existed, however, have the resource structure of a deep bay or inlet comparable to that described above. Such bays are absent from the Labrador-Quebec south shore, and on the west coast of Newfoundland only Bay of Islands and Bonne Bay compare. Considering especially that neither of these areas has yet been subjected to systematic regional subsistence-settlement studies[2], several important questions should be posed: Do subsistence-settlement systems in these areas differ from those in an region characterized by deep bays or inlets? Further, is it possible that geographic configurations other than the deep bay or inlet could provide access to a variety of resource zones and be of

2 Dr. M.A.P. Renouf of Memorial University is currently undertaking such a study on the Port au Choix and Point Riche Peninsulas on the west coast of Newfoundland.

importance to the archaeologist? By addressing these questions, it is suggested that the subsistence-settlement studies which have been conducted in deep bays or inlets constitute a biased sample, and that regions with other types of resource structures should be examined.

It was in the context of these arguments that a subsistence-settlement study was proposed for the Port au Port Peninsula on the west coast of Newfoundland. The Port au Port Peninsula projects roughly 50 kilometers into the Gulf of St. Lawrence, forming St. George's bay to the south and Port au Port Bay to the north. Neither of these Bays corresponds closely to the type of bay described above as typical of subsistence-settlement studies to date. St. George's Bay lacks the dense cluster of islands which characterizes and protects the other bays. Similarly, Port au Port Bay contains only one island, Fox Island, as well as one small island and a small string of rocks 7 to 10 kilometers out of the mouth of the bay[3].

Ice conditions on the southwest coast of Newfoundland are radically different from those experienced in the bay regions of Labrador and the northeast coast of Newfoundland.

3 Post-fieldwork research has revealed that post-glacial sea level fluctuations in the region have significantly altered the shoreline of the Port au Port region. The maximum deviation from present occurred at roughly 5,800 B.P. and by 2,800 B.P. the peninsula had achieved a shape similar to that of the present but with the addition of several low islands in Port au Port Bay and just outside its mouth. See discussion and Map 2 in the following chapter.

Sea ice on the southwest coast arrives later, its coverage is less extensive, and it is present for a shorter period before it retreats. The major impact of this difference is the manner in which it affects the availability of seals. The variety of seal species present in an area, as well as the timing of their availability is primarily a function of the presence or absence of sea ice and the timing of its advance and retreat. The sea ice conditions of the southwest coast thus contribute to the formation of a very different structure of marine resources in the Port au Port Peninsula region than in northeastern Newfoundland and Labrador coast.

In addition, while the inner parts of Port au Port Bay and St. George's Bay provided access to terrestrial resources, as did the type of bays described above, the bottom of Port au Port Bay also provided access to another major marine zone, that of St. George's Bay. A settlement in the vicinity of the isthmus could have taken advantage of the resources of either bay at will, an important factor when weather would have denied access to one but not the other. The isthmus would also have been a strategic location from which to hunt caribou should their seasonal migration have involved movement between the peninsula and the mainland. It is suggested that this configuration of two major bodies of water separated by a narrow isthmus would have constituted a substantially different structure of resources than that in deep islanded bays or inlets. A more fully developed discussion of the natural environment of the Port au Port Peninsula follows in the next chapter.

There were several additional reasons for the choice of the Port au Port Peninsula as the research area. As a land mass surrounded almost completely by water, the research area was very easily defined. The peninsula was also provided with an adequate road network, thus minimizing logistical difficulties in terms of transporting the survey crew. Finally, previous research in the region (Carignan 1975a) revealed the presence of faunal remains at the Port au Port site (DdBq-1). It was hoped that the presence of faunal material in at least one site in the region would facilitate drawing conclusions regarding site seasonality and function.

It was unfortunate that due to time and financial constraints the field component of this project was on a substantially smaller scale than would have been ideal. Instead of a multi-year project where archaeological, and ecological data might be collected in order to formulate subsistence-settlement system models which might be tested in subsequent field seasons, this project was intended to collect archaeological data to be used to form the outlines of culturally specific subsistence-settlement systems. These systems were then to be speculatively fleshed out on the basis of resources which are known to have been available with these speculations serving as foci to be developed and tested by future research.

Several difficulties were encountered which contributed to a paucity of data which could be used to fully realize this primary objective (i.e. post glacial coastal flooding, and the non-representative nature of faunal recoveries, see Chapters II and V below). As a result, a pair of secondary objectives suggested by Carignan's (1975a) survey report which were relevant to research currently being conducted in other areas of the province received greater emphasis than originally planned.

Secondary Objectives

At the Isthmus site, DdBq-2, Carignan found evidence of a Dorset Eskimo occupation. In addition he recovered material he considered to relate to the Beothuk Indians at the Port au Port site, DdBq-1. Thus the following secondary lines of inquiry were proposed: to clarify the nature of the Dorset occupation of the Port au Port Peninsula in relation to the regional expressions of the Dorset in Newfoundland as has been addressed by Douglas Robbins (1985, 1986); and to identify and describe Recent Indian components in the context of research conducted on the south coast (Penney 1981, 1982, 1985) and in Notre Dame Bay (Pastore 1982, 1983, 1984, 1985).

With regard to the former, Robbins (1985, 1986) argued against the notion of a uniform Newfoundland Dorset culture, a concept which arose largely from the work of Linnamae (1975), and Harp (1964). In its stead, he proposed three regional expressions of Dorset in Newfoundland (Table 2). These include: the 'west coast', "along the west coast of the island and the east coast of the Great Northern Peninsula" (Robbins 1985:139), the 'northeast coast', in Bonavista Bay, and which "with further work may prove to hold for the eastern part of Nôtre Dame Bay" (Robbins 1985:139), and the 'south coast', which "includes, for now, the entire Dorset occupation of southern Newfoundland from the Isthmus of Avalon to Cape Ray" (Robbins 1985:140).

> These "regional expressions" presumably developed as responses to different regional ecologies, and can be distinguished archaeologically according to local settlement patterns, artifact styles, and lithic utilization (Robbins 1985:138).

Analysis of the Dorset lithic material recovered from the Port au Port Peninsula bore directly on Robbins' thesis and provided a specific mechanism which explained a great deal of the regional variability he observed in end blade styles. Lithic analysis consisted of the derivation of a set of industries (end blade, microblade, expanding flake scraper, biface etc.) and elucidating as far as possible the reduction sequence(s) for each, from manufacture, through maintenance, to discard. The ideal procedure of refitting or conjoining (cf. Cahen, Keeley and Van Noten 1979; Frison 1968, 1974; Laughlin and Aigner 1966; Spurrel 1880; Van Noten, Cahen and Keeley 1980) was not employed due to an incomplete sample. The analysis thus followed a more

Table 2 Regional expressions of Dorset culture in Newfoundland

Region	Settlement Pattern	End Blade Style	Dominant Lithic Material
Western	Intensive exploitation of sea mammals from permanent or semi-permanent encampments with caribou as a possible secondary focus.	Relatively short and broad with convex sides and markedly concave bases.	Variety of fine grained colorful cherts.
North-eastern	Smaller groups practicing a more mobile hunt, at times creating special sea mammal hunting stations, and possibly also caribou hunting stations in hinterland regions.	Generally larger than those in the west with greater length/width ratios, slightly concave or straight bases and gently convex or straight sides.	Blue or grey rhyolite.
Southern	Greater mobility with use of wider variety of resources (due to absence of migratory seal herds), no large groupings except in locations where two or more major resources occurred in close proximity.	More similar to the northeast end blades, but often ground.	Originally blue to blue-green material, now exhibiting a white or brown patina, quartz crystal is also common and extensively used for end scrapers and microblades.

(adapted from Robbins 1985:138-141)

subjective route, relying on a familiarity with lithic technology in order to identify the products of various stages of manufacture and maintenance and link them in the most logical sequence. It was hoped that by avoiding the more traditional end product oriented typological approach (cf. Laughlin and Aigner 1966) that new, principally technological, explanations of intra- and inter-site artifact variability could be forwarded. In the case of Dorset end blades and expanding flake scrapers significant results were achieved.

It was concluded that variation in the form of end blades from the Port au Port site, that of a few long end blades, and a majority of short end blades, was a result of the application of tip fluting as a maintenance procedure. The reasoning behind this was that not many end blades were expected to be lost or discarded soon after their manufacture, a time when they were still long and could be resharpened for further use. The greatest number of end blades was expected to enter the archaeological context after repeated sessions of tip fluting which ultimately shortened them to the point where they became non-functional and were discarded.

Returning to Robbins' observations of relatively short end blades manufactured from high quality chert on the west coast and longer end blades of coarser rhyolite on the northeast coast, it was argued that this size difference was the result of an inability to successfully resharpen (and in so doing, shorten) the coarse rhyolite end blades by tip fluting as many times as was possible for the finer grained chert end blades. Similarly, the soft patinated chert used on the south coast was considered less suited to repeated tip fluting than the fine grained chert of the west coast. Further, it appeared that a separate or additional technique of manufacture and maintenance was used on this material, that of grinding, a technique with quite different implications regarding variability in the shape of an artifact through its period of functional utility than that of tip fluting. Thus, the type of raw material used in each region, in conjunction with maintenance procedures is concluded to explain regional variation in Dorset end blades across Newfoundland.

This approach to artifact analysis also yielded valuable insights in the case of Dorset expanding flake end scrapers. Again maintenance procedures were used to explain variation in the form of the artifacts, to some extent, sorting out the maze of Dorset scraper 'types' proposed by other researchers.

Regarding the latter secondary objective noted above, the four artifact types defined by Penney (1985) as diagnostic of the Little Passage complex (corner notched projectile points, triangular bifaces, end scrapers and linear flakes) were identified on the Port au Port Peninsula, and an additional set of provisional Little Passage industries (concave side scrapers, large ovoid bifaces, large unifaces and sandstone abraders) were discovered. Further, it was considered important to locate and determine to what extent the outcrops of high quality chert reported in the Port au Port area (Stevens 1983:pers.com.) might have figured in the subsistence-settlement systems of the prehistoric inhabitants of the Port au Port Peninsula and around the island. A preliminary lithic source analysis was undertaken which was formulated primarily to test the hypothesis that the distinctive grey-green chert used by Newfoundland's Little Passage people was derived from the Port au Port Peninsula.

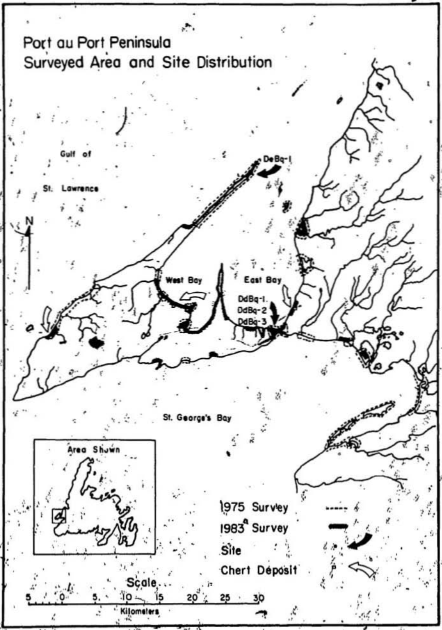
Previous Archaeological Research

In 1925 W.J. Wintemberg (in Carignan 1975a) reported finding fire places, historic ceramics, glass and iron at the mouth of Flat Bay Brook, St. George's Bay. The material was considered to represent a historic Micmac occupation. He also reported that 'arrowheads' had been found in the vicinity by a local resident and that others had been recovered about 0.8 kilometers away on the Benoit farm.

The only extensive archaeological research previously reported from this region is that of Carignan (1975a). This survey, conducted between June 1 and September 1, 1975, was an investigation of the west coast of Newfoundland and the Great Northern Peninsula. Two weeks were also spent in Bonavista Bay. The west coast was chosen for the survey not only because large parts of it were archaeologically unknown, but also because the geological formations of the west coast are "conducive to bone preservation which would allow for interpretation of the subsistence practices and bone technology of the native groups" (Carignan 1975a:1). This study was not included in the subsistence-settlement system discussion above because subsistence-settlement interpretations were limited to descriptions of activities carried out at each site. No attempt was made to propose a seasonal round for any particular region, or to incorporate environmental and ecological data.

Carignan (1975a) concentrated in the following regions around the province: 1) Port au Port - Bay St. George, 2) the Codroy Valley, 3) Deer Lake - Humber River, 4) Conche - Crouse, 5) Main Brook and 6) Bonavista - East Port. River and creek mouths, as well as lengths of the coast in fifteen areas of the Port au Port - Bay St. George region were investigated: 1) Bar - Long Point, 2) Fox Island - Fox Island River, 3) Lourdes - Mainland, 4) Port au Mal, 5) West Bay, 6) Port au Port, 7) Abraham's Cove - Kippens, 8) Stephenville, 9) Stephenville Crossing - St. George's River, 10) Little Barachois Brook, 11) Flat Bay Brook, 12) Flat Island, 13) Feschell's Brook, 14) Robinson's - Barachois Brook and 15) Crabbes - Highland's Brook (Map 1).

Carignan discovered two sites and one isolated find in the Port au Port - Bay St. George region. The Port au Port site (DdBq-1) and the Isthmus site (DdBq-2) are both located in the vicinity of the town of Port au Port, on the north


Port au Port Peninsula
Surveyed Area and Site Distribution
Gulf of
St. Lawrence
N
DeBq-1
West Bay
East Bay
DdBq-1
DdBq-2
DdBq-3
St. George's Bay
Area Shown
1975 Survey
1983 Survey
Site
Chert Deposit
Scale
5 0 5 10 15 20 25 30
Kilometers

Map 1

side of the peninsula just to the northwest of the isthmus. One core was found on Flat Island in St. George's Bay but neither was its specific provenience noted, nor was a site designated.

Fourteen one-meter square units were excavated at the Port au Port site. Occasional concentrations of flakes and granitic rocks were noted, of which some of the latter were fire cracked. This cultural material was located at a depth of 4 to 5 centimeters, just below the sod. One cluster consisted of both flakes and granitic rocks, and measured approximately 40 by 30 centimeters. The artifact distribution was considered to be random. Faunal material was recovered but its fragmentary condition was considered to preclude further analysis. Scattered charcoal fragments were also recovered, but were insufficient for radiocarbon age determinations. The site was interpreted as a very localized activity area, most of which had been eroded into the sea (Carignan 1975a:29).

Carignan (1975a:30) considered the thirty-one artifacts recovered (Table 3 and Plate 1) to reflect both hunting and processing activities. He suggested an Indian occupation, although he indicated the possibility of an additional component based on the presence of blades and the proximity of a Dorset component at the Isthmus site.

At the Isthmus site, one small stemmed point was recovered eroding from the bank, and a collection of fifteen flakes and one Dorset endblade were recovered from four test

Table 3 1975 survey
Port au Port site artifacts

Artifact Class	n=	Percent
side notched point	1	3.2
biface tip fragments	7	22.6
biface base fragments	4	12.9
drill	1	3.2
miscellaneous biface fragments	3	9.7
scrapers	7	22.6
blades	4	12.9
core fragments	2	6.5
linear flake	1	3.2
quartz cobble	1	3.2
Total	31	100.0

(after Carignan 1975a:31)

Table 4 1975 survey
Isthmus site artifacts

Artifact Class	n=	Percent
endblade	1	50.0
stemmed point	1	50.0
Total	2	100.0

(after Carignan 1975a:32)

squares (Table 4 and Plate 2). The stemmed point was tentatively associated with similar 'Beothuk' material from the Beaches site in Bonavista Bay. This site was completely disturbed, and historic metal objects were recovered from the same context as prehistoric debris and there was evidence of cultivation as well. The area is currently littered with large concrete slabs and other recently discarded building material.

A single core was recovered from a beach on Flat Island, which consists of a peninsula and an island. These enclose Flat Bay and Carignan (1975a:5) describes them as undergoing "an incredible amount of erosion". In the vicinity, at Flat Bay Brook, a local inhabitant, Mr. Perrier, is noted to have found 'points' on his property years ago.

Gerald Penney (1980) reported the discovery of a Dorset site at Long Pond, located 40 kilometers inland on Flat Bay Brook, the mouth of which is 45 kilometers from the isthmus of the Port au Port Peninsula along the shore of St. George's Bay. It is likely that the site has now been destroyed by disruption of the pond's water level by a hydroelectric project. Two triangular endblades, one tip fluted endblade with side notches, one multiply notched biface, one notched endscraper, four chert microblade fragments, two quartz crystal microblade fragments, one uniface fragment, one biface fragment and a flake were recovered (Plate 3). Robbins (1985) infers that caribou hunting was the main activity conducted at the site.

To summarize, this body of research is foremost intended to address the subsistence-settlement systems used by the prehistoric inhabitants of the Port au Port Peninsula. The peninsula was chosen as it represents a type of environment which has a resource structure that to date has not been examined in the context of a subsistence-settlement study in Newfoundland and Labrador.

Subsidiary problems to be addressed include relating the Port au Port Peninsula Dorset and Little Passage occupations to similar occupations in other parts of Newfoundland by means of analysis of their lithic technologies and a lithic source analysis.

With regard to the primary objective of subsistence-settlement analysis, in order to understand the resource options available to the inhabitants of the research area, the resources available in the region must be examined in some detail. The following chapter will take into consideration the habits, seasonal availability, distribution and abundance of species of probable importance to the prehistoric occupants of the Port au Port Peninsula.

CHAPTER II

NATURAL ENVIRONMENT

Introduction

The Port au Port Peninsula, projecting into the Gulf of St. Lawrence to form St. George's Bay to the south and enclosing Port au Port Bay to the north, is located approximately one quarter of the way north along the west coast of insular Newfoundland, roughly 130 kilometers north of Port au Basques. The White Hills form the main body of the peninsula, reaching an altitude of 1160 meters near its western extreme, and between the White Hills and the mainland Pierways Hill reaches an altitude of 786 meters. These heights of land are separated by a 'saddle' rising no more than 200 meters, running northeast from Ship Cove, St. George's Bay, to Piccadilly Bay, West Bay.

The Bar extends northeast from the main body of the peninsula enclosing Port au Port Bay, and thus the outline of the peninsula is a half hollow triangle. Its south and northwest shores measure 30 and 40 kilometers respectively, and the remaining shoreline follows the contours of Port au Port Bay, which Shoal Point divides into East Bay and West Bay. South Head projects into West Bay and defines Piccadilly Bay (Map 1, page 17).

Western Newfoundland Ecoregion

A. Damman (1983) divides insular Newfoundland into ecological subdivisions, or ecoregions, which primarily reflect regional differences in climate. Subregions within an ecoregion are defined on the basis of physiography, geography, and/or smaller scale climatic variability. These ecological units provide a convenient format with which to begin a description of the Port au Port Peninsula.

The peninsula lies within the Western Newfoundland Ecoregion. The region encompasses the west coast of the island south of Bonne Bay, extends inland as far as the barrens of the Southern Long Range Mountains and the Buchans Plateau and has a rugged topography ranging from sea level to over 800 meters. Some of the deep river valleys of the south coast which reach beyond the cold fog belt but which are still near sea level are very similar to and are included within this ecoregion. Generally, the region is the most favorable on the island for plant growth and is heavily forested. Balsam fir (*Abies balsamea*) is the predominant forest tree, black spruce (*Picea mariana*) being limited to poorly drained sites and bedrock outcrops. Mountain maple (*Acer spicatum*) thickets are common on nutrient rich sites with much ground water seepage, and birch (*Betula lutea*) is common below 200 to 300 meters. The vegetation of alluvial alder swamps is noted as being particularly diverse and luxuriant, and extensive areas of peatlands occur on flat terrain (Damman 1983).

Temperatures are not uniform within the region, but vary greatly with altitude. The valleys in this ecoregion are warmer than those in any other around the island, and it also has a long frost free period primarily due to the protection afforded by the Long Range Mountains against the cold northeasterly winds of spring and early summer. It is one of the wetter regions of the island, with precipitation occurring on more than 180 days out of the year. Lengthy dry periods are rare, which reduces the role of fires in the region's ecology. Accumulation of snow is heavy, averaging 2 to 4 meters at sea level with more at higher elevations.

The particular elements of physiology, geology and climate by which the subregions of the Western Newfoundland ecoregion are defined are: altitude, climatic gradients along the coast, climatic gradients between the coast and interior, and lithology. The Port au Port Peninsula itself constitutes one of the Western Newfoundland subregions. Damman's (1983:172) descriptions of the subregions are brief:

> I.C Port au Port subregion. Wind-exposed limestone barrens make up most of the area. The soils are shallow and with large areas of exposed bedrock. Most of the land is unproductive, but it has a very rich flora, including many arctic-alpine species of calcareous soils, Gulf endemics and Cordilleran disjuncts.

The Port au Port Peninsula subregion in particular has one of the longest frost free periods on the island, with the mean duration between 140 and 160 days annually. This is matched only by a few small sections of the south and northwest coast, and exceeded only on the western edge of the Burin Peninsula (Banfield 1983:69).

The mean daily air temperature of the Port au Port Peninsula subregion in the coldest month, February, is between -4 and -6 degrees Celsius. The air temperature will fluctuate at this time of year between a mean daily minimum of -8 to -10 degrees Celsius and a mean daily maximum of -2 to -4 degrees Celsius. For the warmest month, July, the mean daily air temperature is between 14 and 16 degrees Celsius and the air temperature will range between a mean daily minimum of 12 to 14 degrees Celsius and a mean daily maximum of 18 to 20 degrees Celsius (Banfield 1983:64-65).

Post Glacial Sea Level Fluctuations

The Port au Port Peninsula region was deglaciated by ca. 13,500 B.P. (Brookes 1977:2123; Brookes et al. 1985:1045). This date is thus the maximum possible age of human occupation of the region. There are, however, further implications of deglaciation which have a profound effect on the archaeological record. Isostatic rebound and eustatic sea level rise will often result in drastic fluctuations in the relative sea level.

The mass of glacial ice is often so great that it will depress the earth's surface. Upon deglaciation the removal of the weight of the ice causes the land to lift upwards, a phenomenon known as isostatic rebound. The uplift may reach a peak and begin to deflect downwards again, oscillating up and down for a period before it stabilizes. Eustatic sea level rise is an absolute rise in sea level due to an increase in the volume of water in an ocean upon the release of water formerly 'locked up' in glacial ice. The interaction of these two processes will produce changes in the relative sea level.

In an area which has experienced deglaciation, the relative sea level will remain unchanged only if the rates of isostatic rebound and eustatic sea level rise are equal. This, however, is rarely the case. Should the rate of rebound be greater, the relative sea level will fall, exposing more land surface. Alternatively, if the rate of eustatic sea level rise is greater, the relative sea level will rise, drowning sections of the coast. Further, as the rates of rebound and eustatic sea level rise change through time, or if rebound reverses direction, the relative sea level in some areas will alternately rise and fall.

Clearly, any rise in the relative sea level has the potential to flood coastal archaeological sites, either damaging them or submerging them completely. In research directed toward reconstructing subsistence-settlement systems, this form of bias should be avoided at all costs as the flooding of even a single site could result in a loss of data regarding a major portion of a population's subsistence-settlement system.

At the time the field work for this project was conducted, the relative sea level fluctuations of the Port au Port Peninsula were poorly understood. Brookes (1974) originally considered the rate of rebound to be greater than the rate of eustatic sea level rise in western Newfoundland:

> The net effect in this early post glacial interval would be for the sea level to fall relative to the land (Brookes 1974: 27).

There were, however, no radiocarbon dates for sea level positions available at that time with which to construct a relative sea level curve. When the dates were acquired, Brookes (1977) presented a 'first approximation' of the post glacial relative sea level changes of the area. The data at this time indicated that the relative sea level fell from its maximum of 44 meters above the present sea level at ca. 13,500 B.P. to about 15 meters below the present level by ca. 10,000 B.P. falling through the current sea level position at ca. 11,500 B.P. He suggests that after ca. 10,000 B.P. the relative sea level rose to within a few meters of the present sea level by ca. 5,500 B.P.

While the hypothetical sea level curve from ca. 5,500 B.P. to present is not shown, the curve approaches the sent level at 5,500 B.P. suggesting that the relative sea level had reached stability close to this point in time.

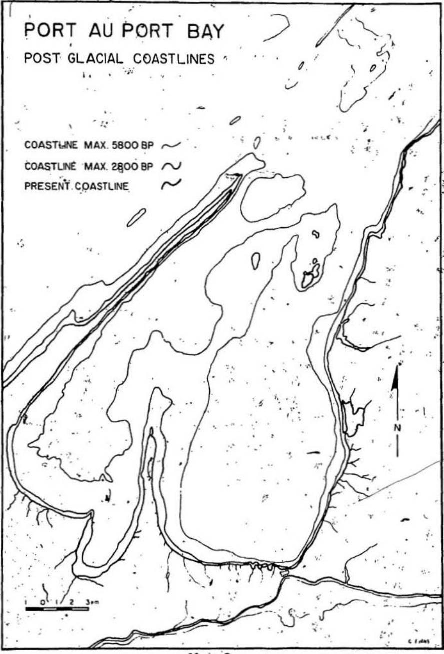
Accordingly, only cultural material deposited along the coast between ca. 11,500 B.P. and ca. 5,500 B.P. would be expected to be subject to flooding. Considering that the earliest known human occupation on the island is at the Beaches site, ca. 4,900 years ago (Carignan 1975b), I felt quite safe in assuming that little if any cultural material had been lost due to post glacial sea level fluctuations. This assumption turned out to be incorrect.

Only after completing the field work for this study did I became aware of a new program of research initiated to acquire additional relative sea level data in Newfoundland (Brookes 1984:pers.com.; Brookes et. al. 1985). The new relative sea level curve for the Port au Port Peninsula region was, to say the least, disconcerting. The new data indicated that the relative sea level fell from 44 meters above the present sea level at ca. 13,500 B.P., fell through the present level at ca. 9,800, and continued to fall to between 11 and 14 meters below the present level at ca. 5,800 B.P. Following this, the relative sea level rose to 2.8 meters below the present sea level at ca. 2,800 B.P., to 1.8 meters below the present sea level at ca. 2,400 B.P. and is currently continuing to rise. Thus, as it is now understood, all cultural material deposited along the coast of the Port au Port Peninsula from ca. 9,800 B.P. to present has been subject to flooding. Cultural material deposited ca. 5,800 B.P., just as man was colonizing the island, may be submerged under as much as 14 meters of water. This flooding is a major factor contributing to the paucity of sites in the region. Relative sea level changes of this magnitude have significantly altered the coastline of the peninsula and as there has been no differential uplift within the region (Brookes 1977:2126) it is possible to use hydrographic charts to plot the coastline of the peninsula as it was during low water periods (Map 2) as a visual representation of the extent of land loss.

Resources

Introduction

A number of researchers have attempted to establish correlations or even causal links between 'environment types' and 'cultural types' (Binford 1980; Jochim 1976; Shalk 1977). The means by which these authors characterize the environments they are working within vary greatly. Binford (1980), for example, used the criterion of effective temperature to determine if an area will have generally patchy resources, uniformly distributed resources, or a mix of these. It is argued that hunter/gatherers in areas with patchy resources will practice logistically organized subsistence strategies, while those in areas with uniformly distributed resources will practice encounter subsistence strategies. Jochim (1976:23) on the other hand extensively quantifies the resource base of a particular area in terms of the ethnographically derived criteria of weight, density,


PORT AU PORT BAY
POST GLACIAL COASTLINES
COASTLINE MAX. 5800 BP
COASTLINE MAX. 2800 BP
PRESENT COASTLINE
N
1 0 1 2 3 km

Map 2

aggregate size, mobility, fat content and non-food yields. To these data he applies an energy based optimization model of hunter/gatherer subsistence behavior and generates an hypothesized exploitation strategy which can then be tested against archaeological data.

The method of characterizing the environment followed here falls between these extremes. It is recognized from Binford's (1980) approach that the spatial and temporal incongruities in the availability of a resource are important. However, characterizing the environment in terms of only a single factor, effective temperature, produces only broad scale results, relating a general type of environment to a general hunter/gatherer type. It is inadequate when it comes to examining the specific adaptations of particular groups in a given environment.

On the other hand, Jochim's method of quantification goes into too much detail for the subsistence-settlement objective defined in this research. His interest lies in determining the relative merits of a set of resources on the basis of the wide range of factors noted above.

The method of this study is to collect archaeological evidence of the resources actually used by prehistoric populations and subsequently present the outlines of culturally specific subsistence-settlement systems by determining when and where these particular resources were available. The detail with which Jochim (1976) pre-judges the relative merits of one resource over another are not relevant for this purpose. Herein it is required only that the resources used by the prehistoric inhabitants of the Port au Port Peninsula be described in terms of their spatial and temporal availability.

Clearly, evidence of each and every resource used will not be recovered from the archaeological record. Thus, to allow the skeletal subsistence-settlement system which will be presented to be speculatively fleshed out, the variety of resources available on and around the peninsula will be described as fully as possible. This speculative model is intended solely to direct future research and the two levels of conclusion reached, the skeletal subsistence-settlement system based on observed data, and the hypothetical subsistence-settlement model, must remain distinct.

Little attempt has been made to control for changes in the environment through time. Some species which may have been present in numbers in the past, but have rarely or never been reported in recent history have been included. Otherwise the list has been compiled primarily on the basis of resources known to be available at the time of European contact.. All of the resources presented are available on or in the immediate vicinity of the Port au Port Peninsula. It will be noted where sources note the presence of a resource in the region. Where sources are not specific, the locations within the region where the resources are most likely to be found will be indicated where possible.

Terrestrial Mammals

There are fourteen species of terrestrial mammals indigenous to insular Newfoundland, as well as two seasonal accidentals which do not maintain breeding populations on the island (Cameron 1958; Dodds 1983; Peters 1967). Of these, two species of bat and the meadow vole are considered to be of minimal economic importance and will not be addressed (Table 5).

Table 5 Terrestrial mammal resources of Newfoundland

Resident;
- Arctic Hare (Lepus arcticus bangsii)
- Newfoundland Beaver (Castor canadensis caecator)
- Newfoundland Muskrat (Ondata zibethicus obscurus)
- Newfoundland Wolf (Canis lupus beothucus)
- Newfoundland Red Fox (Vulpes deletrix)
- Newfoundland Black Bear (Ursus americanus hamiltoni)
- Richardson's Ermine (Mustela erminea richardsonii)
- Newfoundland Marten (Martes americana atrada)
- Newfoundland Otter (Lutra canadensis degener)
- Newfoundland Lynx (Lynx canadensis subsolanus)
- Caribou (Rangifer tarandus caribou)

Accidentals
- Polar Bear (Thalarctos maritimus)
- Arctic Fox (Alopex lagopus)

Arctic Hare

The arctic hare is currently rare and its distribution is limited to the barren highlands of the island (Bangs 1913; Bergerud 1967; Cameron 1958; Dodds 1983). Bergerud indicates that the specific habitats of the hare today in both summer and winter are wind swept boulder fields with numerous inter-rock cavities. The arctic hare was once more numerous and its range probably covered most of the island including woody habitats as well as barrens and coastal areas (Cameron 1958:128). This reduction in range and numbers in considered to be a response to the introduction of the snowshoe hare (Lepus americanus).

In the high arctic the arctic hare is known to congregate in 'bands' during the winter but its behavior regarding seasonal movements varies. Following the breakup of the winter aggregates after the spring breeding season, they will "sometimes move by pairs to the tundra or sea coast", while in other areas they will remain on the same range throughout the year (Cahalane 1947:598). Cahalane (1947:597) also reports that the arctic hare may be "driven down to the flat tundra to find emergency winter subsistence on dwarf willows". This latter pattern of movement has been reported in Newfoundland, although it can not be said whether or not the motivation was a lack of food in the highlands. Mr. Earnest Doanes, who supplied Bangs with many of his faunal specimens from Newfoundland observed that in Newfoundland arctic hares descended to the open plains in winter, but by that time (before 1913) they no longer entered the woodlands (Cameron 1958:75)[1]. Thus while seasonal movements for the arctic hare in Newfoundland have

1 Unfortunately, while Cameron cites Bangs (1913) as the source of this information, there is no such reference in that work.

been observed, these patterns may have been variable thus no generalization as to their movements is proposed here. All that can be said for certain is that they currently live in aggregates year round and that in the past these aggregates may have occurred only in winter.

Newfoundland Beaver

The beaver occurs throughout the Newfoundland, including some of the smaller off shore islands (Cameron 1958). The highest densities occur in "forested lowland, aquatic habitats" (Dodds 1983: 514), but colonies also occur in barren highlands, quite outside the generally accepted habitat of the beaver. While beavers are not known to shift habitats or otherwise move seasonally, the Newfoundland beaver has been noted to abandon lodges and move to new areas more frequently than mainland beaver (Cameron 1958: 80). Any of the waterways draining the peninsula and adjacent mainland would be suitable habitat for them.

Newfoundland Muskrat

The muskrat is most common on the Avalon Peninsula and is found primarily in the drainage basins of large rivers on the rest of the island. They are also found in the interior barrens in rocky lakes and ponds but are not common in this habitat (Cameron 1958; Dodds 1983). As with the beaver, they do not move seasonally but Cameron (1958) observes that they exhaust their feeding grounds and shift to new ones very frequently. This is considered to be the result of the paucity of food plants available in Newfoundland and the virtual absence of their preferred food, the cattail (Typha). In the vicinity of the research area, they would most likely have been found in the Fox Island River drainage basin, and in the basins of the rivers and streams draining into St. George's Bay to the south.

Newfoundland Wolf

The wolf is now extinct in Newfoundland and little is known of it. It was likely derived from the tundra or arctic white wolf (Cameron 1958:91; Dodds 1983:519) and was presumably distributed throughout the island, and available all seasons.

Newfoundland Red Fox

The fox occurs throughout Newfoundland in all habitats (Dodds 1983:52). Northcott (1974:52) indicates that it prefers habitats with mixed coniferous cover, while Dodds (1983:520) considers it likely that carrion along the coast is an important source of their food. It would thus be available anywhere in the research area, probably most easily accessed in the vicinity of meat caches or wherever carrion is available.

Newfoundland Black Bear

The black bear occurs throughout Newfoundland and Northcott (1974:54) indicates that it prefers heavily wooded areas although it moves into open areas in search of food. They would be least accessible in winter as they are dormant in that season, but will travel long distances to intercept salmon runs in spring and early summer. At this time bears will congregate at specific locations along salmon streams where the fish may most easily be caught or where dead salmon will accumulate (Cameron 1958:96; Dodds 1983:521). The most likely such locations around the Port au Port Peninsula would be along the Fox Island River, Port au Port Bay, Harry's River, St. George's Bay and the rivers and streams draining into St George's Bay. They also subsist on raspberries (*Rubus idaeus*), blueberries (*Vaccinium angustifolium*), partridgeberries (*V. vitis-idea*) and bake apples (*R. chamaemorus*) as they ripen through the summer and fall.

Richardson's Ermine

The ermine is found throughout Newfoundland in a variety of habitats, but Northcott (1974:60) describes it as "primarily an animal of the forest". No seasonal movements or aggregates have been reported for the ermine in Newfoundland. It would be available in any of the forested areas on or near the peninsula.

Newfoundland Marten

The original range of the marten probably included all of the well forested regions of the island (Dodds 1983:523). Northcott (1974:67) specifies the Avalon, Bonavista and northern part of the Northern Peninsulas as being outside its range. As with the ermine, they are not known to aggregate or migrate seasonally, and would be available in any of the forested areas on or near the peninsula.

Newfoundland Otter

The otter is a resident of lakes, streams and coastal areas throughout the island. They have very large home ranges, from 24 to 80 kilometers of river, lakeshore or coastline and are thus not found in any great densities. In some coastal areas they apparently move downstream to saltwater bays as ice and snow cover their inland fishing grounds (Cameron 1958:524). They could thus be found along the coast or in freshwater anywhere in the research area during summer, and possibly only along the coast in winter.

Newfoundland Lynx

The lynx is found in coniferous forest and swampy habitats throughout the island. They will move beyond their home range during periods of food scarcity but are not known to aggregate or travel with any seasonal regularity

(Northcott 1974:75). Appropriate habitats are present throughout the peninsula and adjacent forested lowlands.

Caribou

Caribou are currently found throughout Newfoundland, except on the Burin Peninsula, inhabiting barren areas as well as coniferous forest. On the basis of their physical characteristics they are considered to be woodland as opposed to tundra caribou, but they are more migratory than woodland caribou elsewhere (Cameron, 1958:165; Northcott 1974:83).

Both migratory and non-migratory herds occur in Newfoundland. Most migratory herds follow a pattern of shifting northward in the summer and southward in the winter, travelling a distance of no more than 130 to 145 kilometers. Bergerud (1958:4) found no evidence of migration for the herds of the Southern Long Range Mountains which the inhabitants of the Port au Port Peninsula would have exploited. He considered them to travel a negligible distance seasonally, shifting from highlands in summer to adjacent timbered river valleys to the east in winter. Bergerud (1958) does not describe the seasonal aggregates or dispersals of these herds, but I presume that they are similar to those he describes for the migratory herds.

Regarding the migratory herds, summers are generally spent in highlands and winters in lower areas near the coast. Winter aggregates usually number from four to forty animals (Northcott 1974:83). Groups numbering into the thousands may travel together during the spring migration into the highlands. This movement usually correlates with spring breakup, the stags appearing to lag behind the does (Bergerud 1958:4). By the latter half of May the interior herds are widely scattered into small groups of one to three animals. Following calving in May, small doe-calf herds will form. During the heat of summer caribou will seek windy open hill tops to escape from the warble fly:

> These flies are thought to be the primary factor influencing the herd structure and distribution in the summer and play an important role in scattering doe-calf herds (Bergerud 1958:8).

Rutting occurs primarily in October (Bergerud 1961) and the fall migration begins at its end, usually marked by the first heavy snowfall (Dugmore in Cameron 1958). The fall migration is a much more rapid movement than the spring migration, especially if the onset of cold weather has been delayed.

To summarize, caribou in the vicinity of the Port au Port Peninsula occur in the largest aggregates during winter in timbered river valleys. This is followed by a period of dispersal in the adjacent highlands through the spring and early summer, and small aggregates are available in the highlands later in summer and fall. It is possible that the peninsula supported a caribou population which followed this seasonal pattern. Alternatively, or in addition to a local population, mainland caribou may have used the Port au Port

Peninsula as a summering ground. In either case, due to the pattern of minimal seasonal movements for caribou in the vicinity of the Port au Port Peninsula, prehistoric human populations living on the peninsula would not likely have had to travel any great distance to acquire caribou in any season.

Polar Bear and Arctic Fox

While breeding populations of these species are not maintained on the island, there have been regular reports of them being carried to the island on winter ice pack (Cameron 1958, Dodds 1983; Northcott 1974). They appear primarily on the northeast coast with pack ice which is present in this region usually from the second week of February until late May, but can be present from late December to late June (Farmer 1981:72). Cameron (1958:98), however, reports that one was killed on the northwest coast, at Port au Choix, in 1936. This would appear to be a rare occurrence as ice along the west coast generally originates from the Gulf of St. Lawrence ice pack to the south. They would be similarly rare on the southwest coast in the vicinity of the Port au Port Peninsula.

Sea Mammals

A total of seven species of pinnipeds and sixteen cetaceans are found, or once occurred (Table 6), in the coastal waters of Newfoundland (Mansfield 1967; Mercer 1976a).

Table 6 Marine mammal resources of Newfoundland

Pinnipedia
- Harbor Seal (*Phoca vitulina*)
- Grey Seal (*Halichoerus grypus*)
- Harp Seal (*Pagophilus groenlandicus*)
- Hooded Seal (*Cystophora cristata*)
- Ringed Seal (*Pusa hispida*)
- Bearded Seal (*Erignathus barbatus*)
- Walrus (*Odebenus rosmarus*)

Cetaceans
- Fin Whale (*Balaenoptera physalus*)
- Sei Whale (*Balaenoptera borealis*)
- Blue Whale (*Balaenoptera inusculus*)
- Minke Whale (*Balaenoptera acutorostrata*)
- Humpback Whale (*Megaptera novaeagliae*)
- Black Ringed Whale (*Balaena glacialis*)
- Gray Whale (*Eschrictius robustus*)
- Sperm Whale (*Physeter catodon*)
- Northern Pilot Whale (*Globicephala malaena*)
- Bottle Nose Whale (*Hyperoodon ampullatus*)
- Killer Whale (*Orcinus orca*)
- Harbor Porpoise (*Phocoena phocoena*)
- Beluga (*Delphinapterus leucas*)
- White-sided Dolphin (*Lagenorhynchus acutus*)
- White-beaked Dolphin (*Lagenorhynchus albitostris*)

Harbor Seal

The harbor seal is found on all coasts of Newfoundland except Trinity Bay, Conception Bay and the east coast of the Avalon Peninsula. Aggregates of up to several hundred may occur during the breeding season between mid-May and mid-June. These groups will usually be located on the sand banks and mud flats of river estuaries or on reefs and rocky islets. Large groups may also be found in late summer or fall in favored feeding areas. Other than during these periods they are generally well dispersed and may often be found in freshwater far from the coast. The harbor seal is never associated with fast ice. Thus its distribution in late winter and spring is restricted to the south and southwest coasts of the island (Mansfield 1967) as the south coast remains ice free year round and there is often a shore lead running up the southwest coast in winter and spring (Farmer 1981:70; Steele 1983:431).

They would be absent from the region in late winter or spring except during years when the shore lead of the southwest coast reached as far as the peninsula. Local residents indicate that harbor seals frequented Shoal Point, Port au Port Bay until 1973 and that they are still found on the rocks 11 kilometers northeast of the tip of the Bar.

Grey Seal

The grey seal follows a pattern of wintering in its breeding grounds and dispersing in spring and summer. Aggregates of up to several hundred females occur during the breeding season, but there are no breeding grounds along the Newfoundland coast. Very large aggregates, sometimes more than one thousand animals, may be found in preferred summer feeding areas. The grey seal is a summer resident of Port au Port Bay, Fortune Bay, Hare Bay and Notre Dame Bay (Mansfield 1967).

Harp Seal

The harp seal is a migratory seal found in dense concentrations in its breeding areas on the ice fields of the Gulf of St. Lawrence (the 'Gulf' herd) as well as off the southern coast of Labrador and the northeast coast of Newfoundland (the 'Front' herd). Very large numbers occur along the migration routes as major portions of the population pass through an area in a short period of time.

Harp seal movements are largely determined by the annual formation and movement of sea ice. Whelping takes place in early March in both breeding areas and some newborn Front seals drift into the Gulf on ice and may be driven on shore in March and April. Adults breed a few days after birth and this is followed by a moulting period. The Front herd moults while drifting on ice and continues to do so while starting to swim north while the Gulf herd moults in open water in their breeding area (Sergeant 1965).

Following the moult the Gulf herd moves northward in May and June, mostly passing through the north side of the Gulf and coming close to shore only near the Strait of Belle Isle. They then follow the Front herd farther north to Greenland and the eastern Canadian arctic (Sergeant 1965).

After a summer dispersal in the arctic all but a few immature harp seals will move south with the ice advance, the Gulf herd passing through the Strait of Belle Isle in December according to Sergeant (1965) and January according to Mansfield (1967). This southward migration is slower than the northward movement and the seals travel closer to shore where they are more susceptible to being netted (Sanger 1973; Sergeant 1965). It is uncertain where the seals are for a period following their southward migration, although Sergeant (1965:448) considers them to be dispersed, remaining well off shore until they return to their breeding grounds in late February.

To summarize, young harp seals from the Front herd may be available in the vicinity of the Port au Port Peninsula in March and April. In June and July the Gulf herd passes through the Gulf of St. Lawrence but the majority will by-pass the peninsula, remaining off shore and in the north side of the Gulf. It is not until December or January on the last leg of their southern migration that they will again be present in the vicinity of the peninsula in any great numbers.

Hooded Seal

The hooded seal is a migratory species which breeds in large aggregates on pack ice among the harp seal Gulf herd and on heavier pack ice to the seaward of the harp seal Front herd. These groups are, however, more widely dispersed than the harp seal aggregates. Pups are born in the latter half of March and are suckled for eight to ten days. The adults breed immediately following this period then leave the pack ice to move north. It is uncertain whether the Gulf herd starts the migration north in late March or early April as do the hoods on the Front, or if they delay until May and June to wait for the Strait of Belle Isle to clear of ice as do the Gulf harp seals.

Most moult off the east coast of Greenland in June then begin to migrate south in September, reaching the Strait of Belle Isle in December at about the same time as the harps. They are thus available in the vicinity of the Port au Port Peninsula in roughly the same periods as the harp seal, some time between March and June and again in December or January, but they are much fewer in number and remain farther off shore than the harp (Mansfield 1967; Sanger 1973).

Ringed Seal

The ringed seal is widely distributed across the arctic, its range extending to the lower north shore of the Gulf of St. Lawrence and the northeast coast of Newfoundland. It is non-migratory and inhabits areas where stable fast ice may be found in winter and spring. They are rarely found on floating pack ice. They are not known to congregate in large numbers, but will remain in an area year round with the adults maintaining breathing holes through the fast ice in winter and immature seals remaining at the edge of fast ice (Mansfield 1967).

At the southern end of their range the young are born in the beginning of April, birth taking place in lairs on fast ice. Success in breeding, and thus their population density is determined to a large extent by the presence of secure fast ice. More seals will be present in areas with complex coastlines while in areas with straight coastlines fast ice will be unstable and many pups will be separated from their mothers and die (Mansfield 1967). They would be available year-round in the waters of the Port au Port Peninsula, but not likely in as great numbers as in the islanded bays and inlets of the northeast coast of Newfoundland or the Labrador coast.

Bearded Seal

Newfoundland is included within the southern limit of the bearded seal's range. They are a non-migratory solitary seal preferring shallow waters. Pups are born on floating ice in April and May in the eastern arctic, slightly earlier in Newfoundland. They will often 'haul out' to rest on ice or on sand bars in river mouths during the ice free season (Mansfield 1967). The shallow waters of Port au Port Bay and the estuaries of St. George's Bay are ideal habitats for this seal.

Walrus

The range of the walrus currently excludes Newfoundland, but breeding herds were once present in the Gulf of St. Lawrence. They are inevitably found in large aggregates either near open leads on pack ice or on small islets or promontories which provide access to deep water. The locations where these aggregates occur on land are returned to annually (Mansfield 1967). The tip of Long Point and the rocky islands seven miles to the north are likely locations for such aggregates.

Cetaceans

There is much variation between different species of whales in terms of their habits and migrations. It may be generalized, however, that whales are available in Newfoundland's inshore waters only during the summer months. The pilot whale is of particular note as it may be driven ashore easily in pods. This small whale subsists primarily on squid which, however, is scarcer on the west coast of Newfoundland than in other areas around the island. The sperm whale and bottlenose whale also rely mainly on squid and are relatively scarce on the west coast as well (Mercer 1976a).

Fish

The marine fish resources of Newfoundland include several species of abundant pelagic fish, a variety of exploitable mollusks and one exploitable crustacean. Nineteen species of fish occur in freshwater on the island of which only nine will be addressed (Table 7). The

Table 7 Fish resources of Newfoundland

Pelagic Fish
- Capelin (_Mallotus villosus_)
- Cod (_Gadus morhua_)
- Atlantic Mackerel (_Scomber scombrus_)
- Atlantic Herring (_Clupea harengus harengus_)

Shellfish
- Short Finned Squid (_Illex illecebrosus_)
- Soft-shelled Clam (_Mya arenaria_)
- Bar or Surf Clam (_Spisula solidissima_)
- Bay Quahaug (_Mercenaria mercenaria_)
- Blue Mussel (_Mutilus edulus_)
- Rough Whelk (_Buccinum undatum_)
- Common Periwinkle (_Littorina littorea_)
- Moon Snail (_Lunatia heros_)
- Lobster (_Homarus americanus_)

Fresh Water and Anadromous Fish
- Atlantic Sturgeon (_Acipenser oxyrhynchus_)
- Atlantic Salmon (_Salmo salar_)
- Arctic Char (_Salvelinus alpinus_)
- Brook Trout (_Salvelinus fontinalus_)
- American Smelt (_Osmerus mordax_)
- American Eel (_Anguilla rostrata_)
- Tom Cod (_Microgadus tomcod_)
- American Sand Lance (_Ammodytes americanus_)
- Winter Flounder (_Pseudopleuronectes americanus_)

remaining freshwater species occur with great rarity or are small and do not occur in large aggregates. As a result of the salt water barrier surrounding Newfoundland, all species of fish native to the brackish estuaries and freshwaters of Newfoundland are to some degree eurhalyne, that is, they have a tolerance to a wide range of salinity. The diversity of species is quite small as the closest land mass to Newfoundland, southern Labrador, itself has a small diversity of freshwater fish species (Scott and Crossman 1964:103). For a complete list of freshwater species in Newfoundland see Scott and Crossman (1964). Leim and Scott

(1966) provide a comprehensive treatment of the marine species of the region.

Capelin

Capelin are readily available on beaches throughout the island in June and early July as they 'roll in' to spawn. Their annual appearance is very regular on the south and northeast coasts, but is somewhat less so on the west coast. Their spawning behavior is largely dependent on water temperature and along the west coast the absence of the cold Labrador Current allows the water temperature to rise so fast that beach spawning is often replaced by deep water spawning (Jangaard 1974). Capelin were observed spawning on the beaches of the western shore of the Port au Port Peninsula in the first week of July in 1983.

Cod

Cod generally spend winters in deep water offshore and are available during summers when they are inshore in search of capelin (Leim and Scott 1966; Steele 1983:445). Pinhorn and Wells (1976) indicate that the west coast stock is concentrated in the southwest coast area in winter and disperses into the Gulf in spring and summer.

Atlantic Mackerel

Mackerel occur in large schools, wintering in moderately deep water in the southern Gulf of St. Lawrence, migrating inshore to the northeast in spring (Leim and Scott 1966) and thus would be available around the Port au Port Peninsula during the summer.

Atlantic Herring

Herring are abundant in Newfoundland waters and form large aggregates generally in association with low water temperatures and spawning activities. There are two annual spawning periods, each probably representing separate populations. They are more easily accessible during the spring spawn in which they tend to approach shallower inshore waters while the summer or fall spawn occurs farther offshore (Leim and Crossman 1966). While they are present year-round, they would be inaccessible during late winter and early spring due to ice cover.

Shellfish

The short finned squid is available in inshore waters by July or early August at the earliest and are out of Newfoundland waters by mid-November. They travel inshore in the upper warm water layer and if they arrive late, at the end of June or early July when the warm water layer is thin, they will often run ashore. They are most common on the south and northeast coasts and are rather scarce along the west coast (Mercer 1976b).

The habitats of each of the remaining shellfish range from the splash zone through the intertidal zone to subtidal and deep water but all are available in at least the intertidal zone (Dawe, Newell and Wells 1972; Mercer 1976b). The meat quality of the blue mussel is at a peak from the middle of May to early August. After this period they spawn and lose up to half of their body weight (Mercer 1976b).

The lobster is common in Newfoundland waters. Despite fishermen's assertions of a fall offshore and a spring onshore migration, tagging operations have identified no such seasonal movements (Rutherford, Wilder and Frick 1967). They would thus be available throughout the ice free season.

Atlantic Sturgeon

Although it has been encountered only rarely in waters off Newfoundland and its presence in rivers on the island has never been verified it is possible that the sturgeon does or did spawn in Newfoundland. They enter rivers in the fall, after the finish of the salmon run in September, and the lack of reports could be due to them 'slipping by' when fishermen are not active on the rivers. Further up the St. Lawrence estuary in areas where they were once thought to be exceedingly rare or extinct, large runs of sturgeon have been recently discovered (Gibson 1985:pers.com.). All saltwater reports of sturgeon off the coast of Newfoundland have been in July (Scott and Crossman 1964:16). Some of the larger rivers emptying into St. George's Bay are the most likely candidates in the region for sturgeon runs.

Atlantic Salmon

Both the landlocked salmon, or ouananiche, and anadromous forms of Atlantic salmon occur in Newfoundland. Ouananiche are found in most regions of the island, essentially everywhere they have been looked for and they probably occur in areas where little research has been done or angling pressure is minimal (Scott and Crossman 1964:37). They spend the majority or all of the year in lakes, leaving them only in the fall to spawn if appropriate streams are available. In the absence of spawning streams they will spawn on gravel shoals in the lake. The spawn occurs in October and movement into the streams is usually triggered by increased runoff of moderately cold water in lake tributaries following rains.

The anadromous form of Atlantic salmon is found throughout Newfoundland. The timing of entry into freshwater, as well as the spawn itself varies with latitude and the size and runoff characteristics of the river itself. In southwestern Newfoundland there are two runs into freshwater, in July, and again in August-September (Gibson 1985:pers.com). Runs in larger rivers start slightly earlier than in smaller ones. The spawn for both the summer and fall runs occurs in October. Atlantic salmon do not die after spawning but will move down to a pool and rest for a few weeks then usually swim back to the sea. Male salmon, however, may overwinter in the pool (Scott and Crossman 1964:194).

Thus, while landlocked salmon are available year-round, and anadromous salmon are present in rivers and spawning streams from as early as July through to October and sometimes through the winter, they can be most easily caught in great numbers during the periods they move up the rivers in dense aggregates in preparation for spawning (July and again in August-September). Flesh quality is also best during these runs, as opposed to during the spawn or later in winter for salmon do not eat upon entering freshwater.

Most of the drainage systems in the Port au Port Peninsula area are suitable for the spawning of salmon, but some are more productive than others. The productivity of a river is a function of the amount of accessible rearing area for young salmon (stream bottom with gravel, rubble or boulder composition, Pippy 1982). In an examination of salmon productivity in Newfoundland (Pippy 1982), the rearing area available for young salmon was determined for thirteen salmon rivers in St. George's Bay, and one in Port au Port Bay. Harry's River, which empties into the mouth of the St. George's River 33 kilometers southeast of the isthmus, was found to have the largest rearing area, and thus the greatest productivity. It is followed by Southwest and Bottom Brook, Crabbes River, Flat Bay Brook, and Robinson's River, all of which feed into St. George's Bay.

In terms of salmon productivity across the island, Pippy (1982) divided Newfoundland into fourteen statistical areas. The Port au Port Peninsula is included in his areas L and K. Area L extends from the southwest corner of the peninsula northward to encompass Bay of Islands and is judged to produce the third greatest number of salmon of all the areas. Area K extends from the southwest corner of the island north to the southwest corner of the peninsula and is estimated to be the sixth most productive in terms of numbers of fish. Areas K and L, however, rank first and second respectively in terms of producing the greatest number of large salmon (Pippy 1982:85).

Arctic Char

Both the anadromous and landlocked forms of Arctic char are found in Newfoundland. Their presence was only discovered in 1949 and the extent of their range on the island has not been completely investigated. The landlocked form is known to occur in the watersheds of the major rivers on the southwest coast, northeast coast and the Avalon Peninsula. Scott and Crossman (1964) report that the landlocked char of Butt's Pond in the watershed of Freshwater Bay spawn in late October and early November in a shallow (1 to 1.5 meters deep) rocky bay.

Anadromous char overwinter in lakes and run to the sea just prior to or during the breakup of river ice. They return to freshwater and spawn in the fall, the larger females being the first to enter the rivers (Scott and Crossman 1964). Arctic char are not as good jumpers as Atlantic salmon and are more susceptible to weir fishing. Only one run of anadromous char has yet been identified on the island, in Park's River (West River), Pistolet Bay on the Great Northern Peninsula. Possibly anadromous populations have been reported from Middle Brook, Parson's Pond River and Capelin Cove Brook, Baie Verte Peninsula. Additional anadromous populations probably exist in the northwestern part of the island.

To summarize, while anadromous populations appear to be restricted to the northwest of Newfoundland, landlocked char are available on the southwest coast. The landlocked char are accessible year-round but based on observations at Butt's Pond they do not appear to run from interior lakes and ponds up rivers and streams to spawn and thus do not present themselves as an easily collectible resource before their spawn as do anadromous char, salmon and trout.

Brook Trout

The brook trout is the most abundant freshwater fish on the island and its distribution has been described as universal, occurring in suitable waters everywhere in Newfoundland. Both the anadromous 'sea trout' and the non-anadromous 'mud trout' are present. They are most easily captured in large numbers during their spawn. If appropriate streams are available, mud trout move into spawning streams in the fall. Otherwise spawning takes place in ponds and lakes. The precise timing of the spawn varies according to water temperature and flow. Frost (in Scott and Crossman 1964:64) indicates that the spawn in Murray's Pond, near St. John's occurs between October 14 and November 18.

Most sea trout overwinter in fresh water running to the sea in spring and summer, the run peaking from late April to early June. After spending two months at sea the majority will ascend rivers in July in order to spawn later in the fall. Again timing is a function of temperature and flow and varies from river to river. Some fish will move inland very quickly while others move upstream more gradually. Smith and Saunders (in Scott and Crossman 1964:72) report a second ascent in November. Both anadromous and non-anadromous populations would likely be present in most drainage systems in the Port au Port Peninsula region.

American Smelt

Smelt are normally only anadromous but landlocked forms also occur in Newfoundland. Scott and Crossman (1964:76) report that smelt eggs were planted in lakes across the island in 1893 and 1895 and that this may account for the presence of the non-anadromous forms.

Smelt are present in suitable bays and estuaries around the island. Jeffers (in Scott and Crossman 1964) reports large numbers in the rivers of Notre Dame Bay, the Humber river mouth and Port au Port Bay. Their numbers have been sufficient to support a fall commercial fishery in Notre Dame Bay and St. George's Bay. Spawning occurs in the early spring in streams and rivers above the level of the tide. While not reported in Newfoundland, in some areas smelt will enter estuaries in the fall, remaining there throughout the winter until the spring spawn. Most estuaries in the research area would be suitable for their spawn.

American Eel

The eel is common in streams and rivers in Newfoundland. They spawn in the southwest North Atlantic and the young work their way into the coastal rivers and inland lakes as 5 to 9 centimeter long elvers in early April to late June. They stay in freshwater for a period of five to ten years before they mature sexually. The sexually mature 'silver' eels may be captured on their fall downstream migration to spawn in the sea, while the adult but sexually immature 'yellow' eels are available in freshwater year-round (Eales 1968).

Tom Cod

Freshwater capture of the tom cod has been reported in Deer Lake of the Humber River system as well as from a stream flowing into Pistolet Bay. It is possible that it occurs in freshwater in other areas of the island (Scott and Crossman 1964:86). They spawn in estuaries in December and January, sometimes moving into streams or rivers beyond tidal influence. They are most common in fresh or brackish water during the spawn, but may be present throughout the winter.

American Sand Lance

The sand lance is normally a marine species which is common to the south of Newfoundland, off the New England coast where its ecological role is somewhat similar to that of the capelin (Gibson 1985:pers.com.). Scott and Crossman (1964:99), however, report large numbers of them in the lower part of a small brook in Picadilly Bay, Port au Port Bay. No explanation for their presence in this estuary is offered and they make no suggestions as to its seasonal availability. They note only that the collections were made in mid-July.

Winter Flounder

This is a marine species common to the shallow waters of the Canadian Atlantic coast. Its young, as do the young of many marine species, frequent brackish estuaries. While there have been few reports of young flounder in Newfoundland estuaries, it is of value to note that Scott and Crossman (1964) have recorded their presence in a small brook in Picadilly Bay, Port au Port Bay.

Avifauna

Leslie M. Tuck (1967) reports the presence of 269 species of birds in Newfoundland, many of which are considered to be of economic importance. These are presented by family (Table 8).

Loons

Two species are present in Newfoundland, the red-throated (Gavia stellada) and the common loon (Gavia immer). Both are present primarily in the warmer seasons, but only the latter breeds on the island. Small numbers of both species overwinter on the island.

Grebes

Three species are present, each in the fall and winter for breeding.

Table 8 Bird resources of Newfoundland

Loons (Gaviidae)
Auks (Alcidae)
Cormorants (Phalacrocoracidae)
Swans, Geese and Ducks (Anatidae)
Shearwaters (Procellariidae)
Storm Petrels (Hydrobatidae)
Gannets (Sulidae)
Gulls and Terns (Laridae)
Herons and Bitterns (Ardeidae)
Rails, Gallinules and Coots (Rallidae)
Plovers (Charadriidae)
Sandpipers and Phalaropes (Scopacidae)
Pheasants (Phasianidae)
Hawks, Eagles etc. (Accipitridae)
Ospreys (Pandionidae)
Falcons (Falconidae)
Owls (Tytonidae and Strigidae)
Pigeons and Doves (Columbidae)
Crows, Jays etc. (Corvidae)

Auks

Seven species of this family are present in Newfoundland. Of these, the great auk (Alca impennis) is now extinct. They are most easily caught in numbers during the summer when they congregate to breed on islands off the coast. They spend all winter at sea (Peterson 1980).

Cormorants

Two species are present year round in Newfoundland. The common cormorant (Phalacrocorac carbo) breeds in several small colonies on the west coast, at Port au Port and Bay of Islands.

Geese, Swans, and Ducks

Except for occasional accidentals, no swans are present in Newfoundland but there are numerous representatives of the sub families of: goose (Aniserinae), marsh ducks (Anatinae), diving ducks (Aythynae) and mergansers (Merginae). The most common goose is the Canada goose (Branta canadensis) which nests in the interior on small islands in ponds or on the shores of larger lakes. Young for the most part remain in the interior until they can fly, but some drift down small streams to the coast. They are known to overwinter at Stephenville Crossing, St. George's Bay, and in the Codroy valley numbering up to five thousand and would thus have been available to the prehistoric inhabitants of the Port au Port Peninsula year-round. Three other species occur in small numbers in the fall.

Ten species of marsh ducks have been recorded in Newfoundland. Of these, the black duck (Anas rubripes) the green-winged teal (Anas carolinensis) are the most common. They, along with the pintail (Anas acuta) both overwinter and breed in Newfoundland. The remaining species are absent in winter.

There are thirteen species of diving ducks in Newfoundland. The ring-necked duck (Aythya collaris) is presently the third most common duck which breeds on the island. The remaining species are primarily winter residents, some of which have been known to breed on the island as well.

Three species of mergansers are present. The hooded merganser (Lophodytes cucallatus) is a rare summer resident. The common (Mergus merganser) and red-breasted merganser (Mergus serrator) are year round residents. Both winter in coastal areas, the latter breeding along large lakes and rivers and the former breeding from estuaries along the coast to the interior barrens. The red-breasted merganser and the Canada goose are thus the only waterfowl which may be present in the interior barrens. It is also important to note that those geese and ducks which breed in Newfoundland would be most easily caught during their various moults, which for most species take place in the summer and fall.

Shearwaters

Shearwaters are open sea birds which breed on offshore islands, three species being present in bays around the island in summer.

Storm Petrels

These are small open sea birds, the Leach's petrel being particularly abundant. It breeds in burrows on offshore islands.

Gannets and Boobies

The gannet is the only species of this family present in Newfoundland. It is a summer resident, breeding in large colonies on offshore islands.

Gulls and Terns

Twelve species of gull and five species of tern have been recorded in Newfoundland. The herring gull (Larus argentatis) is the most common gull and is present year round. The great black-backed gull (L. marinus) is the only other year round resident, the remaining species comprising a mix of seasonal summer or winter occupations or are accidentals. All tern species in Newfoundland are either summer breeding residents or summer accidentals.

Herons and Bitterns

The American bittern (Botaurus lentiginosus) is a common summer resident breeding along marshy ponds and lakes. The remaining nine species are either rare or are summer accidentals.

Rails, Gallinules and Coots

Eight species of this family have been recorded in Newfoundland. The sora (Porzana carolina) is known to nest near Stephenville and the American coot (Julica americana) is widely distributed in the fall. The remaining species are rare or are accidental summer occurrences.

Plovers

Seven species of this family are common on sandy beaches in Newfoundland in spring, summer and/or fall.

Sandpipers and Phalaropes

Twenty five species of these wading birds have been recorded on the island. The purple sandpiper (Erolia maritima) is the only sandpiper to winter regularly in Newfoundland. It is found primarily on the southern shore of the Avalon Peninsula and the south coast. The white-rumped (Erolia fuscicollis) and semipalmated (Ereunetes pusillus) sandpipers are the most common fall shore birds in Newfoundland. The whimbrel (Numenius phaeopus) is common in the barrens in fall and is rarely seen on the coast. The Eskimo curlew (Numenius borealis), now nearly extinct in Newfoundland, was once present in great numbers in the fall. The remaining members of this family are for the most part rare or accidental present in the summer and/or fall.

Pheasants

Two species are represented, the willow ptarmigan (Lagopus lagopus), which is widely distributed, and the rock ptarmigan, (Lagopus mutus), which frequents the higher mountains and ridges, especially the Long Range Mountains.

Hawks, Eagles etc.

Six species have been recorded on the island. The bald eagle (Haliaetus leucocephalus) is common year round and is known to congregate in numbers up to one hundred in Hermitage and Fortune Bays during herring runs (herring spawning is concentrated in May and again in September) and aggregates of this nature may have taken place in other parts of Newfoundland in the past. Ahrens (1984) reports that the traditional herring fishery took place in Fortune Bay and the area of the Port au Port Peninsula, and while this may have been due to historical reasons, it is possible that an abundance of herring in the region attracted large numbers of bald eagles seasonally. The sharp-shinned hawk (Accipiter straitus) is also present year round and the golden eagle (Aquila chrysaetos) is a winter resident. The remaining species are fall residents which will on rare occasions breed in Newfoundland.

Ospreys

The osprey (Pandion haliaetus) is the only representative of this family in Newfoundland. It is a common summer resident found mostly along large rivers and lakes or in estuaries.

Falcons

The pigeon (Falco columbarius) and sparrow (F. Sparverius) hawks are common breeders in Newfoundland, but only the former has been recorded in winter. The gyrfalcon (F. rusticolus) is rare but has been common during winter in some years. The peregrin falcon (F. peregrinus) is a rare fall visitor noted mostly along the coast.

Owls

There are seven species of owls in Newfoundland. The horned owl (Bubo virgianus) is a year round resident in heavily wooded areas. The short-eared owl (Asio flammeus) is a late summer migrant along the coastal barrens which will on rare occasions breed or overwinter in the island. One was observed by the author on the Point Riche Peninsula, near Port au Choix in the summers of 1984 and 1985. The remaining species are rare and/or are winter visitors which do not frequently breed in Newfoundland.

Pigeons and Doves

The rock dove (Columba livia) is a year round resident and the mourning dove (Zenaidura macroura) is present during the summer and fall, and will on rare occasions overwinter.

Crows, Jays etc.

There are four representatives of this family. The common raven (<u>Corvus corax</u>) is widely distributed and winters on the coast. The common crow (<u>C. brachyrhynches</u>) is present year round but is rare on the north end of the Great Northern peninsula.

<u>Plant Resources</u>

Peter J. Scott (1975) lists forty-six species of berries present in Newfoundland. These ripen in the late summer and fall, although many remain edible through the winter and spring and some are known to improve in flavor with freezing. Scott (1975) also presents twenty species of edible herbs, again some of which are available or even at their best after having been frozen.

As noted in the introduction to this chapter, both hard woods (primarily mountain maple and birch) and soft woods (primarily balsam fir and black spruce) are available in the Port au Port Peninsula region for use as fuel and as a raw material for the manufacture of tools.

<u>Lithic Resources</u>

Chert outcrops occur commonly in the Ordovician sedimentary deposits of Newfoundland's west coast (James and Stevens 1982; Nagle 1984:106). The deposits extend from the

Port au Port Peninsula to the tip of the Great Northern Peninsula. Prior to this research only two sources have been identified which were used by prehistoric populations, those at Cow Head and Factory Cove, and Nagle (1985) has recently reported four more from Gros Morne National Park on the west coast of Newfoundland. The discovery of chert outcrops which were exploited on the Port au Port Peninsula has increased this sample, and more sources will inevitably be found in these Ordovician deposits in the future.

The Port au Port Peninsula sources are of particular importance in terms of the dynamics of population movement and/or trade up and down the coast of Newfoundland and into the interior. For example, as the southern terminus of the chert rich Ordovician deposits, the Port au Port Peninsula would serve as the closest supply of chert to groups living to the south of and east of the peninsula. Thus, groups in these areas would have to maintain lengthy travel/trade routes to the peninsula, while those living in the chert rich northern part of the west coast would have little difficulty maintaining their supply of chert with a minimum of travel and/or trade. The identification of differences in patterns of resource exploitation of this nature will contribute greatly to our understanding of the relationship between man and his environment.

Many sources of soapstone have been identified in Newfoundland, Labrador, and northern Quebec. Only two of these, L'anse aux Meadows and Fleur de Lys, are located on the Island of Newfoundland (Nagle 1984, 1985), but additional sources are likely to be discovered. Most of the outcrops are small, and evidence of quarrying activities have been discovered only at Fleur de Lys, on an unnamed island immediately west of Napatalik Island north of Hopedale (Nagle 1985), and at Saglek Bay (Tuck 1986:pers.com.).

An attempt to characterize soapstone outcrops using discriminant function analysis of trace element data has met with partial success. Of 167 samples collected from 27 sources (including those on the Island of Newfoundland) only 70.7% were correctly classified by the statistical analysis (Nagle 1984:143). While it is possible that the sources do not differ sufficiently to allow "absolute separation", Nagle (1984:150-51) notes that some of the assumptions of the statistical analysis were violated and that some sources had insufficient sample sizes to characterize their variability. He concludes, however, on a positive note indicating that additional samples from each source would result in greater reliability of source identification.

The only source of nephrite which has been discovered in Newfoundland, Labrador and the eastern Canadian arctic is located in Noddy Bay on the northern tip of Newfoundland's Great Northern Peninsula but additional sources are expected to be located in the Ramah and Mugford Groups of northern Labrador and in a small area to the South of Hopedale in southern Labrador (Nagle 1984). Fifty-two samples of nephrite collected from archaeological contexts along the central Labrador coast and a sample from Noddy Bay were subjected to a statistical analysis of their trace element characteristics and the results indicate that the samples may be derived from four discrete geological sources, three presumed to be in Labrador and the fourth being the one at Noddy Bay (Nagle 1984).

While no regional correlations were apparent between the archaeological sites from which the samples were collected and the areas potentially containing sources, temporal trends were identified. Nephrite samples from Early Dorset sites fell into only one of the statistical groups, that group presumably representing a source in Labrador. Samples from Middle Dorset sites fell into each of the four groups, suggesting they were derived from sources in both Newfoundland and Labrador. Finally, samples from Late Dorset sites fell only into the three groups, suspected to be in Labrador. Nagle (1984) finds this pattern to be consistent with the spatial and temporal distribution of Dorset populations in Newfoundland and Labrador. He considers the early pioneering groups to have exploited fewer sources due to a lack of knowledge of the available resources. The later groups having become more familiar with the lithic resources around them exploited a larger number of sources, and having expanded their range to Newfoundland also took advantage of the Noddy Bay source. Finally, upon withdrawal from the island in Late Dorset times, a variety of Labrador sources are exploited, but material from the Noddy Bay source in Newfoundland is no longer used.

Summary

Having presented the set of potential resources available to the prehistoric inhabitants of the Port au Port Peninsula, the chapter will be concluded with a summary of their aggregate peaks and seasonal availability (tables 9 to 12). This body of data will be used in conjunction with the faunal remains recovered to formulate outlines of the subsistence-settlement systems of the populations discovered in the course of the field work. This will be accomplished by determining, if possible, the season during which each of the species represented in the faunal sample was exploited. It will also provide a data base from which speculative subsistence-settlement models will be forwarded by listing sets of resources for which evidence of use was not recovered, but which were available exclusively in the seasons which the sites were determined to have been occupied. The following chapter will describe the survey and excavation activities which were carried out, and serve to introduce the archaeological entities which were discovered.

Table 9 Aggregate peaks and seasonal availability of terrestrial mammal resources

```
Resource                      Season

                J    F    M    A    M    J    J    A    S    O    N    D
--------------------------------------------------------------------------
arctic hare    --------------------------------------------------------
beaver         --------------------------------------------------------
muskrat        --------------------------------------------------------
wolf           --------------------------------------------------------
red fox        --------------------------------------------------------
black bear     - - - - - - - - ------------******----------------- - -
ermine         --------------------------------------------------------
marten         --------------------------------------------------------
otter          *?*?*?*-----------------------------------------*?*?*?*
lynx           --------------------------------------------------------
caribou        ***************-------------*-*-*-*-*-*-*-*-*-******
                  valleys                    highlands             val.
polar bear     - - - - - - - - - - - - - - -
arctic fox     - - - - - - - - - - - - - - -
```

Table 10 Aggregate peaks and seasonal availability of marine mammal resources

```
Resource                      Season

                J    F    M    A    M    J    J    A    S    O    N    D
--------------------------------------------------------------------------
harbor seal    -?-?-?-?-?-  ************----------*******-?-?-?
grey seal                            **************
harp seal      ***              - - - -*?*?*?*                         *
hooded seal    ---            (------)or(------)                       -
ringed seal    --------------------------------------------------------
bearded seal   --------------------------------------------------------
cetaceans                              ---------------
```

```
- - - - -    rare or difficult to access

-?-?-?-?-    possibly present

---------    present

*********    aggregate

*?*?*?*?*    possible aggregate
```

Table 11 Aggregate peaks and seasonal availability of fish resources

```
Resource                 Season

                J   F   M   A   M   J   J   A   S   O   N   D
-------------------------------------------------------------
capelin                            *******
cod                              ---------------
mackerel                        ----------------
herring                        *****----------*-*-*-*-*------
squid                                  = - - - - - - - - - - -
blue mussel                   --(peak weight)----------------
other
 bivalves                      ------------------------------
lobster                        ------------------------------
sturgeon                                              -?-?-?-
salmon       --------------------*****-------********--------
arctic char  -------------******--------------*******--------
brook trout  -----------------******----****------------****-
smelt        -?-?-?-?-?-?-?-?-*****                 -?-?-?-?-
eel          -----------------------------------********-----
tom cod      ****-?-?-?-                             -?-?-**
sand lance   -?-?-?-?-?-?-?-?-?-?-?-?-?-----?-?-?-?-?-?-?-?-?-
winter
 flounder    -?-?-?-?-?-?-?-?-?-?-?-?-?-----?-?-?-?-?-?-?-?-?-
```

```
-?-?-?-?-   possibly present

- - - - -   rare or difficult to access

---------   present

*-*-*-*-*   small aggregate

*********   large aggregate
```

Table 12 Aggregate peaks and seasonal availability of bird resources

```
Resource                    Season

                J   F   M   A   M   J   J   A   S   O   N   D
--------------------------------------------------------------
loons           - - - - - - - - - - - - - - - - - - - - - - -
grebes          ---------                               ------
auks                                ****************
cormorants      ----------------------------------------------
swans, geese
  and ducks     ----------------------------------------------
shearwaters                         -----------------
storm
  petrels                           *****************
gannets                             *****************
gulls           ----------------------------------------------
terns                               -----------------
herons and
  bitterns                          -----------------
rails,
  gallinules
plazersoots                 --------------------------------
sandpipers
  and
  phalaropes                                    -----------
pheasants       ----------------------------------------------
hawks,
  eagles,
  etc.          -----------------*****-------------*****------
ospreys                             --------------------
falcons         - - - - - - - - - - - - - - - - - - - - - - -
owls            ----------------------------------------------
pigeons and
  doves         ----------------------------------------------
crows, jays,
  etc.          ----------------------------------------------
```

- - - - - rare or difficult to access

--------- present

********* aggregate

CHAPTER III

SURVEY, SITE DESCRIPTION AND LITHIC SOURCE ANALYSIS

Survey Methodology

While the value of a probabilistic sampling strategy is recognized, time and personnel constraints rendered this option unfeasible. A six week field season with a crew of four was insufficient to examine a statistically significant area of the peninsula. Further, one or more of the numerous extant communities on the peninsula would almost certainly have fallen into randomly chosen survey areas and caused significant problems with regard to extracting representative samples from those localities. It would be possible to 'adjust' the sampling design to avoid such locations, but this would defeat the purpose of drawing a random sample in the first place. As an alternative, a purposive judgement sampling strategy was employed. Both interior and coastal areas were chosen in an effort to include a variety of microenvirnoments, and local inhabitants were interviewed, resulting in the collection of a group of interesting but rather unproductive leads.

Along the coast, survey areas were selected to include a full range of river and creek outlets, small calm bays and headlands. As essentially the whole shoreline of the peninsula was undergoing erosion, the principal methods of the survey were to investigate eroding banks, the beaches below them, as well as to look for blowouts and surface features above the banks. Examination of this wealth of already exposed strata allowed more areas to be investigated than would have otherwise been possible. The more time consuming task of sub-surface testing was restricted to previously reported sites and those discovered in the course of the survey. Similarly, in inland areas exposures along creeks, ponds, road cuts, trails, and eroding banks were investigated.

The majority of the survey was conducted along the coast (Map 1, page 17). Of the peninsula's approximately 180 kilometers of shoreline, 85 kilometers are for the most part inaccessible, as they are backed by precipitous cliffs possessing little or no beach. Of the remaining 95 kilometers of accessible shoreline, 55 kilometers, or 57%, were surveyed. This represents 30% of the total shoreline. Approximately 10 kilometers of inland exposures were investigated (Map 1, page 17). Following a description of these survey areas below, the sites discovered and the archaeological activities conducted at each will be presented.

Survey Description

The Bar

The Bar is a 24 kilometer long promontory projecting northeast from the west side of the main body of the peninsula. For the northernmost 14 kilometers of its length it is only 400 meters or less in width, while the southern portion is 2 kilometers wide. A ridge runs along all of its length except for the northernmost 3 kilometers. The Bar rises from 3 to 10 meter high banks of peat and/or limestone on the northwest side to 30 to 50 meter cliffs on the southeast side. The wide southern end is dominated by dense coniferous cover and swampy areas, while along the narrow portion the crest of the ridge is barren and the slope along the northwest side is covered with tuckamore. This tuckamore has been cleared in a number of areas for gardening and livestock grazing. Between 2 and 3 kilometers from the end of the Bar the ridge slopes off to a grassy strip 3 to 4 meters above sea level.

The northern 3 kilometers on the southeast side and the northern 10 kilometers of the northwest side were surveyed. The Long Point site (DeBq-1) was discovered on the southeast side near the terminus of the ridge.

West Bay

Nine and one-half kilometers of the shore of West Bay stretching from Lourdes Brook up to the boundary of Piccadilly Head Provincial Park were surveyed. This area is characterized by sand or cobble beaches backed by a 5 to 50 meter bank and is interrupted by Victor's Brook, Harry's Brook and several smaller streams. Vegetation behind the bank consists of either coniferous tree cover, or grassy fields which were probably cleared for gardening, livestock grazing or by wood gathering. No evidence of prehistoric occupations was recovered, but an outcrop of fine grained grey-green chert was located to the east of Harry's Brook, immediately below Hink's Store. Cobbles of chert were found on the beach or eroding out of the bank for approximately 5 kilometers, between Harry's Brook and Piccadilly Head Provincial Park.

Picadilly Head Provincial Park

The park is situated on South Head, projecting into West Bay. The 2 kilometers of sand and cobble beaches around the park were surveyed as were the roads and numerous trails running through the park. The shore along the west side of the park is backed by a 10 meter high sandy bank while 100 meter high rocky cliffs overlook the shore on the east side. Between these is a low grassy area currently in use as a picnic area. Vegetation on the point is dominated by coniferous trees. Small fragments of unworked chert were found but no evidence of prehistoric occupation was recovered.

Piccadilly Bay - Shoal Point

A 23 kilometer stretch from the mouth of the brook running into the bottom of Piccadilly Bay around the tip of Shoal point and down the west side of East Bay was surveyed.

The periphery of a low marshy area immediately to the east of the brook was also examined. A wide sand spit encompasses the marsh on its seaward side. The cobble beach to the east of the marsh is backed by a 10 to 20 meter high bank and coniferous tree cover. This gives way to eroding banks of peat on both sides of the point. No prehistoric cultural remains were recovered, but a large nodule of iron pyrites was discovered on the west side of Shoal Point.

Boswarlos

One kilometer of the shore of East Bay to the east of the community of Boswarlos was surveyed. The cobble beach is backed by a 3 to 5 meter bank and most of the low ground in this vicinity has been denuded of trees. Coniferous tree cover is common further inland above the 50 meter contour. No prehistoric cultural material was recovered.

Aguathuna

A creek was examined from its mouth, 1 kilometer to the west of the jetty at the community of Aguathuna through dense coniferous cover to its source at a pond 1 kilometer inland. The west side of the pond around the head of the creek had experienced much disturbance. This area was examined and a 2 kilometer transect northwest from the pond toward Boswarlos was surveyed. No prehistoric cultural remains were recovered.

Isthmus

The isthmus consists of a pair of cobble strips, each less than 1 kilometer long, which enclose Gravel pond. Both sides of the isthmus, the circumference of Gravel Pond, and portions of the Peninsula's and the mainland's adjacent shoreline were surveyed.

On the north side of the isthmus 3.5 kilometers were examined, from Lead Cove on the peninsula to a position 1 kilometer beyond the isthmus on the mainland. To the south, 3 kilometers were surveyed, extending 1.5 kilometers beyond the isthmus on the peninsula side and 0.5 kilometers on the mainland side. On the peninsula side the shoreline is backed by 1 to 10 meter high banks and much of the coniferous tree cover has been cleared for gardening and expansion of the community of Port au Port West. The mainland side is dominated by a 50 to 100 meter high glacial till deposit on top of which is situated the community of Port au Port East. Carignan's Port au Port site (DdBq-1) and Isthmus site (DdBq-2) were relocated and the Gravel Pond site (DdBq-3) was discovered.

Fox Island River

Approximately 1 kilometer along each bank of the mouth of Fox Island River and the 1 kilometer long spit and breakwater enclosing the river's delta was surveyed. The north side is characterized by 10 meter high banks topped with cleared fields and coniferous tree cover. The south side is mostly low and marshy, having been extensively disturbed by activities at the fishing station and fish plant situated there. No prehistoric cultural remains were recovered.

Fox Island

One clearing on the east side, two on the north side, and one on the west side of the island and a number of trails running between these were surveyed. The banks to the seaward of the clearings ranged from 1 to 3 meters in height. Large amounts of recent historic material, mostly metal objects relating to an active fishing station, were eroding from the bank on the east side of the island. The high banks and grassy slopes at the south end of the island were also examined. The remainder of the shoreline consisted of precipitous cliffs. A number of cliff shelters located around the island were inspected and Carignan (1975a) describes testing one of these. Historic materials were recovered to a depth of about 3 meters at which point the test was abandoned. No prehistoric cultural material was recovered by either survey but Robert Stevens (pers.com. 1983) indicated that he observed stratified deposits in a cave on the island which contained faunal material he considered to have been the result of cultural activity. Unfortunately, these deposits were not relocated.

Black Point

Two kilometers of the eastern shore of East Bay to the south of Black Point were surveyed. Rocky cliffs, 10 to 20 meters high, overlook a narrow to non-existent rocky beach. Land behind the cliffs rises steeply to an altitude of 1235 meters and is forested with coniferous trees. One outcrop of fine grained chert was located but tests on the edge of the cliff overlooking the outcrop were sterile. Nodules of pyrite were found along the shore to the south and serpentine was located in the vicinity as well, but no prehistoric cultural remains were recovered from the area.

Stephenville

Approximately 1 kilometer of the wide sandy beach to the north of the mouth of the small river running from Noel's Pond near Stephenville was surveyed. The beach is backed by a 20 to 30 meter high sand and cobble bank. Both banks of a creek running through Stephenville and draining into the small river were examined along a 1 kilometer stretch. No prehistoric cultural material was recovered.

Campbell's Cove

The small beach and creek mouth at Campbell's Cove was surveyed. The beach is bounded on either side by high rocky cliffs and land behind the beach rises steadily to the crest of Pierway's Hill, 1.5 kilometers to the northwest. No prehistoric cultural materials were recovered.

Ship Cove

The sand and cobble beach at the community of Ship Cove, part of the gravel pit along the beach and the top of the point to the east of the cove were surveyed. Land rises steeply to the north of the beach but the slope is much more gentle to the northeast where the community is located. This flatter grade leads into the 'saddle' running between Ship Cove and Piccadilly. Coniferous tree cover on all of the slopes in the area is dense. The beach is bounded on either side by steep rocky cliffs.

Tree cover on the point to the east of Ship Cove has been mostly cleared for livestock grazing. The seaward edges of the point drop 50 meters to a narrow cobble beach. No prehistoric cultural material was recovered.

Mainland

One kilometer of the cobble beach south from the end of the road at the community of Mainland was surveyed. The beach is backed by precipitous cliffs behind which land rises to an altitude of 1160 meters within 2 or 3 kilometers. No prehistoric cultural material was recovered, but a potential lithic source was identified.

Local Informants

Members of the White family of West Bay Center told of a chipped stone artifact being found along Victor's Brook but the artifact had been lost and its precise provenience forgotten. They also related that human skeletal remains had been found on the east side of the mouth of Harry's Brook and that these were reported to the RCMP. Unfortunately, the local RCMP office had no record of this report.

Several inhabitants of the community of Port au Port West indicated that as children they found 'arrowheads' in Leitch's Field, the local name for the clearing in which the Port au Port site is located. They cladm that these discoveries were incidental to their other activities there and that interest in the artifacts was negligible. The site has drawn no attention locally in the last fifteen or so years and Carignan's activities there apparently went unnoticed or have been forgotten.

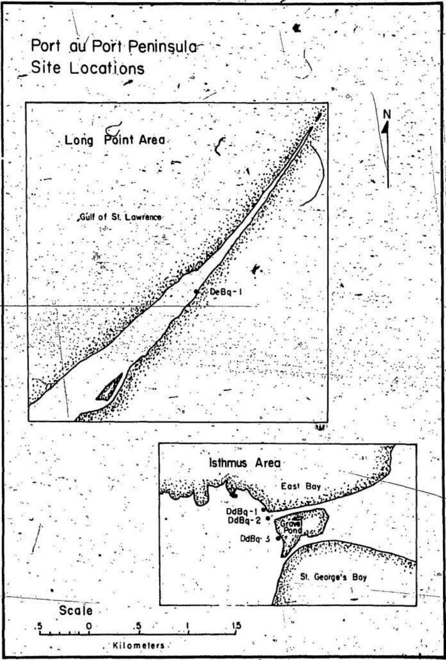
Finally, individuals from several communities in the region described a flat rock roughly the size of a dinner plate which had a human face carved on one side, but unfortunately the author was never able to examine the specimen. It was found on the Bar probably near the fishing station of Blue Beach and is suspected by those who described it as having been made by a fisherman at Blue Beach.

Site Descriptions

As noted above, the two sites discovered by Carignan in 1975, the Port au Port site and the Isthmus site, were located. In addition, the following new sites were discovered, the Gravel Pond site and the Long Point site, and two outcrops of fine grained chert, as well as a potential lithic source were identified. The locations, environs and archaeological activities conducted at each of these will be described below.

The Port au Port site (DdBq-1)

The Port au Port site is located in Leitch's Field, a clearing at the eastern extreme of the peninsula overlooking both the bottom of East Bay and the isthmus connecting the peninsula to the mainland (Map 3). The field lies immediately to the north of the paved road where the road first meets the peninsula. It rises to the northwest, dropping to a rock and cobble beach along its eastern edge. The eroding bank along the seaward edge of the clearing is 2 meters in height in the south, and rises toward the north for 200 meters to a height of 10 meters. The erosion is proceeding relatively slowly, as the thin deposit of soil (10 to 30 cm.) is being washed away only at the rate of the breakdown of the limestone bedrock along the face of the bank. Comparison of photographs taken of the north end of


Port au Port Peninsula
Site Locations
Long Point Area
Gulf of St. Lawrence
DeBq-1
N
Isthmus Area
East Bay
DdBq-1
DdBq-2
Gravel Pond
DdBq-3
St. George's Bay
Scale
.5 0 .5 1 1.5
Kilometers

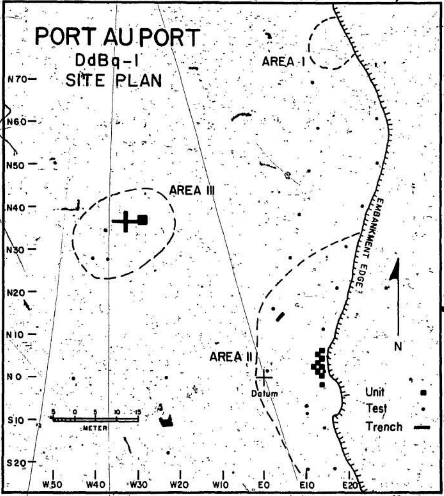
Map 3

the bank in 1975 and the bank as it appeared in 1983 indicated that no notable erosion had taken place in the interim.

The northern and western edges of the clearing are covered with trailing juniper (Juniperus horizontalis) and common juniper (Juniperus communis), as well as isolated clumps of white spruce (Picea glauca). Vegetation in the remainder of the field consists primarily of a variety of grasses. The area is surrounded on the north and west sides by white spruce and is bounded by residential property and warehouses of the community of Port au Port West to the south.

Local informants indicate that the grassy section of the field has been used for livestock grazing in the past and it appears that cultivation was restricted to the southwest quarter where surface indications of gardening such as furrows and rock piles are still evident. Fortunately only a few isolated artifacts and a small amount of lithic debris were found in this disturbed area. A bovine tooth was recovered from the base of a rock pile and the only other historic material was recovered from the southern and western peripheries of the clearing, well away from the centers of prehistoric activity.

Prehistoric occupations have been discovered in three areas of the clearing (Map 4). Area I is the 'Beothuk' component which Carignan excavated. The projectile point from this assemblage conforms to what is now recognized as


PORT AU PORT
DdBq-I
SITE PLAN
AREA I
AREA II
AREA III
EMBANKMENT EDGE
N
Datum
Unit
Test
Trench
METER
5 0 5 10 15
N70
N60
N50
N40
N30
N20
N10
N0
S10
S20
W50
W40
W30
W20
W10
E0
E10
E20

Map 4

the Beaches Complex. Area II, a Dorset component, and area III, containing artifacts relating to the Little Passage and Beaches Recent Indian complexes, were recognized in the 1983 field season. The presence of microblades in Carignan's assemblage may indicate an overlap between Area I and Area II; however, it may be that they were collected from Area II. No mixing of diagnostic artifacts was noted between areas II and III.

Carignan (1975a:29) indicates the area he excavated to be situated:

> about 300 feet from the paved road at the edge of a 30 - 40 foot embankment or terrace.

Upon inspection of this embankment (the bank along the edge of Leitch's Field) it appeared that Carignan's recoveries were actually from a location 200 meters rather than 100 meters (300 feet) from the road. Several lines of reasoning brought me to this conclusion. In the first place, the bank reaches a height of 10 to 13 meters (30 to 40 feet) only at the northern most end of the clearing, 200 meters from the road. Secondly, the nature of the assemblage recovered by Carignan in no way corresponds to the purely Dorset material found at 100 meters from the road in 1983. Further, there is an area denuded of vegetation 200 meters from the road which very much resembles an old excavation. Finally, a photograph of the 1975 excavation in progress (Carignan 1975a:47) places at least some of Carignan's fourteen one-meter square units at this eroded location. Unfortunately, this author was unable to verify that all of the 1975 excavation was conducted at this location. The component was presumably completely excavated as tests in the immediate vicinity were sterile.

Area II encompasses the locality where Dorset artifacts were recovered, a stretch of approximately 145 meters along the bank to the south of Area I. Tests indicated that the component extended at least 15 meters in from the bank in the central area. The component thus has the shape of a shallow triangle with an area of about 1100 square meters. The highest density of Dorset artifacts was noted along the bank 120 meters from the road.

Area III was discovered in the northwest quarter of the clearing among small stands of white spruce 40 meters inland from the bank. Tests indicated it to cover an area of at least 20 by 20 meters.

Excavation Methodology

Twenty-six 50 by 50 centimeter test units were shoveled or troweled in order to define the boundaries of the site and its component areas. Fourteen one-meter square units were troweled and three test trenches (one measuring 30 centimeters by 1 meter, and two measuring 50 centimeters by 6 meters) were shoveled or troweled in order to extract a sample from the site (Map 4, page 90). All one-meter square units were excavated in arbitrary 5 centimeter levels measured from surface. Natural horizons were noted but not used as excavation units as artifacts were distributed in single vertical clusters which corresponded virtually completely to one, often thick (up to 30 centimeters), soil horizon.

A grid was established using a compass and 30 meter tapes, and the horizontal provenience of all artifacts was measured from site datum to the nearest centimeter. The depth of all artifacts was measured from the surface to the nearest centimeter. Line levels were not used, rather, depths were recorded by measuring down from a string stretched across the unit at the surface. One end of the string was permanently attached at the surface of the southwest corner of each unit and the other end could be positioned at a point along the surface of the north or east walls to position it directly over an artifact.

This method of recording depths relative to the surface facilitated comparisons across the site, whereas had line levels been used to derive depths below an arbitrary unit or site datum, the marked slope of the surface of the site would have resulted in depths which could not be directly compared.

Area I

Carignan's (1975a) tool recovery is summarized in Table 4 (page 19). Unfortunately, precise provenience for these artifacts is unavailable, and some may have been collected from the fringe of Area II to the south, thus accounting for the presence of Dorset microblades in his assemblage. Carignan (1975a:31) assigned the non-Dorset portion of the assemblage "cautiously and tentatively" to a 'Beothuk' occupation, recognizing Montagnais, Naskapi and Micmac as possible alternatives. On the basis of the side notched projectile point he recovered (Plate 1 a), this material is considered to represent a Beaches complex occupation. Cultural material was recovered immediately below the sod, from a depth of 4 to 5 centimeters, and no distinct culture layer was evident.

In addition to finished tools, Carignan (1975a:29) also exposed "hundreds of flakes," charcoal fragments, granitic cobbles, many of which were fire altered, as well as a small amount of faunal material. The cobbles were distributed in small random concentrations the dimensions of only one reported, that 30 by 40 centimeters. These are inferred to be the scattered remains of hearths. The artifact distribution is reported to follow "this random pattern" (Carignan 1975a), presumably meaning that they clustered in the same randomly located concentrations of granite.

Small fragments of charcoal were scattered across the area but were not present in sufficient quantity to be radiocarbon dated by techniques available at that time. While they could be dated by current techniques, the lack of provenience for the samples would mean that any dates derived would be of minimal interpretive value.

The faunal assemblage was considered too fragmentary for further analysis (Carignan 1975a). All pieces are fire altered, either calcined or burned, and are thus quite similar to the faunal material recovered in Area III.

Area II

Nine square meters were excavated in a checkerboard pattern in order to sample as much area as possible in the main artifact concentration. A total of 859 lithic tools, tool fragments and diagnostic debris such as tip flute spalls, cores and core fragments was collected. Other recoveries include, seven fragments of seal fat (35.9 grams), 590 bone fragments, one fragment of red ochre, and 9.583 kilograms of lithic debris.

Stratigraphy

Vegetation in Area II consisted of grass, and sod was up to 5 centimeters deep. The majority of artifacts were recovered from a 10 to 40 centimeter thick dark brown to black soil horizon immediately below the sod. A small number of artifacts was recovered from a discontinuous mottled black and orange horizon below this. The mottled horizon was up to 5 centimeters thick and is considered to be a zone of soil chemistry transition between the dark culture bearing horizon and the horizons below. Two sterile horizons, a densely packed chalky to sandy white horizon up to 8 centimeters thick and a gritty orange deposit up to 20 centimeters thick, were present in some locations between the upper layers and the limestone bedrock. The order of superposition of the three discontinuous horizons follows the order in which they are presented above, but as none consistently occur together the limestone bedrock could be overlain by either the orange, white, mottled black and orange or the continuous dark cultural horizon (Figures 1 and 2).

Of the discontinuous horizons, only the white layer was present in any regular pattern. It was present across all of the westernmost unit in Area II (N2E12) as well as parts of the two adjacent units to the east (N1E13 and N3E13). Over most of its extent it was extremely thin and only isolated pockets were thicker than 1 or 2 centimeters. It was immediately overlain by a thin layer of charcoal stained soil with which it would mix during excavation rendering most of the thin parts of the white horizon virtually invisible in soil profiles.

Features

Three features were discovered in Area II. Feature I is a hearth and/or refuse pit at the northern end of the excavation. A dense layer of charcoal was exposed at a depth of 18 centimeters, below which was a clearly defined charcoal stain containing a concentration of unburned food

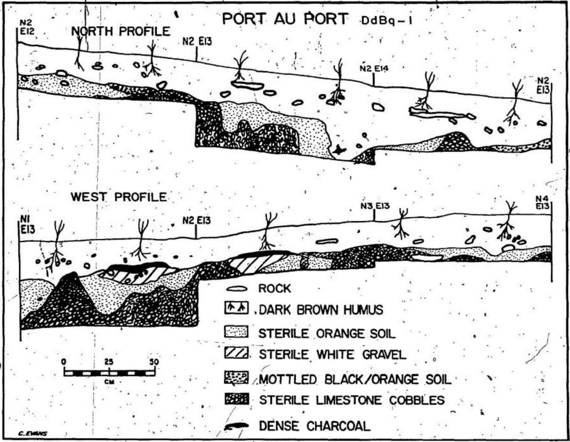

PORT AU PORT DdBq-1
NORTH PROFILE
N2 E12
N2 E13
N2 E14
N2 E13
WEST PROFILE
N1 E13
N2 E13
N3 E13
N4 E13
ROCK
DARK BROWN HUMUS
STERILE ORANGE SOIL
STERILE WHITE GRAVEL
MOTTLED BLACK/ORANGE SOIL
STERILE LIMESTONE COBBLES
DENSE CHARCOAL
0
25
50
CM
C. EVANS

Figure 1

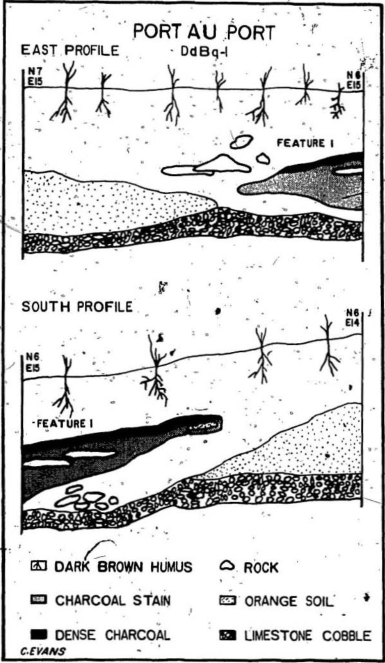

PORT AU PORT
EAST PROFILE
DdBq-l
N7 E15
N6 E15
FEATURE I
SOUTH PROFILE
N6 E14
N6 E15
FEATURE I
DARK BROWN HUMUS
ROCK
CHARCOAL STAIN
ORANGE SOIL
DENSE CHARCOAL
LIMESTONE COBBLE
C.EVANS

Figure 2

bone refuse, and large fragments of charcoal (Figure 2, page 97). The presence of unburned bone rules out its exclusive use as a hearth, but it may have originally served as a hearth and subsequently as a refuse pit.

Only the northwest corner of the feature was exposed as it was discovered during the excavation of the last unit to be opened on the site and thus its total size is unknown. The excavated portion was a maximum of 15 centimeters thick and encompassed an area of 0.5 by 0.5 meters. Half of one charcoal sample was submitted for radiocarbon dating (16 grams submitted), an age of 1350+/-60 years B.P. was determined (Beta 7778). An additional date of 1300+/-80 (Beta 7779) was obtained from charcoal scatter (3 gram sample) which was likely related to this feature.

Feature II was a raised linear mound oriented northwest to southeast which was roughly 6 meters long, 1.5 meters wide and 0.3 meters high, and located 12 meters to the northwest of Feature I. Upon excavation of a small trench (30 centimeters by 1 meter) across half of its width it was discovered that the mound was the result of a natural ridge in the bedrock, but the presence of rounded beach cobbles (absent in other excavation units), one scraper and flakes in the trench warranted its designation as a feature. A number of small black chert flakes was recovered from the top of the mound, while those at the base included a variety of colored cherts. No interpretation is made regarding the activity or activities represented by the feature.

Feature III was a cluster (roughly 3 by 3 by 3 centimeters) of densely packed small flakes and three tip flute spalls, two of which articulated. It was located at in level 6 (25 to 30 centimeters) of unit N6E14, adjacent to feature I. It is presumed to be the result of 'cleaning up' after a session of knapping. Krol (1985:pers.com.) reported a similar occurrence at the Broom Point site.

Area II Summary

As noted above, artifacts were recovered primarily from the dark brown horizon and thus ranged in depth from 5 to 40 centimeters. Material excavated from the mottled layer included only a small amount of lithic debris from the top few centimeters. The vertical distribution of artifacts closely paralleled that of the lithic debris which was unimodally distributed, peaking at level 3 (10 to 15 centimeters, Appendix 1). This suggests that the area was used for only a single, possibly quite short period, radiocarbon dates indicating this occupation to have taken place about 1300 radiocarbon years ago.

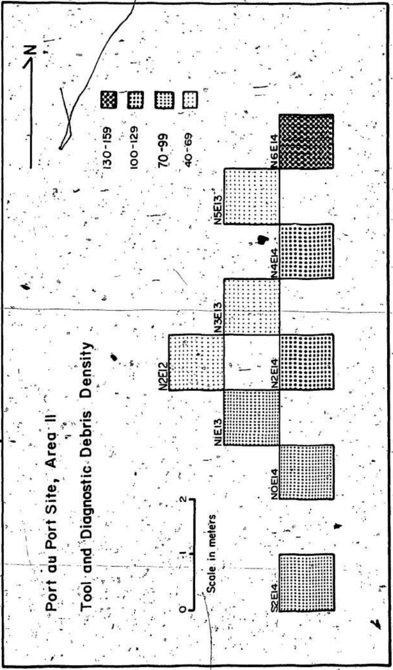
The range of depths at which material was recovered may be the result of post depositional vertical displacement. The presence of a fragment of green bottle glass in the dark culture bearing zone (18 centimeters deep), and a difference of 7 centimeters in depth between a pair of articulating tip flute spalls from the same unit indicates that at least some vertical displacement has occurred. Potential mechanisms for this include frost heave, root action and the treading of livestock over the site.

Artifacts were most densely concentrated along the eastern edge of the area excavated, near the bank (Maps 5 and 6). It is reasonable to expect that this trend of increasing artifact density to the east extended somewhat into the part of the site which has been eroded away. Thus it can be assumed that a major portion of the site has been lost. As the rate of erosion of the bank is not known, no estimate can be made of the original size of the site.

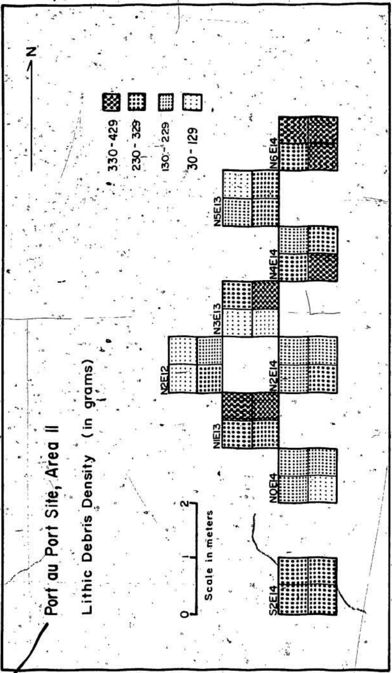
Area III

A total of 120 lithic tools, tool fragments and diagnostic debris, such as cores and core fragments, were recovered from Area II. Corner notched projectile points in the assemblage indicate a Little Passage Indian Complex presence and a single side notched point is attributed to the Beaches Complex. A faunal sample of 1720 fragments, as well as 3.542 kilograms of flakes and shatter blocks, were also recovered.

A rectangular area in which the vegetation was less luxuriant was suspected of being a house and a pair of trenches was excavated across its north and south axes (Map 4, page 90). No evidence of structural remains was observed, although cultural material was present at the southernmost end of Trench A and the easternmost end of Trench B. The recoveries from the former include only


Port au Port Site, Area II
Tool and Diagnostic Debris Density
N
130-159
100-129
70-99
40-69
N6E14
N5E13
N4E14
N3E13
N2E12
N2E14
N1E13
N0E14
S2E14
0
1
2
Scale in meters

Map 5


Port au Port Site, Area II
Lithic Debris Density (in grams)
N
330 - 429
230 - 329
130 - 229
30 - 129
Scale in meters
0
1
2
S2E14
N0E14
N1E13
N2E12
N2E14
N3E13
N4E14
N5E13
N6E14

Map 6

lithic debris while tools, lithic debris, charcoal and bone mash were discovered in the latter. A 2 by 2 meter area was excavated in this more productive location and the sample from it constitutes the bulk of cultural material from Area III. It is uncertain whether the cultural material from the 2 by 2 meter area, the south end of Trench A and from a set of particularly rich test units 5 meters to the southwest are from a single contiguous distribution, or if distinct artifact clusters are present.

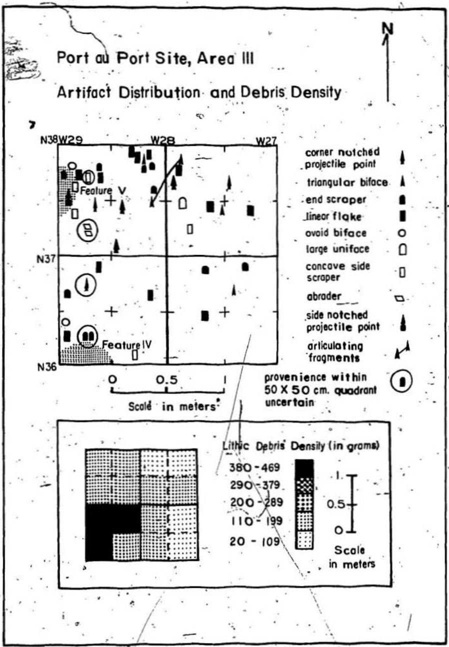
Stratigraphy

Vegetation in the vicinity of the Area III included white spruce and juniper, and roots thus constituted more of a problem during excavation here than in Area II. The soil deposit was thinner than it was toward the bank in Area II, but the stratigraphy was in general quite similar in each area. Artifacts were recovered from a dark brown to black horizon which was underlain by an intermittent gritty orange sterile horizon. Below this lay the limestone bedrock.

The dark culture bearing horizon in Area III was more variable in terms of color, consistency and constituents than it was in Area II. In the northern two units of the block it was a brown clay-like soil which became increasingly gritty with depth. The southern two units were darker due to an abundance of small charcoal fragments and contained much grit from decomposed granite throughout. The presence of the grit and charcoal gave the soil a looser consistency than that immediately to the north. Fire cracked rock, as well as decomposed and decomposing granite were scattered throughout the 2 by 2 meter area. As in Area II, an abundance of small and large limestone cobbles was present in the culture bearing horizon.

Features

Features IV and V were a pair of charcoal stains interpreted as hearths and/or small middens. The former was exposed in the southwest corner of the block, continuing from 8 centimeters in depth to sterile soil at 18 to 20 centimeters. The portion excavated extended 45 centimeters east from the west wall and 55 centimeters north from the south wall (Map 7). A charcoal sample from this feature was dated to 790+/-70 B.P. (Beta 7777). Feature V was intersected by the west wall of the block, again extending from 8 to 18 centimeters in depth. The excavated portion covered an area roughly 30 centimeters in diameter (Map 7). A cluster of fire cracked rock was discovered in this feature. Charcoal fragments, burned and calcined bone fragments as well as decomposing granite tended to cluster in and around both charcoal stains, extending up to 75 centimeters beyond them.


Port au Port Site, Area III
Artifact Distribution and Debris Density
N
N38W29
W28
W27
N37
N36
Feature V
Feature IV
0
0.5
1
Scale in meters
corner notched projectile point
triangular biface
end scraper
linear flake
ovoid biface
large uniface
concave side scraper
abrader
side notched projectile point
articulating fragments
provenience within 50 X 50 cm. quadrant uncertain
Lithic Debris Density (in grams)
380 - 469
290 - 379
200 - 289
110 - 199
20 - 109
1
0.5
0
Scale in meters

Map 7

Area III Summary

Neither the horizontal distribution of artifacts, nor inspection of artifact depths provide a means of distinguishing between the two components represented in Area III. The majority of artifactual remains are, however, tentatively assigned to the Little Passage Component on the basis of uniformity of raw material type. Virtually all of the lithic material from Area III, including the Little Passage projectile points, are manufactured from chert visually identical to, and probably derived from, one or both of the sources of high quality chert in the Port au Port region described below. The Beaches Complex projectile point and one biface base are manufactured from a more granular opaque black chert. The few flakes of different types of chert recovered, and a multicolored chert block may relate to this occupation or may be 'scatter' from the Dorset occupation of Area II.

The Isthmus Site (DdBq-2)

The Isthmus site is located at the south end of the same bank on which the Port au Port site is situated (Map 3, page 87). Carignan (1975a) recovered one narrow stemmed projectile point of the same type of chert which dominates the sample from Area III of the Port au Port site, one Dorset end blade (Plate 2) and fifteen flakes from the surface and four test units 10 meters from the road. The 1983 survey added only four flakes of variously colored cherts to the assemblage. These were recovered from the surface 30 meters north of the road.

The site was completely disturbed at the time Carignan (1975a:32) discovered it, "flakes were found at varying depths and historic metal objects were abundant throughout." No additional tests were excavated in 1983 and as noted earlier, the site is presently littered with concrete slabs and other twentieth-century debris.

Both Little Passage and Dorset Eskimo complexes are inferred from Carignan's recoveries. While the site should be more properly described as 'Area IV' of the Port au Port site, Carignan's original designation was retained for the purpose of convenience.

Gravel Pond (DdBq-3)

This site is located 0.5 kilometers south of the Port au Port site, overlooking Gravel Pond (Map 3, page 87). Both historic and prehistoric cultural material was found to be eroding from a 1.5 to 2 meter high bank, as well as in areas in the field behind. Five productive test units and surface collections yielded lithic debris representing a variety of chert types. A microblade/flake core, a biface blank or flake core, a biface tip, and a fragment of an unidentified porous material resembling a soapstone vessel fragment were also found. The microblade/flake core is taken to indicate a non-specific Palaeo-Eskimo occupation, although the presence of more than one cultural group can not be ruled out.

The Long Point Site (DeBq-1)

The Long Point site extends for 60 to 70 meters along a bank overlooking Port au Port Bay (Map 3, page 87). The low ridge behind the site is covered in tuckamore, the land between the bank and the ridge being wet and boggy. The ridge rises in elevation to the west, its crest commanding a view of the the Gulf of St. Lawrence to the southwest, west and north, as well as Port au Port Bay to the east and the southeast.

The artifact recovery was small, including one asymmetrical biface, one biface base, one microblade, two fragments of unidentified porous stone similar to that recovered at the Gravel Pond site, an additional piece of the same material which had been used as an abrader and 311 grams of lithic debris. Most of the site is considered to have eroded into Port au Port Bay. Of nine test units excavated at 10 meter intervals along the bank, only eight flakes were found, and additional tests further from the bank were sterile. Tests on the slope of the ridge and its crest were also sterile. On the basis of the microblade a non-specific Palaeo-Eskimo occupation is inferred, but again the presence of other cultural groups can not be absolutely ruled out.

Chert Sources

As noted above, two outcrops of chert, and one possible source of lower grade lithic material were located. Samples from the two former outcrops were collected and incorporated in a preliminary lithic source analysis to be described below. The source in East Bay, south of Black Point, is exposed along roughly 50 meters of shoreline in a bed approximately 5 meters thick, and many large boulders of chert are scattered along the beach below the outcrop. The material is very fine grained, giving it very good flaking characteristics, and the majority of it is green, in places grading abruptly to red. Its proximity to the Port au Port site, the presence of visually identical material in both the Dorset and Little Passage assemblages of this site and trace element data leave little doubt that it was exploited by these populations.

An additional outcrop of high quality chert on the south shore of West Bay is considered to have been exploited by the prehistoric inhabitants of the region for the same reasons. This outcrop stretches for some 70 meters along the water's edge in a bed up to 6 meters thick, and chert blocks can be found along the sandy beach and in the bank for several kilometers in either direction. The material ranges from a waxy grey-green to a mottled grey and tan color.

Small cobbles of a possibly exploited lithic material were found in the dramatic near vertical bedding planes along the Gulf coast immediately to the south of the community of Mainland. The material appears to consist of small angular blocks of grey stone in a clear matrix. Its flaking characteristics are quite poor and it is described by Stevens (1983:pers.com.) as limestone due to its low silica content. A small amount of similar material was, however, recovered from the Dorset component of the Port au Port site.

Lithic Source Analysis

The chert source analysis described herein may be described as a regional approach as opposed to the methods of specific source identification which are coming into more common use among archaeologists. This option was chosen due to the exceedingly costly and time consuming nature of the latter approach. The regional analysis relies upon the assumption that chert from various regions of Newfoundland may be distinguished on the basis of attributes related to the differing modes of formation of chert in each of the regions. While losing a significant degree of resolution, it has the potential to identify the movement of lithic material across regional boundaries. It was applied primarily to determine if the Little Passage populations of Newfoundland distributed chert from the Port au Port Peninsula across the island, although the implications of the study are not restricted to a Little Passage context. Following a brief background discussion, the methods and results of the analysis will be presented.

Chert is a catch-all term used by geologists and archaeologists alike which refers to most if not all sedimentary rock with a high, 70% to 99.9%, silicon dioxide content (Leudtke 1979:746). It may be any color or combination of colors and results from a variety of processes of formation (Williams, Turner and Gilbert 1955:358). Most cherts are very compact sediments and fracture in a conchoidal manner. These characteristics make it easier to flake in a controlled manner, more durable and presumably more desirable to prehistoric populations than other types of materials.

Cherts from different sources are generally more variable visually than such uniform or homogeneous materials as obsidian (Leudtke 1979:745), and archaeologists have traditionally based their definitions of chert types on these characteristics. Once it is defined, a type is expected to correspond to a particular source. The typological procedure follows much the same general rules as the attribute analyses used to define artifact types. In addition to such difficulties as, determining which attributes are to be considered the significant ones and how to maintain consistent criteria for types, there exists a special difficulty in the identification of chert types. The problem stems principally from the unfounded assumption that a given source is visually homogeneous and thus distinct from other sources, when in fact a chert source may be heterogeneous and a wide range of overlap may exist between sources. Thus not only will a heterogeneous chert source be difficult to categorize, but where overlap occurs, a type may be found to correspond to more than a single source.

Leudtke (1979:745) argues that defining types on the basis of attribute clusters may be a valid procedure when dealing with cultural materials, but the chert source has "an objective reality that is independent of any attribute." While regularities between chert sources and their visual characteristics may exist, there is no reason that they should be expected to, and very often they do not occur. Failure to recognize this usually results in researchers participating in furious debates regarding the identification of chert types which may well have no basis in reality.

Quantitative methods, notably trace element analysis, have proved to be of some success in resolving this problem. Chert, while composed primarily of silicon dioxide, also incorporates a variety of major impurities (1% to 30%), including the oxides of calcium, carbon, iron, potassium and magnesium, as well as innumerable trace elements in much smaller amounts "ranging from a few millionths to several hundred thousandths of a percent" (Leudtke 1979:746). The proportions of these latter impurities reflect factors influencing the formation and post-depositional history of individual chert sources and are thus expected to exhibit patterning among different sources (Leudtke 1979:746).

If the statistical interpretation of any quantitative compositional analysis is to be trusted, the number of samples per source must be representative, and the range of sources must be sampled as fully as possible. Archaeologists have therefore been required to devise systematic source sampling procedures which detect the full range of variation within a source (Leudtke 1978:422). This can be accomplished by sampling a geological deposit both stratigraphically and horizontally (Lazenby 1980:634-635, and Meyers 1970:18). However, it should be noted that surface weathering can significantly alter the chemical composition of both geological sources and archaeological specimens (Leudtke 1978). This is an additional and often difficult factor to control, especially if differential weathering has taken place between geological sources and archaeological deposits. Leudtke (1978:422) suggests that ten to thirty samples per source is adequate.

The problem of matching single archaeologically recovered samples to a 'population' of geological samples from a given source is less severe. Leudtke (1979) suggests that discriminant function analysis is a successful and appropriate technique, but without an adequate geological sample there is not much use to which discriminant function analysis can be put. On the other hand, if attention is shifted away from the identification of specific sources to a regional characterization of cherts, the data collected may be of some use.

Cherts are often distinctive in some manner on a regional basis. These differences are often quite radical, exhibiting little or no overlap between regions and are generally an expression of the different modes of formation of chert in each region. Most regional differences are adequately defined in existing geological literature. Thus it remains for the archaeologist only to verify the regional differences in order to control for unexpected inter-regional 'contamination', and then to collect and analyze samples from archaeological contexts using any of the techniques which would detect the differences expected. Should samples from an archaeological context not match the geological characterization of that region, then statements may be made regarding the movement of artifacts across regional boundaries. While decreasing resolution in this manner is clearly a sacrifice, the results will still be archaeologically relevant, and will be achieved at minimal expense.

Newfoundland is composed of three geological regions with regard to the modes of formation of chert. Cherts on the west coast are of biogenic origin, that is they are formed as a result of the compression of sediments rich in marine micro-organisms which have incorporated silica dissolved in sea water into their bodies. West coast cherts are thus typically rich in micro-fossils. The formation of chert in Newfoundland's central volcanic belt is incidental to submarine hydro-thermal activity. Water issuing from ocean bottom hot springs is generally saturated with respect to a variety of minerals, including silicon dioxide. As this saturated water mixes with cold ocean water, it becomes super-saturated and minerals such as silicon dioxide will precipitate out as a gel on the ocean floor. As additional sediments are layed down, this gel will compress and form chert. They will often have a biogenic 'imprint' as a result of blooms of silica fixing micro-organisms which occur in the vicinity of under water hotsprings, but as a result of the precipitation of the other minerals, such cherts will have much higher contents of iron and iron related minerals than the biogenic cherts of the west coast (Stevens 1984:pers.com.).

The tuffacious cherts of the Avalon Peninsula are the result of the explosive eruption of silica rich volcanoes depositing small glass shards in the ocean. These shards react with sea water and devitrify, or crystallize, as they form a sediment which will eventually become chert. Not only will these cherts be distinct in that 'ghosts' of these glass shards will be visible in thin section, but they will lack micro-fossils as the rocks of the Avalon Peninsula were formed in the Precambrian era, before virtually any forms of life had evolved.

Thus trace element analysis should be able to differentiate between the cherts of the west coast and central region, while thin section analysis provides a means of distinguishing chert of the Avalon Peninsula from the rest of the island. The discussion below focuses primarily on verifying and making use of the former expectation to determine if the grey/green chert found in Little Passage sites across Newfoundland were derived from a source or sources on the west coast, such as those in the Port au Port region, or if these populations employed locally available grey/green cherts. A secondary objective is to determine the region of origin of a porous blue chert with gold colored inclusions and a 'bubbly' cortex which was recovered from the Dorset component of the Port au Port site and noted in the lithic assemblage at Stock Cove (Robbins 1984:pers.com.).

Fourteen chert samples derived from chert sources at Port au Port and Cow Head were subjected to trace element analysis using X-ray fluorescence spectroscopy. Archaeologically derived samples were also tested. These included one piece of the blue chert from the Port au Port site, as well as seven samples of grey-green lithic debris from Little Passage contexts at the Port au Port site, L'Anse a Flame, Burgeo, Stock Cove, Frenchman's Island, and Boyd's Cove. Inspection of the results of this analysis, in comparison to data collected by P.L. Dean and J.L. Meyer (1981), confirms that nickel and most probably chromium are patterned in a regular manner between the west coast and the central volcanic region. The mean nickel content of the west coast chert sources is significantly lower than that reported by Dean and Meyer for slates and cherts of the central volcanic region (Table 13). Except for the blue chert with the bubbly cortex from the Port au Port site, and the green chert from Frenchman's Island, the nickel content of samples from archaeological contexts corresponds most closely to that of the regions in which they were recovered. This means that all of the other samples are derived geologically from the region in which they were recovered archaeologically.

The nickel content of the blue chert compares favorably to that of the central region, indicating that it was transported across that boundary. Supplementary thin section examination of the blue chert revealed that it had been extensively metamorphosed, leading Stevens (1984:pers.com.) to suggest that it could not have been derived from the west coast's sedimentary deposits, but that it had to have come from the central region. The Frenchman's Island sample is intermediate between the mean values for sources in each region and is thus somewhat problematical. Additional evidence to be presented below indicates it to be anomalous in other ways, suggesting that it may not have been derived from the central region, but possibly from the Avalon Peninsula.

While Dean and Meyer did not measure the content of

Table 13 Nickel content of west coast cherts vs. central region cherts and slates

Samples from Geological Contexts	mean p.p.m.	stan. dev.	range	n
west coast sources	11.42	18.542	0 to 55	14
central region sources (mineralized samples)*	135.524	82.753	5 to 849	63
central region sources (non-mineralized samples)*	57.5	44.560	1 to 364	932

Samples from Archaeological Contexts	p.p.m.
Port au Port site (Little Passage green chert sample DS-9)	0
Port au Port site (Little Passage green chert sample DS-10)	0
Port au Port site (Dorset, blue chert sample DS-17)	81
Burgeo (Little Passage, green chert sample DS-6)	42
L'anse A Flamme (Little Passage green chert sample DS-7)	50
Stock Cove (Little Passage green chert sample DS-8)	50
Boyd's Cove (Little Passage green chert sample DS-13)	48
Frenchman's Island (Little Passage green chert sample DS-12)	34

* from Dean and Meyer 1981

chromium in their samples, the data at hand suggest that this element may also be used to distinguish between cherts of the west coast and central region. Inspection of Table 14 reveals that the chromium content of the Port au Port and Cow Head samples, as well as the Little Passage samples from the Port au Port site have significantly lower chromium contents than the blue chert and samples from archaeological contexts in the central region. Of additional interest are the anomalously high values of rubidium, strontium and zirconium in the Frenchman's Island sample (Appendix 2). Future research should address the possibility that this sample was derived from the Avalon Peninsula and that these three elements may provide an unexpected chemical means by which the Avalon cherts may be distinguished from sources elsewhere in Newfoundland.

Aside from minimizing the cost of analysis, this somewhat 'quick and dirty' approach to the lithic source problem can be described as an attempt to increase the reliability of results by decreasing resolution. It was conceived as a means of providing qualitative 'index fossils' which could differentiate between the cherts of various regions. Unfortunately, while the mean values of nickel and chromium are quite different on the west coast and the central region, the range of variation within each region is disconcerting. Two of the samples from the Port au Port sources (DS-2 and DS-27/29) have nickel and chromium contents which fall well within the rather tight range of

Table 14 Chromium content of west coast vs. central region cherts

Samples from Geological Contexts	mean p.p.m.	stan. dev.	range	n
west coast sources	59.71	79.732	6 to 244	14

Samples from Archaeological Contexts	p.p.m.
Port au Port site (Little Passage green chert sample DS-9)	19
Port au Port site (Little Passage green chert sample DS-10)	15
Port au Port site (Dorset, blue chert sample DS-17)	308
Burgeo (Little Passage, green chert sample DS-6)	224
L'anse A Flamme (Little Passage green chert sample DS-7)	251
Stock Cove (Little Passage green chert sample DS-8)	246
Boyd's Cove (Little Passage green chert sample DS-13)	229
Frenchman's Island (Little Passage green chert sample DS-12)	131

variation of the archaeological samples derived from the central region, and another (DS-4) falls midway between the west coast and central groups (Table 15). Had these samples been recovered from archaeological contexts on the west coast they would have been misclassified. Thus with regard to reliability, classification of archaeological samples from the west coast can be expected to be unreliable three times out of fourteen, or at a rate of approximately 21%. The source of the anomalously high content of nickel and chromium in these three samples is likely due to contamination by iron pyrites (Stevens 1984:pers.com.). Inspection of thin sections of samples submitted for trace element analysis could verify this and could potentially provide a control for this error factor.

Table 15 Anomalous nickel and chromium values from the west coast sources

Sample	Nickel content (in p.p.m.)	Chromium content (in p.p.m.)
Black Point, East Bay, Port au Port Peninsula, (sample DS-2)	55	238
Hink's Store, West Bay, Port au Port Peninsula (sample DS-15)	48	244
Black Point, East Bay, Port au Port Peninsula, (sample 27/29)	27	82

Summary

This chapter has served not only to introduce the reader to the research area, and the archaeological activities which were conducted in it, but has also presented a preliminary regional lithic source analysis. As stated in Chapter I, this analysis was intended to address the relationships between Little Passage populations that have been identified across Newfoundland, and it has contributed to an understanding of this problem. It concluded that Little Passage groups situated in diverse areas of the Island did not supply their requirements for grey-green chert via travel and/or trade only from the Port au Port Peninsula's chert outcrops, but rather they used appropriately colored chert available to them more locally. This is a significant contrast to the pattern of Dorset lithic material utilization. Not only do the Dorset of the west coast use a variety of differently colored cherts, but at least one type of chert, a porous blue chert with a bubbly cortex, has been transported from somewhere in Newfoundland's central volcanic belt to the Port au Port Peninsula on the west coast and probably also to Stock Cove on the isthmus of the Avalon Peninsula.

Attention will now be turned to an analysis of the archaeological data recovered in the course of the survey. Following an analysis of the lithic remains and a discussion of its implications regarding the regional expressions of

Dorset culture in Newfoundland, the faunal recoveries will be addressed and statements regarding the subsistence-settlement systems of the prehistoric inhabitants of the Port au Port region will be made.

CHAPTER IV

ARTIFACT ANALYSIS

Introduction

The purpose of this chapter is two-fold: to provide a description of the lithic material collected which will facilitate comparisons with previously reported recoveries, and to analyze and present the material in a framework which has greater explanatory value than the traditional typological approach.

The procedure followed conforms to the 'etiological' approach applied by L.S. Laughlin and Jean S. Aigner (1966:41-42) to a unifacial core and blade industry at Angula, Alaska:

> concern lies with the steps in the process as well as in the end products. The correspondence between cores and the tools struck from them contains information not found in either cores or in core products alone.

In brief, Laughlin and Aigner (1966) performed a 'phase' analysis, more commonly referred to now as stage analysis, whereby blades flakes and cores were re-assembled in order to determine the series of operations applied to cores, the reduction sequence, involved in the production of blades. In sorting out this hierarchy of steps,[1] precise definitions were assigned to the tool and debris products of each stage in the reduction process. This set of finely broken down classes provided a descriptive basis for inter-site comparisons.

While Laughlin and Aigner (1966) address only a single lithic industry, that of blade manufacture, such an approach may be equally well applied to sort out and describe a set of independent reduction sequences, or industries, as is represented in this sample. Note, however, that the re-assembly procedure by which they derive the sequences requires a large if not near complete sample of a site. The data at hand are clearly inadequate in this respect. As an alternative, artifacts are ordered into a set of empirically derived hypothetical industries which conform to generally accepted classes such as end-blades, end scrapers, microblades and so on, which appear to be the result of different reduction sequences.

In the absence of a sample sufficient for the re-assembly procedure, hypothetical reduction sequences within each industry are derived through the identification of discarded intermediate forms (i.e. blanks, preforms, cores) and diagnostic debris. A review of more complete stage analyses of comparable industries and an examination of

---

1 Lithic industries are defined in relation to their reduction sequence, or more properly the hierarchy of steps in the decision making process followed to produce a tool. Rarely if ever does a reduction sequence follow a single linear set of steps.

ethnographic literature pertaining to the manufacture and use of lithic tools proved useful in the development of this analysis.

In the present study the etiological approach is expanded to include not only the manufacturing process of the tools recovered, but activities relating to the use and maintenance of the tools as well. In particular, by addressing the procedure of resharpening, it will be pointed out how the shape of a tool will vary through its period of use. George C. Frison, for example, observes that:

> Tools such as side scrapers, end scrapers, knives, and drills were continually modified throughout their lifetime of functional utility, and at the time when they were discarded or became non-functional they were usually quite different than when originally completed (1968:149).

Recognition that the form of a tool recovered from the archaeological record may be as much the result of its use as an attempt on the part of its manufacturer to have it conform to a 'mental template' will have a profound effect on how archaeological remains are interpreted.

The Port au Port Site, Dorset Component

The Dorset component of the Port au Port site has been sub-divided into six major industries: end blades, expanding flake end scrapers, microblades, bifaces, ground stone tools and miscellaneous flake tools. Hammerstones, adzes and non-diagnostic cores and debris will be considered separately. Due to the difficulties in deriving chert types based on visual criteria outlined above, and the fact that trace element data are as yet insufficient to conduct a source specific chert identification analysis which would result in the derivation of a reliable set of types, no attempt was made to organize all of the flakable lithic material recovered into discrete chert types. The range of variation of this material, however, will be described as will several particularly distinctive cherts which future research will likely confirm to be source specific types.

Chert resembling each of the Port au Port sources was recovered (green grading to red, waxy grey-green to mottled grey and tan, and small angular grey blocks in a clear matrix), as well as a variety of presumably non-local material. The latter includes: chert grading from beige through to dark reddish brown, translucent brown to black chert with a smooth glass-like surface, the porous blue chert ascertained above to be from the central volcanic region of the island, as well as a small amount of pink chert and mottled turquoise and black chert. The blue chert, in the form of lithic debris, was recovered in small amounts (usually one to three pieces) in each of the one-meter square units and in test trench C, while only three artifacts are manufactured from it: an end blade preform, an end blade fragment and a biface fragment. The translucent brown chert is most commonly represented in the products and debris of the end blade industry, most of the chert microblades are manufactured from the locally available green chert and scrapers include essentially the whole range of variation with a high representation of the local chert as well.

End Blade Industry

A common characteristic of Dorset end blades is the removal of long 'channel flakes', or tip flute spalls, from the distal end of the ventral face of the artifact. This reduction technique is employed in both the manufacture and, as will be argued, the maintenance of end blades as a resharpening procedure.

Tip fluting is commonly preceded by edge trimming which leaves lateral scars completely or partially across the ventral surface of the end blade. A striking platform is prepared on the tip of the artifact to allow the detachment of a single or series of tip flute spalls. The platform is prepared by working the end blade's distal end to a flat or slightly concave wedge shaped tip. The shoulders thus formed serve as striking platforms for the removal of spalls from either side of the ventral face (Figure 3 a), or a spall may be channeled along the central portion of the ventral face (Figure 3 b).

Spalls detached from along the sides of the ventral face will retain a portion of the distal end of the lateral edge of the end blade thus leaving it with a sharp fresh cutting edge. The old, or remnant, edge retained on the

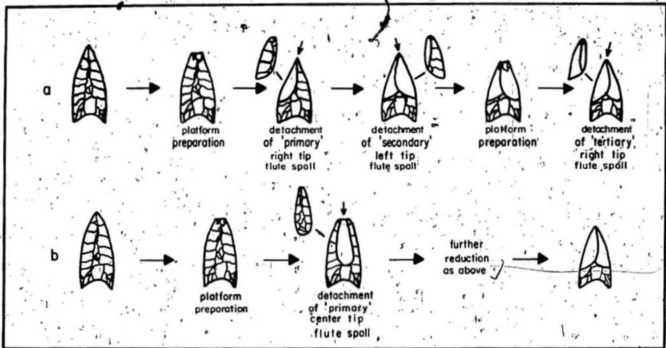


Figure 3
Sample tip fluting sequences
(ventral view)

spall has the appearance of a 'lip' and is particularly diagnostic and helpful in distinguishing tip flute spalls from microblades and ridge flakes (Figure 4). The central spalls are not so easily recognized, they are generally elongated triangles in outline (Figure 4), blades being more parallel sided. An end blade which has been tip fluted will have either one or two spall removal scars on its ventral surface, the latter forming pair of flat facets and a median ridge. Such facets generally extend from the tip to between one third and two thirds the length of the artifact.

Most artifacts relating to the end blade industry are identified on the basis of attributes diagnostic of tip fluting. These include: preforms and preform fragments, end blades and end blade fragments, end blade or preform tip fragments with preparation for tip flute spall detachment, and tip flute spalls.

Preforms

A total of nineteen complete and thirteen fragmentary preforms were recovered. They were identified by the presence of tip flute spall removal scars and/or striking platform preparation for the removal of spalls. They are distinguished from completed end blades in that they lack fine edge and dorsal surface retouch. They are larger overall than end blades, ranging from 54.5 to 28.2

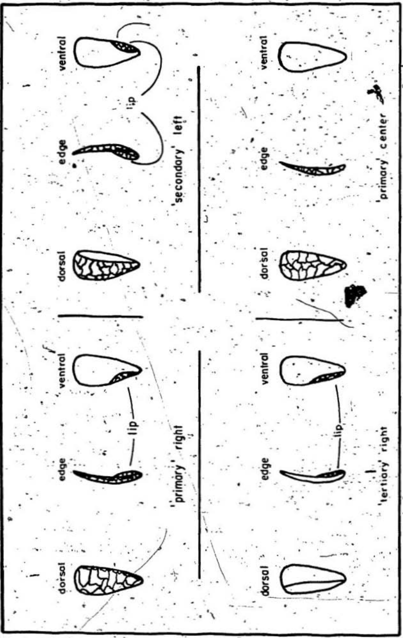


Figure 4 Morphology of lip flute spalls from sample sequence in Figure 3 a

millimeters in length, 29.1 to 15.4 millimeters in width, and 13.1 to 4.6 millimeters in thickness.

Tip fluting is employed from the earliest stages in the working of a preform. Spall scars and striking platform preparation are in evidence on preforms which have a minimum of edge trimming and in some cases on specimens with no basal treatment at all. In several cases spall scars are partially obscured by the subsequent removal of flakes from the lateral edges, indicating that the reduction process follows a series of alternately tip fluting and trimming the lateral edges of the artifact.

No consistent pattern is apparent with regard to selection of the blank from which the preform is reduced. Most preforms were manufactured on flake blanks, the remainder were either reduced from very thick flakes or core blanks. Further, flake blanks, once selected, were not oriented consistently as remnant bulbs of percussion are evident on either the proximal or distal ends of preforms (Table 16).

Table 16 End blade preforms, type and platform orientation of original blank

	Flake Blanks			Thick Flake or Core Blank	total
	platform on tip	platform on base	platform indeterminate		
complete specimens:	3	2	7	7	19
fragments:					
tip missing	1	2	6	0	9
base missing	0	0	2	2	4
total	4	4	15	9	32

End Blades

A total of eighteen complete end blades, twenty-four main body fragments and five tip and corner fragments is present in the assemblage. Tip and corner fragments which could not be classified without doubt as end blade fragments are included with biface fragments. Thus the number of end blade tip and corner fragments is most probably underrepresented. All end blades are triangular with straight to slightly convex sides. Bases range from almost straight to markedly concave (Table 17 and Plate 4). The majority have basal thinning on both dorsal and ventral faces, one specimen being basally thinned by grinding rather than flaking. Two complete (Plate 4 q and r) and one fragmentary end blades have a single pair of shallow notches at the extreme basal end of their lateral edges.

All but two complete specimens are symmetrical, the overall shape of the majority ranging from an elongated triangle (length/width ratio of 2.73), to verging on an equilateral triangle (length/width ratio of 1.34). Table 17 summarizes the metric attributes of complete end blades. Not evident in Table 17, however, is the somewhat expected observation that the longer endblades also tend to be the widest, and that they also have the greatest length/width ratios.

Table 17 Metric attributes of complete end blades (in mm., n=18)

	mean	standard deviation	range	coefficient of variation
length	29.0	5.95	21.0 to 42.9	20.52
width	16.7	4.00	11.9 to 26.6	23.95
thickness	4.2	0.98	2.8 to 6.9	23.33
length/width ratio	1.79	0.41	1.33 to 2.73	22.91
basal concave-ity index *	1.10	0.05	1.00 to 1.20	4.55

* = maximum length/length from center of base to tip

Cross sections are either plano-convex or triangular-convex. The dorsal surface is in all cases completely and carefully retouched, while the ventral surfaces display a variety of surface preparations. Ventral surfaces may have any combination of tip fluting states (absent, single or double spall removal), and ventral surface retouch states (absent, unilateral or bilateral). In total, twelve of eighteen complete end blades display evidence of tip fluting, as do twelve of nineteen main body fragments for which this attribute is observable. The most common single class is that of two tip flute scars on a bilaterally retouched ventral face (Table 18). Both the notched and the ground end blades are in this group.

It is of interest to note the presence of eleven end blade tip fragments and one main body fragment whose distal ends have been prepared as striking platforms for tip flute removal. Comparable specimens are reported at the Cape Ray

Table 18 End blades, modification of ventral face

Type of Modification	Complete Specimens	Main Body Fragments	Tip * Fragments	Base * Fragments	total
bilateral retouch two flute scars	8 +	12 ++	15 +++	0	35
bilateral retouch one flute scar	2	0	0	0	2
bilateral retouch no flute scars	3	3	0	0	6
unilateral retouch no flute scars	1 ≠	0	0	0	1
no retouch one flute scar	2	0	0	0	2
no retouch no flute scars	2	4 ≠≠	0	0	6
not observable	0	5	0	1	6
total	18	24	15	1	58

* non-diagnostic tip or corner fragments are not included
\+ includes two notched and one chipped and ground end blade
++ includes one notched end blade fragment and one prepared for tip fluting
+++ includes 11 tips prepared for fluting
≠ asymmetrical specimen
≠≠ each of the four has marginal retouch but no surface retouch

site (Linnamae 1975:106). While it is possible that these represent preforms which were broken, lost or discarded in the final stages of preparation before use, they are considered here to provide evidence of the preparation for resharpening of completed end blades. The arguments for, and implications of, this assertion are presented below.

We note that the preparation of an end blade for tip fluting requires that its end be squared off, thus shortening it to some degree. Detachment of the tip flutes, will shorten it further, as well as thin and narrow the distal end somewhat. Assuming the use of tip fluting as a resharpening procedure, repeated sessions of tip fluting would reduce the end blade to the point where it either becomes too short and thus non-functional, or until it is judged too thin to sustain further tip fluting without danger of breakage. In either case the short 'exhausted' end blade will be discarded. On a site where tip fluting is used as a resharpening procedure, one would expect a majority of short but still relatively broad end blades with only a few longer specimens which were lost, broken or otherwise discarded before their full term of usefulness was reached. This pattern is clearly evident in the Port au Port site Dorset end blade assemblage (Figure 5). The end blade sample includes two specimens which are significantly longer than the majority (42.2 and 40.9 millimeters), six fragmentary specimens for which length measurements may be taken that fall in the middle of the range of lengths (i.e. they were broken before they were reduced to a non-functional or unresharpenable state), and a bulk of short end blades.

Further confirmation that tip fluting was employed both as a manufacturing and a resharpening procedure could be provided by microscopic use wear analysis and blood residue

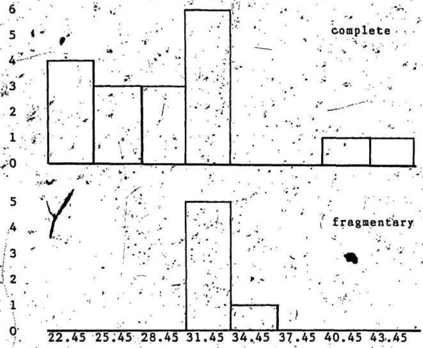


Figure 5 Histogram of end blade lengths

analysis. Based on the argument presented above, it would be expected that non-human blood residue should be found on some tip flute spalls and that there should be traces of use wear along their remnant edges. The possibility that tip flute spalls themselves were used as tools would have to be controlled through inspection for haft/handling marks, especially considering that a small number of tip flute spalls do display use wear on the edges opposite the remnant edge. The challenges posed by these tests are left as problems for future research.

Tip Flute Spalls

The assemblage includes a sample of 104 tip flute spalls. They are in general blade-like, very thin and have lengths greater than twice their widths. Sub-categories of tip flute spalls are defined on the basis of the portion of the end blade from which they are removed (left, right or center), as well as the pattern of flake scars on their dorsal surface (the number of previous spall removal scars and the presence, absence and degree of lateral retouch).

The 'handedness' of a spall is simply a statement of whether the remnant edge is on its left or right side, central spalls having no remnant edge. Note that conventions regarding the description of flakes require their orientation with the striking platform toward the observer, with the dorsal surface exposed to view. If a tip flute spall is described in this manner, when it is reoriented and refitted to the end blade from which it was struck its 'side' will correspond properly to the side of the end blade from which it was detached, assuming the end blade is correctly oriented with the tip away from the observer and the dorsal surface exposed.

The morphology of the dorsal surface of a tip flute spall has been used to judge the stage at which it was detached in the course of a given tip fluting session. In a generalized example where a set of overlapping tip flute spalls are removed from a completely retouched ventral face, the first or 'primary' tip flute spall will retain lateral flake scars completely across its ventral surface. The second or 'secondary' spall will have a flat facet along one edge truncating the lateral flake scars. Additional, or 'tertiary' spalls, removed immediately will have no lateral flake scars (Figure 3 a, page 129).

The sub-categories generated by this example do not, however, exhaust the variability observed in the sample (Figure 6 and Table 19). Some tip flute spalls exhibit only partial retouch across their dorsal surface, indicating that there is sometimes an intermediate stage of marginal edge retouch before the detachment of tertiary spalls and/or that the ventral face is not always completely retouched prior to a tip fluting session. This latter possibility implies that some 'tertiary' spalls with marginal retouch are actually the first or second tip flute spalls removed

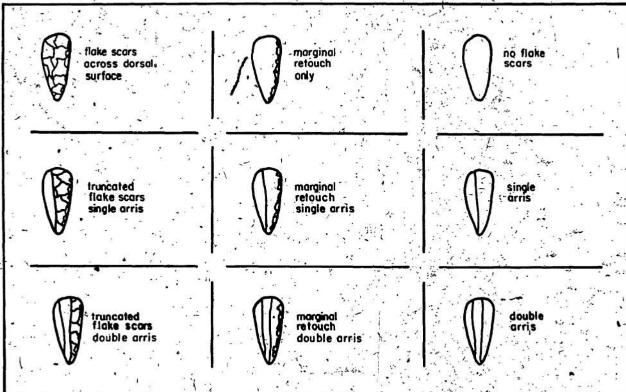


Figure 6 Tip flute spall dorsal surface variability

Table 19 Frequency of tip flute spall categories

	Left	Center	Right	total
'primary' (transverse flake scars across all of dorsal surface)	8 ≠	3	8 +	19
'secondary' (transverse flake scars truncated by spall facet)	16 +*	9 *	27 ≠	52
'tertiary':				
no retouch:				
one arris	1 +	0	2	3
two arrises	1	0	1	2
marginal retouch:				
no arris	8 +	0	1	9
one arris	0	1	5	6
two arrises	3	0	0	3
transverse flake scars truncated by two spall facets	4 *	4	2 *	10
total	41	17	46	104

* includes one specimen with use/retouch on edge opposite remnant edge, n=3

\+ includes one specimen with flat remnant edge, n=4

≠ includes two primary left/secondary right articulating pairs

during a session. Further, it is plausible that the ventral face is not retouched at all prior to the removal of a set of tip flute spalls, thus some unretouched 'tertiary' spalls may actually be the first and second removed. The only foreseeable resolution to this terminological inconsistency is through the use of microscopic use wear analysis, the presence of use wear on a tertiary spall indicating that it is actually the first or second spall removed following a period of use. In the absence of use wear analysis researchers must be cautioned that tip flute spalls resembling the primary, secondary and tertiary tip flute spalls presented in the generalized example above are not necessarily the first, second and third tip flute spalls detached. The following discussion will in fact provide additional examples of how tip flute spalls may be 'misclassified', and in some cases how this cannot be corrected by use wear analysis.

Another set of classes which were not accounted for in the generalized example above include spalls with more than one arris, (Figure 6, page 140). These specimens are the only ones which can be truly identified as tertiary spalls, in that at least two spalls were removed prior to their detachment. Their presence implies that spalls are not necessarily detached sequentially from alternating sides as was the case in the example cited above, but rather that in some cases a pair is removed from one side, or from the center and one side before a third is detached from the other side.

In the case where two spalls are removed sequentially from the same side, the second will not retain lateral flake scars and will thus resemble the tertiary spall of the generalized example. In the case where a central spall is removed first, then the two removed to either side will both appear to be secondary spalls. This may explain the presence of more than twice as many secondary as primary tip flute spalls. The removal of one primary central spall, could be followed by two secondary spalls, whereas the detachment of one left or right primary can be followed only by one right or left secondary spall. The absence of a sufficient number of primary central spalls in this sample to account for all of the extra secondary spalls is probably due to the difficulty in identifying central tip flute spalls. A problem also arises when successively detached spalls do not overlap. In this situation, the first two spalls removed from a completely ventrally retouched end blade will be primary.

To reiterate the most important conclusions of this section it has been recognized that: tip fluting does not follow a single sequence of steps but rather it involves a set of hierarchical steps, and the terms primary, secondary and tertiary tip flute spalls do not imply an absolute order in the sequence of tip flute spall detachment. A given spall cannot be reliably identified as the first or second removed without a great deal of effort. All that can usually be said is that in certain cases one or more spalls have been removed previous to the one in question.

End Blade Industry Summary

The preceding discussion of the Port au Port site Dorset end blade industry has been principally an investigation into the process of tip fluting. It is presumably derived from an innovative application of microblade technology to the manufacture and maintenance of end blades. During manufacture it is employed in the earliest stages of preform treatment in a sequence of alternately tip fluting and trimming the lateral edges of a prospective tool. Upon reduction of the preform to an appropriate shape and thickness, the base will be prepared. The final stages of preparation before use probably involves the removal of a pair of tip flutes spalls from along the lateral edges.

Tip fluting may then be employed to resharpen an end blade until it is exhausted. That all of the longer end blades in the sample are tip fluted suggests that only once they are somewhat reduced due to resharpening is tip fluting sometimes abandoned for other maintenance procedures (such as unifacial or bifacial edge retouch). In general, whether during manufacture or maintenance, the sequence of tip flute spall detachment during a given tip fluting session will follow no single simple set of steps.

The presence of end blades lacking retouch altogether on the ventral surface suggests a possible parallel manufacture sequence which has not yet been addressed. While these end blades may be the result of the unifacial reduction of relatively small flake preforms which were not reduced by alternate sessions of tip fluting and edge retouch, they may alternatively represent the manufacture of some end blades by a spall being detached across the whole of the ventral face. Tuck (1975:166) argues that similar specimens from the Rose Island Site W, Saglek Bay, were manufactured by this latter procedure, suggesting that it represents "the final step in the evolution of the tip fluting technique of thinning or resharpening." The presence of tip fluted end blades with no other ventral retouch, both at Port au Port and Saglek Bay, indicates that the removal of a single broad spall and a pair of spalls would not have been mutually exclusive procedures.

Turning to broader regional considerations, it is important to point out that the pattern of a few long end blades, some intermediate length fragments and a bulk of short specimens which is indicative of the use of tip fluting as a resharpening procedure is also evident in other collections from the west coast of Newfoundland as indicated by qualitative examinations of the Phillip's Garden and Point Riche sites on the Point Riche Peninsula, as well as the Cape Ray Light Site on the southwest corner of the island.

It is uncertain if this pattern is universal in Dorset contexts across Newfoundland. Robbins (1985, 1986) notes that endblades from the northeast and south coasts tend to be longer overall than on the west coast. They appear not to have been resharpened and shortened to any significant degree. The most likely explanation for such a different treatment of the end blades in the different areas is the use of different raw materials in each.

On the west coast end blades are predominantly manufactured from fine grained cherts with exceedingly good flaking characteristics allowing tip fluting to be successful on even quite small end blades which have been reduced by a number of resharpening sessions. Robbins (1985, 1986) reports that northeast coast end blades are manufactured from rhyolite which is coarser than chert, and consequently has relatively poorer flaking characteristics. As such, the removal of tip flute spalls would be expected to be less successful on smaller end blades. Thus, rhyolite end blades would not have been subjected to the procedure of resharpening and shortening through the removal of tip flute spalls to the same degree as it occurred on the west coast, they would instead, have been retired from use through loss, breakage or discard while they were much longer than their west coast counterparts.

The raw material factor comes into play once again on the south coast where end blades are predominantly manufactured from a soft patinated chert. Not only does this material appear less suitable for tip fluting, but it seems less suited to flaking altogether as it is commonly ground or chipped and ground.

This examination of the patterns of manufacture and use of end blades provides an explanation for the variability in length of Dorset end blades across Newfoundland. This accounts for a great deal of the regional variability in end blade style reported by Robbins (1985, 1986; Table 2, page 12). It does not, however, account for all of it. Differences in basal treatment, marked concavity of the base on the west coast and slightly concave or straight bases on the south and northeast coasts, may also relate to limitations inherent in the raw materials of the south and northeast coast, but no mechanism to link base shape with lithic raw material type has been formulated. Alternatively, base shape may relate to any number of functional considerations (i.e. the type of harpoon tip to which it is attached, the material from which the harpoon tip is fashioned, the species which it is used to kill, etc.), or it may be a matter of cultural preference. Future analyses may provide a key to understanding this variability more fully.

Expanding Flake Scraper Industry

Scrapers in the Port au Port assemblages were defined on the basis of relatively steep unifacial retouch along a working edge and are distinct from utilized or retouched flakes whose working edges are only minimally retouched. Three specimens with bifacially retouched working edges were classified as a scrapers since the retouch on the ventral face of their working edges appeared to have been executed only to reduce bumps on that face and form plano-convex cross sections equivalent to the other scrapers. Frison (1968:150) notes scrapers with this characteristic in a collection from a late prehistoric buffalo kill and butchering site in northern Wyoming and considers them to be functionally equivalent to scrapers with unifacial working edges.

Scrapers in the Dorset assemblage are divided into three general categories: expanding flake scrapers, end of blade scrapers and side scrapers. The latter two forms are subsumed under the microblade and flake tool industries respectively, and the former constitutes an industry in itself.

Expanding Flake Scraper Preforms

The manufacturing stages of this industry are poorly represented, and only two are tentatively identified as preforms. These are minimally worked flakes, unifacially retouched to a tear drop shape with plano-convex or asymmetrical bi-plano cross sections. In the absence of much data from the manufacturing stages, it is assumed that the procedure was a relatively simple reduction of an appropriately shaped flake through edge and surface retouch.

Expanding Flake End Scrapers

A total of seventy-seven complete specimens, fourteen distal fragments, seven probable proximal fragments and four other fragments of this class were recovered. All but three complete, and one distal fragment are manufactured from a variety of fine grained cherts, the four exceptions being made of quartz crystal. The complete quartz crystal specimens measure 22.4 by 12.7 by 4.7 millimeters and 18.2 by 14.7 by 6.3 millimeters. Two are unretouched along the lateral edges, and one is unifacially retouched along one edge. The small number of quartz crystal scrapers recovered from this site suggests that they are not the preferred material for this tool class. Due to its different flaking characteristics, as well as the small size of the blocks of quartz crystal which are usually available, they are excluded from the discussion below. Metric attributes of the complete chert end scrapers are presented in Table 20.

Table 20 Metric attributes of complete chert expanding flake end scrapers (in mm., n=74)

	mean	standard deviation	range	coefficient of variation
length	23.56	7.39	11.2-43.5	31.37
width	17.81	3.52	12.8-28.5	17.76
thickness	5.00	1.41	2.5-9.7	28.20

Expanding flake end scrapers are triangular or quadrilateral in form with, as the name suggests, broader working edges than bases. Sides are for the most part straight to convex with only two specimens exhibiting concave sides (Plates 5 and 6). The working edge is in all cases but one opposite the striking platform, the single exception having a bifacially retouched working edge formed along the striking platform. Four specimens have a pair of notches near the base (Plate 5 m to p), and another has a single notch.

In terms of working edge shape, corner shape, lateral edge retouch and basal treatment these scrapers display a bewildering degree of variation (Appendix 3). Working edges are convex, and may be symmetrical or asymmetrical.

Corners may be sharp, or rounded or a scraper may possess one of each. Lateral edge retouch may be absent, unifacial, or bifacial. Further, the retouch characteristics of each lateral edge of a scraper may be different for example, with one edge bifacially worked and the other unaltered. Edge retouch in some cases reduces the proximal end to a point, completely obliterating any trace of the striking platform and bulb of percussion. On some the ventral face is retouched only in the vicinity of the bulb of percussion while others lack bulb reduction altogether.

Researchers in general assume overall size, working edge shape, corner shape, and overall form to have functional implications and have devised typologies based on these attributes. These typologies are, however, in the end only descriptive and in no cases of which I am aware have convincing arguments been presented to link specific functions to differently shaped Dorset end scrapers. Indeed, in the absence of such techniques as microscopic use wear analysis, any explanation of the observed variability in terms of function will remain inadequate. Further, exclusive use of shape to organize scrapers into types ignores the variability present in lateral edge and basal treatment, variability which requires some sort of explanation. Examination of this collection of scrapers in terms of the etiological approach provides insight into factors other than function which contribute to the variability of the sample. Of particular value are ethnographically derived observations relating scraper use to variation in form.

The extreme degree of variability described above is of particular interest in comparison to the similar range of variation reported by Mason (1891:585-586) among the northwestern Eskimo:

> Scraper blades among the northwestern Eskimo are made from a planoconvex spall of black chert, jasper, etc., kept flat on the under face and chipped into shape on the upper face. The cutting edge is rounded and chisel-shaped, and is usually the broadest part of the blade. The general outline varies from circular, or even a flattened ellipse through infinite varieties, to an oblong parallelogram rounded at either end. Indeed, one and the same blade may be all of these forms at various periods of its existence by a process now to be explained.....The writer has lately learned that the hunter and leather-worker are never without one [a bone flaking tool] and they bring it into requisition with a frequency which reminds one of the old plantation slave sharpening his scythe every few minutes to get a rest.
>
> Lieutenant Stoney, speaking of his experience at Kotzegue Sound, says that the leather-worker is incessantly touching up his scraper edge with the chipper, and that in time he wears it out to a mere stub. This constant sharpening also accounts for the fact that few specimens show signs of great wear. It is important to repeat this, that the constant use of the edging tool rapidly wears down the scraper blade and keeps the edge sharp. This accounts for the difference in lengths of the artifacts in our cabinets and for the fact that they show so little sign of use (emphasis mine).

Gallagher (1977), in a description of obsidian scrapers used by three ethnic groups in Ethiopia, the Gurage, the Arussi-Galla, and the Sidamo, concurs with the observation that scrapers are resharpened constantly to the point where the 'exhausted scraper' is discarded. He indicates that among the groups he studied it takes on average six hours to completely scrape a cow hide and that four scrapers will be used up in the process, the rate of reduction of the length of the scrapers being roughly one centimeter per hour. The constant retouching of the working edge, he explains, is executed not so much as to keep the scraper sharp as to remove burrs which form through use which will cut and damage a skin.

These examples demonstrate that scraper length is not necessarily determined by functional considerations (i.e. what it was used to scrape), but rather, that length will relate to how a scraper is maintained through its period of use, specifically, how it is resharpened. Further, the maintenance of a scraper in this fashion will affect the overall shape of a scraper and the form of its corners. For example, an originally tear drop shaped scraper with clearly rounded corners when reduced to an exhausted nub would end up as a short triangular scraper with sharp corners, providing any attempt was made to retain a similar degree of curvature on the working edge (Figure 7 a).

It is easy to visualize cases where a scraper will change form even more drastically through its period of use.

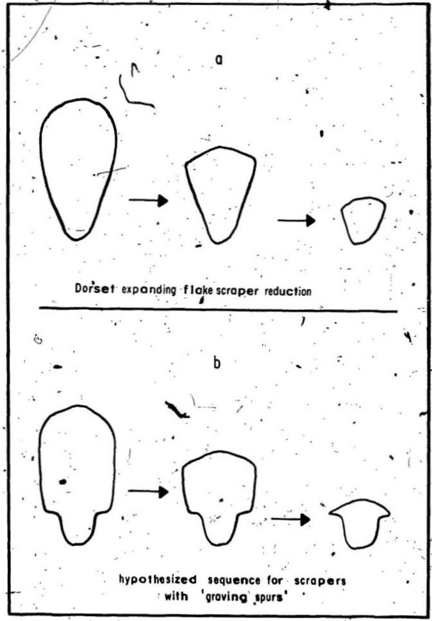


Figure 7 End scraper reduction sequences

A scraper stemmed for hafting purposes, for example, would be so reduced that it would be described as possessing 'pronounced graving spurs' (Figure 7 b). Such spurred scrapers from Groswater, Palaeo-Eskimo contexts in Newfoundland and Labrador have generally been assumed to have a particular functional significance, while in the context of this discussion, these spurs have no functional significance at all.

With regard to hafting, the collections that both Mason (1891) and Gallagher (1977) address were used in a handle of some type. While stemmed or notched scrapers may be safely assumed to have been hafted, researchers have reported ethnographic as well as archaeological incidents of scrapers with no clearly evident modification for hafting as having been used in a handle (Metcalf 1970; Nelson 1899; Osgood 1940; Wedel 1970). This author finds it difficult to visualize using a freshly prepared end scraper, much less an exhausted one without the aid of some form of haft. In the absence of direct association between scrapers and their hafts on a site, any assertion that most if not all scrapers are hafted must rely on microscopic use wear analysis. While surface polish as well as use and/or haft wear along the lateral edges is present on many of the Port au Port Dorset specimens, the task of a more complete investigation is left to future analysis. Assuming for the moment that the scrapers were hafted, it is clear that the treatment of the lateral edges and base of a scraper would be determined by hafting requirements.

Given a situation where a scraper has just been used up, has been discarded and a replacement is to be mounted in its place, should the replacement be slightly oversized and not quite fit the socket, it would be more efficient to alter the scraper than the socket. Alteration of a socket each time an oversize scraper is to be mounted would eventually enlarge it to the point where appropriately small scrapers could no longer be mounted and a new haft would have to be manufactured. Reduction of a large scraper to fit the haft socket would allow the haft to be used for a much greater period of time. Thus, when the time to refit a scraper to the haft has come, should the freshly manufactured scraper fit with no further modification, then it will be used as is. A scraper which is too large will be trimmed as much as necessary until it fits, larger scrapers requiring more extensive retouch, smaller ones requiring less. Lateral edge and basal treatment of scrapers is therefore a matter of expediency, and even slight variation in the size and shapes of freshly prepared scrapers will contribute to a wide degree of variability.

The above discussion points out how variability in scraper shape and basal treatment can be explained by a particular means by which they are hafted and maintained. In the absence of direct observation of use or the recovery of scrapers and their haft elements in direct association, this behavior can only be inferred through the generation of implications which can be tested against the archaeological data. One such test is suggested above, that of the use of microscopic use wear analysis to discover haft wear marks and will not be explored further in this work other than to repeat that polish and edge wear which are most probably the result of hafting are visible by eye on many of the scrapers in the collection.

A second implication is that as a result of resharpening, one would expect only a few scrapers to be lost or discarded in their earlier stages of use while they are still quite long. Further, more would be damaged, lost or discarded after a short period of use and reduced to a medium length[2], and a majority would enter the archaeological record after having been resharpened to a short exhausted state. This pattern is clearly evident in the histogram of scraper lengths from the Port au Port site (Figure 8).

A third implication addresses the relationship between scraper length and corner shape. Given a freshly prepared scraper with rounded corners, we expect that as it is used

2 Scrapers could be discarded before their exhaustion, for example, in the event a scraping task is finished but the scraper is not yet completely used up. The hide worker could decide to take time to refit a new scraper into the haft before starting a new scraping task and thus start with a fresh scraper next time rather than be interrupted more than necessary to refit fresh scrapers. Gallagher's observations indicate that interruptions of this sort are minimized by fitting two scrapers into opposite faces of a single haft, using up one then the other before halting scraping to refit.

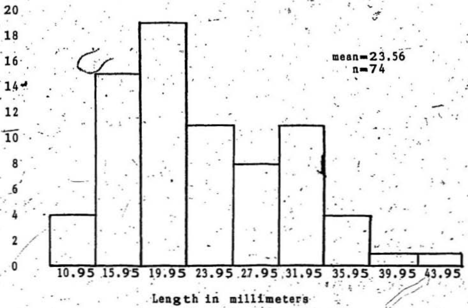


Figure 8 Histogram of expanding flake scraper lengths

up and becomes shorter its corners will tend to become sharper. Examination of Figure 9 indicates that scrapers with two round corners do tend to be longer, those with one round and one sharp corner cluster at intermediate lengths, and those with two sharp corners are generally shorter than the others. This relationship can be demonstrated quantitatively using the Student's t test.

The Student's t test compares the variates from a pair of samples in order to determine if they came from the same or different parent populations. Each group of scrapers (those with two round corners, those with one sharp and one round corner, and those with two sharp corners) will be treated as separate statistical samples. Should the groups of scrapers turn out to have been selected from the same statistical population it can be concluded that the apparent correlation between length and corner shape is the result of random sampling errors. On the other hand, should the samples be from different parent populations the length differences can safely be assumed to be the result of non-random factors, implying that a correlation between corner shape and length does exist.

Application of the t test requires that the data meet four assumptions: that measurements are of an interval scale, that the selection of any single variate does not affect the probability of selection of any other, that the sample variates are randomly selected from a normally distributed population, and that the variances of the parent

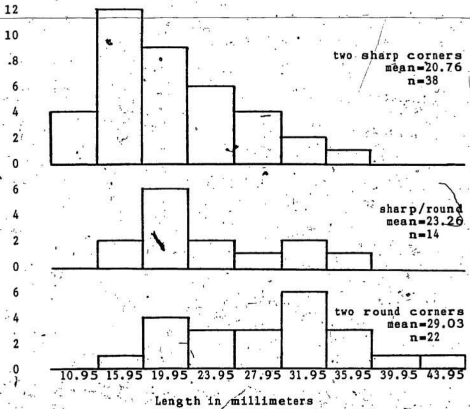


Figure 9 Histogram of expanding flake scraper lengths by corner shape

populations are roughly equal (Thomas 1976:255-257). The data at hand satisfy the first two requirements, but the latter two assumptions are difficult to justify. Thomas (1976:256), however, indicates that the assumption of normality can safely be ignored providing that the sample sizes are fairly large and that the test is non-directional (i.e. that we are testing if variates are equal or not equal as opposed to if they are greater or less than). As the sample is sufficiently large and the statistical hypotheses will be formulated as non-directional tests, this third requirement has been adequately met. Regarding the final assumption, Thomas (1976:257) indicates that acceptable results will be produced when the parent population variances deviate from each other as long as the sample sizes are roughly equal and the parent populations have distributions of approximately the same shape. These final requirements are also met by the data. Thus the Student's t test may be safely employed.

Each pair of the three groups of scrapers were tested; two round corners versus one round and one sharp corner, two round corners versus two sharp corners, and one round and one sharp corner versus two sharp corners. The following statistical hypotheses were formulated:

> H_o: the mean lengths of the parent populations are equal indicating that the samples are from the same statistical population

H_1: the mean lengths of the parent populations are not equal, indicating that the samples are from different statistical populations

In each case the calculated value for t exceeded the critical value of α at the 0.05 level and H_0 was rejected:

for two sharp corners vs. two round corners:

t=4.619
α=0.681 to 0.679
(degrees of freedom = 58)

for two sharp corners vs. one round and one sharp corner:

t=1.126
α=0.681 to 0.679
(degrees of freedom = 50)

for two round corners vs. one sharp and one round corner:

t=1.805
α=0.683 to 0.681
(degrees of freedom = 34)

In other words, the differences in scraper lengths are not the result of random factors but rather, each group represents a separate statistical population, and it can be safely assumed that the correlation between scraper length and corner shape is not a result of random factors.

This pattern of a bulk of short exhausted scrapers, a few intermediate length specimens, and a minority of longer scrapers, as well as the presence of probable haft wear on some scrapers supports the argument that expanding flake end scrapers from the Port au Port Dorset component were used in a manner similar to that reported by Mason (1891) and Gallagher (1977). I wish to stress that a traditional typological analysis, one oriented toward classification of the end products of a lithic industry, could only have provided a description of the data and the meaning of the types derived would have remained unclear. As an alternative, the etiological approach, bolstered with even a minimum of ethnographic data, has provided a coherent explanation for the variability observed in the sample.

Summary of Expanding Flake end Scraper Industry

Little has been said of the manufacturing sequence of expanding flake end scrapers other than that it was probably a matter of reducing appropriate flake blanks to triangular or ovoid scrapers of probably 35 to 40 millimeters in length and 20 to 25 millimeters in width[3]. Through its period of use the scraper would be continually resharpened, becoming shorter to the point when it would be discarded as an exhausted nub. These scrapers are considered to have been hafted in some form of an open or closed socket organic component. Expanding flake scraper hafts have yet to be identified in Dorset components in Newfoundland[4] due to a lack of preservation in most sites and probably also because they have gone unrecognized in some collections. Harp

3 These measurements are estimated on the basis of the largest scrapers in the sample which can be presumed to have been lost or discarded before they were used to any great extent and thus may be taken to represent a freshly prepared scraper.

4 Renouf (1986:pers.com.) reports recovering the haft of a ground slate scraping tool from the Phillip's Garden site, on the Point Riche Peninsula, Newfoundland.

(1964:75-77) illustrates and describes a piece of worked bone from the Phillip's Garden site, Port au Choix which "suggests an unfinished haft". It is my contention that this is actually a completed and fully functional haft, possibly a scraper haft, and that a re-examination of organic tools from other collections will turn up additional examples.

Microblade Industry

The Dorset microblade industry has been divided into two sub-industries based on the type of raw material used for their manufacture, either chert or quartz crystal. The difference between these materials in terms of hardness, flaking characteristics and the size of pieces available sometimes requires not only different manufacturing procedures for microblades, but also appears to condition the uses to which microblades of each are put.

Richard E. Morlan (1970) describes four basic types of microblade cores: conical, cylindrical, tabular and wedge shaped. They are distinguished primarily on the basis of the position of fluting facets, which may be either on core faces or on margins (the juncture of faces). Conical and cylindrical cores have fluting facets completely or nearly completely around a circular or oblong striking platform. Tabular cores have elongated striking platforms with fluting arcs along the long axis of the platform, the fluting arc being thus described as 'facially distributed'. Wedge shaped cores have elongated platforms with fluting arcs across the short axis of the platform, the fluting arc being described as marginally distributed. Morlan (1970) points out that these four types are not exhaustive, a variety of intermediate forms exists and a given core could change from one type to another through its period of use. For example, the long axis of a wedge shaped core will become increasingly shorter as microblades are detached until it begins to approach the proportions of a conical or cylindrical core, and as it is further reduced it will more closely resemble a tabular core. The microblade cores in this collection will be described according to these types where possible and where exceptions occur, the arrangement of the fluting facets will be described.

The definition for microblades is not stringent as the objective at hand is to compile a set of data relating to the microblade industry as a whole rather than to examine only very narrowly defined 'microblades' to the exclusion of flawed broken or otherwise discarded products of the microblade industry. The category of microblades thus includes specimens which have: generally parallel sides, a flat ventral face, one or more arrises on the dorsal face, and a prepared striking platform on complete or proximal fragments. Diagnostic debris such as ridge flakes and core reduction debris will be described as well.

Chert Microblade Cores and Core Debris

Two tabular and one 'bipolar' cylindrical cores were recovered in addition to two small chert blocks, each of which has a single primary ridge flake detached. Core debris includes six ridge flakes and three core reduction flakes. One tabular core has only a single striking platform, while the other is rather thick and has three striking platforms. Except for the striking platforms, neither of these cores was particularly carefully prepared, microblades having been detached wherever a convenient striking platform could be formed.

The cylindrical core is bipolar in that it has had microblades detached from a pair of platforms at opposite ends of the core, but it is uncertain whether it is bipolar in the sense that microblades were detached by placing one platform on an anvil and striking the opposite end with a hammer. The blocks with only primary ridge flakes removed may have been too small for the successful removal of microblades or they may have broken from the face of a core upon attempts to detach microblades.

Microblades must follow a ridge in order to be successfully detached from a core. Scars from the detachment of previous microblades generally suffice, but the first ridge must be formed by the manufacturer, or the platform may be positioned so as to take advantage of a fortuitous ridge on the core. The 'microblades', or ridge flakes, struck from these first ridges are distinctive. Four ridge flakes resulting from manufactured ridges, and two from natural ridges were recovered. Two of the manufactured ridges were bifacially chipped while the other two were unifacially formed and have careful edge retouch suggesting that cores were sometimes reoriented and that old striking platforms were used as ridges. The three pieces of core reduction debris had either remnants of a striking platform or microblade detachment scars across a face.

<u>Chert Microblades and Microblade Tools</u>

The sample includes 22 complete microblades, 180 microblade fragments and 12 tools reduced from microblades (Plate 7). Inspection by the unaided eye shows that slightly more than half (55.4%) of the complete and fragmentary microblades have no sign of use and/or retouch and that roughly equal numbers of the remainder have bilateral or unilateral use/retouch (Table 21). The high proportion of proximal (n=90) to distal (n=38) fragments may be the result of the former being easier to identify and/or be the result of the latter being selected for further reduction into other tools.

Only four specimens have any evidence of hafting modification, and two patterns of hafting are present: a pair of notches (one on each lateral edge) and a single notch on one lateral edge opposite an edge which has been 'backed' or blunted. The former are considered to be end

Table 21 Chert microblades, use/retouch characteristics

	use/retouch absent	unilateral use/retouch	bilateral use/retouch	total
complete	11	4 *	7 **	22=10.9%
fragments:				
proximal	45	23	22	90=44.5%
medial	36	11	5	52=25.7%
distal	20	10	8	38=18.8%
total	112=55.4%	48=23.8%	42=20.8%	202=100%

* includes one notched specimen
** includes one notched specimen and two 'backed' specimens with a single notch

hafted and two examples are present, one with unilateral and the other with bilateral use retouch. The three with a backed edge and a single notch are considered to have been side hafted, the blunting of one edge serving to protect the haft from splitting.

Tools reduced from microblades include ten end of blade scrapers, four concave side scrapers, one 'micro-point' and probably one small barbed point (Plate 7 k to p). The barbed artifact has a bifacially retouched concave base and is unifacially retouched to form a sharp tip as well as three barbs along each lateral edge and measures 19.7 by 9.3 by 2.7 millimeters. It could have tipped a bird or fish dart, or may have served some non-utilitarian function. The 'micro-point' is unifacially retouched on the ventral face toward the proximal end to form a stem and is unifacially retouched on the dorsal face toward the distal end to form a sharp point and measures 14.9 by 5.5 by 1.8 millimeters. It may have been the tip of a small projectile or have had some non-utilitarian purpose.

Three of the ten end of blade scrapers retain striking platforms opposite their working ends, the remainder are broken across the proximal end. They range in length from 44.2 to 9.6 millimeters, in width from 16.7 to 11.0 millimeters and in thickness from 3.8 to 2.0 millimeters. Three have only one arris while the remainder have two. All have evidence of use/haft wear on at least one lateral edge, one has bilateral edge retouch and two have unilateral edge retouch.

Four microblade midsection fragments have concave unifacial working edges formed on one or both of their lateral edges. Two of these concave side scrapers have only one working edge each, while the other two have one on each lateral edge. In the latter case, the working edges are not positioned directly opposite one another, but are offset presumably in order not to narrow and weaken the artifact too much.

Quartz Crystal Microblade Cores and Core Debris

Thirteen quartz crystal cores were recovered; seven are wedge shaped, two are described as 'crystal cores', one is conical and one is a block which has had a primary ridge flake detached from each of a pair of striking platforms (Plate 8 p to r). One of the wedge shaped cores has an extra striking platform at the base of the 'normal' fluting face from which microblades have been detached along the 'under side' of the core (Plate 8 q). The crystal cores are hexagonal quartz crystals which have had one end prepared as a striking platform and microblades driven off along one of the natural crystal faces.

Quartz Crystal Microblades

The sample includes 40 complete and 57 fragmentary quartz crystal microblades (Table 22 and Plate 8 a to o). Again, more than half (67.5%) show no evidence of use and/or retouch to the unaided eye. Of those with such modification, a majority have unilateral use/retouch (20.0%), and a minority have bilateral use/retouch (12.5%).

Table 22 Quartz crystal microblades, use/retouch characteristics

	use/retouch absent	unilateral use/retouch	bilateral use/retouch	total
complete	27 *	8 **	5 ***	40=41.2%
fragments:				
proximal	17	7	4	28=28.9%
medial	3	4	1	8= 8.2%
distal	19	2	0	21=21.6%
total	66=68.1%	21=21.6%	10=10.3%	97=100%

* includes 16 specimens with hafting modification; one stemmed, three notched, one with two notches on the same edge, nine with a single notch and two with one shoulder

** includes five specimens with hafting modification; three backed with a single notch and two with a single notch

*** includes four specimens with hafting modification; one stemmed, one notched and two 'backed' with single notch

Hafting modifications for quartz crystal microblades are more variable than for chert microblades and includes specimens with: single shoulders, stems, a pair of notches (one on each lateral edge), a single notch on one lateral edge, a single notch on one lateral edge opposite a backed edge, and two notches on the same lateral edge. The greater incidence of hafting on quartz crystal microblades is likely a response to the small size of microblades which can be produced from the small blocks of quartz crystal that are available, smaller microblades being more difficult to manipulate by hand.

Assuming that quartz crystal and chert microblades were used in the same manner, the lack of visible use or retouch scars on the working edges of some quartz crystal microblades which have been modified for hafting supports an argument that quartz crystal artifacts have a more durable edge than their chert counterparts. That they were not manufactured more frequently than chert microblades is presumably a result of chert being available in greater amounts and in larger pieces.

Summary of Microblade Industry

In general it may be stated that the quartz crystal microblade technology on the site is more variable than that of the chert microblade technology both in terms of the method of manufacture of microblades (as expressed in the variability of core types) and the means by which the microblades were used (as indicated by hafting modification). This is understood to be primarily a result of the size of the blocks of raw material from which the cores were manufactured, chert being available in larger blocks than quartz crystal, and to some extent the greater durability of quartz crystal. The variability of core types present not only in this site sample, but from Dorset contexts around the island (i.e. a classic chert wedge shaped core from Broom Point, Krol 1985:pers.com.), at least for the present appear to preclude the possibility of using microblade core types as indicators of cultural or temporal differences within the Dorset tradition in Newfoundland.

Biface Industry

The bifaces and biface fragments display a wide range of forms; however, the low frequency of recovery of complete specimens and blanks does not allow the formulation of reduction sequences for each of the forms represented. Bifaces are thus lumped into a single 'industry' which also serves as a catch-all for otherwise non-diagnostic fragments (i.e. end blade fragments which can not be identified as such with any certainty). Blanks are thick, crudely worked and characterized by large flake scars and sinuous edges, while completed bifaces are generally thinner and have more precise edge and surface retouch.

Biface Preforms

Two complete and three fragmentary biface preforms were recovered. The outline of one complete specimen is roughly rectangular, and the other is ovoid. Both are wider at one end than the other and they measure 63.6 by 38.4 by 21.7 millimeters and 52.8 by 35.9 by 19.0 millimeters. Apart from the fractured edges, the fragments each have circular to oval outlines.

Bifaces

The sample includes thirty biface fragments but only three complete bifaces including: one asymmetrical specimen with notches at the base forming 'ears', one lanceolate, and one thick triangular biface (Plate 9). The latter probably served as an axe or adze bit and is quite robust. Its relatively small size, however (58.8 by 42.5 by 18.0 millimeters), suggests that it would have been used in this way most easily if it were hafted and it does in fact show clear signs of haft or handling polish on one face, and is considered to be an exhausted axe or adze bit. Further excavation or the examination of similar artifacts from larger collections might suggest an appropriate sequence of reduction through resharpening and use which would support this.

The notched asymmetrical biface has one straight side which projects from the longitudinal axis (as determined by the base) at an angle of 95 degrees. The other lateral edge is concave and forms a much more shallow angle. The tip is flat while the base is slightly concave. The concavity of the lateral edge is likely the result of resharpening. Thus given a sufficient sample, a sequence for the reduction of this type of biface could be presented. The degree of concavity suggests that it may have been near the end of its term of usefulness and the fact that it was recovered in two fragments may mean that it had been weakened through sharpening.

Three basal fragments are "eared" in a manner similar to the asymmetric biface described above. One asymmetric basal fragment which has only a single shallow notch and marked basal concavity conforms to the "eared" asymmetrical biface in terms of the angles between the lateral edges and the longitudinal axis. Three corner fragments represent a different type of biface, each has a notch on the lateral edge, and the angle between the base and edge approaches 90 degrees. A further variant is represented by a contracting basal fragment which has a slight shoulder on one edge, and a notch on the other. The remaining fragments include: four un-notched basal fragments, two mid-sections, four lateral edges, eight small acute corner or tip fragments, six large obtuse corner or tip fragments and two miscellaneous biface fragments.

The abundance of fragments relative to complete bifaces indicates that the area excavated served as a retooling station or a dump, and their distribution suggests that the center of this activity was the hearth/refuse pit located in unit N6E14.

Soapstone Industry

The sample includes 106 fragments of soapstone, all but one of which are from vessels. The exception is a rectangular fragment of soapstone, plano-convex in cross section, which is broken at either end (Plate 10).

Vessel fragments include thirteen rim, one rim and corner, fourteen corner and seventy-eight body fragments. Maximum thickness of the vessel fragments is unimodally distributed (Figure 10) and ranges from 3.6 to 17.9 millimeters (excluding 13 exfoliated fragments), with an average of 9.8 millimeters and a standard deviation of 2.84.

Five types of rims are represented: symmetrical rounded, asymmetrical rounded, unifacially beveled, squared, and squared with one corner beveled. The frequencies of these types are presented in Table 23. Corner angles are measurable on only eight fragments (including one base and side corner) and range from 99 to 135 degrees with a mean of 109.3 and a standard deviation of 11.82.

Only one unifacially beveled rim fragment and two body fragments are from vessels with curved sides. One basal fragment is broken across a shallow rectangular depression. Linnamae (1975:163-64) describes these as the result of a

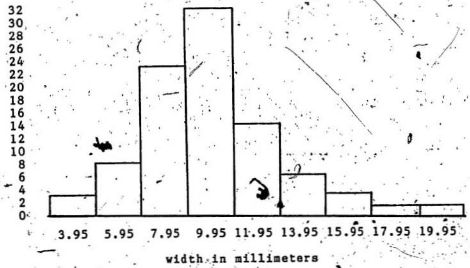


Figure 10 Histogram of soapstone vessel fragment widths

Table 23 Soapstone vessel fragments, rim type frequencies

Rim Type	n	%
symmetrical rounded	1	7.1
asymmetrical rounded	3	21.4
unifacially beveled	7	50.0
squared	2	14.3
squared with one corner beveled	1	7.1
total	14	99.9

mending procedure. The depression would be gouged across a break and a 'bar' of chert would be cemented in place. An additional basal fragment is perforated by the intersection of a pair of grooves gouged from opposite faces. This represents another mending procedure, that of binding between a pair of perforations across a break. This latter fragment also has a shallow depression carved on one face along a break.

Ground Slate Industry

No complete ground slate tools are present in the assemblage. The most nearly complete specimen is bifacially bevelled, measures 51 by 36 by 3 millimeters, has one broken and one rounded end and a shallow T shaped depression ground into one face (Plate 11 a). A second fragment of note is a bifacially beveled midsection which has a notch on each lateral edge and two additional 'notches' along one fractured end (Plate 11 e). These latter notches are probably the remains of a pair of perforations across which the artifact is fractured. The remaining specimens include one mostly exfoliated, and an assortment of seven unifacially beveled, ground slate fragments.

Ground Nephrite Industry

The assemblage includes one small complete burin-like tool, four distal ends of burin-like tools, five miscellaneous fragments of ground nephrite tools and a block of nephrite with two ground facets (Plate 11 f to p). The complete specimen has a notch on each lateral edge near the base and contracts slightly toward the distal end which is bifacially beveled to a sharp chisel edge. Two distal fragments have undamaged working edges, one being bifacially ground to a sharp chisel edge, the other with a bifacially beveled working edge which has been blunted, likely as a result of use. Each has a single notch on one squared lateral edge, the other lateral edge being bifacially beveled. They are broken immediately below the notch and contract toward the distal end. An additional distal fragment is similar to these in all respects, but has a damaged working edge. A final distal fragment has a pair of notches on one lateral edge, is fractured below the notches and contracts toward a damaged working edge.

The five remaining fragments include two corners, two mid-sections and one lateral edge fragment. The corners each have a bifacially beveled edge along their long axis and the edges across the short axis are ground flat. One mid-section has a notch on a flat lateral edge, the other edge being bifacially beveled. The other mid-section has a notch on each of its bifacially beveled lateral edges. The lateral edge fragment has a bifacially beveled edge. The block may have been a supply of raw material from which burin-like tool blanks were detached, and/or it may have served as an abrader.

Flake Tool Industry

The assemblage includes twenty-four miscellaneous retouched and/or utilized flakes, ranging in size from 23 by 15 by 3 millimeters to 70 by 40 by 12 millimeters. Two of these are of particular note, one which has had the bulb of percussion and a dorsal ridge at the proximal end reduced for hafting purposes, and another which has a concave unifacial working edge formed along one side. The latter is assumed to have served as a spokeshave (Plate 12 e and f).

Four side scrapers, ranging from oval to rectangular outlines, have unifacial working edges formed on each of their longer edges. The three complete specimens range from 39.9 to 28.8 millimeters in length, 21.7 to 12.3 millimeters in width and 6.1 to 4.9 millimeters in thickness (Plate 12 a to d).

Miscellaneous Tools, Tool Fragments and other Materials

The assemblage includes eleven fragments of tabular sandstone abraders, this total being reduced to nine upon mending breaks where possible. An edge along the long axis of the most complete fragment (110.0 by 36.8 by 8.8 millimeters) is squared off and polished as a result of use and both faces of this specimen are abraded (Plate 12 g).

Nine miscellaneous unifacially worked tool fragments could not be assigned to any of the above lithic industries. They are for the most part quite small, none exceeding 25 millimeters in either length or width.

Three beach cobble hammerstones were recovered, one round slightly flattened specimen and two oblong ones (Plates 13 and 14 a). The former has a diameter of 95 millimeters and is 58 millimeters thick. There are peck marks on the center of one flat face and at two locations along its circumference which are opposite each other.

The large oblong hammerstone measures 100 millimeters in length and 82 in width. It is narrower at one end and has peck marks at that end. The third hammerstone measures 72 by 47 by 24 millimeters, is narrower at one end but has peck marks at the wider end.

One oblong beach cobble has been roughly flaked into an adze (Plate 14 b). It measures 117 by 45 by 32 millimeters and is bifacially worked on both the bit end and the base. Flake scars extend further on the more convex dorsal surface than on the only slightly convex ventral face. There are peck marks on the unchipped portion of the proximal end. The material is quite coarse and does not break with good concoidal fractures as does chert.

One small fragment of red ochre was recovered. It is quite soft and has the color and consistency of jeweler's rouge.

Lithic Debris

A total of 8.361 kilograms of lithic debris was recovered from the nine one-meter square excavation units. An additional 1.222 kilograms from tests and the surface bring the total to 9.583 kilograms. This sample is dominated by small retouch flakes and larger reduction flakes, primary decortification debris being quite rare. Several large blocks with little or no cortex were recovered, some of which were badly faulted and occasionally burned. These blocks are considered to be raw material brought to the site for the purpose of tool manufacture but which were rejected upon discovery of their flawed character. Presumably unflawed lithic material was completely used up. This pattern of lithic debris is consistent with the arguments presented above for the manufacture and maintenance of tools on the site.

Dorset Artifact Summary

Each of the tool categories discussed above fits comfortably into the tool kit of the Dorset culture in Newfoundland as it has developed to date. Their lithic assemblage is quite well understood and ongoing research is succeeding in drawing finer distinctions between the Dorset people and their Palaeo-Eskimo predecessors.

This analysis has focussed on Dorset lithic technology as represented at the Port au Port site. It has outlined reduction sequences for several lithic industries, with those of end blades and expanding flake scrapers being most completely understood. Taking these two industries as examples, it is clear that the implications of such a technological approach to artifact analysis can be far reaching.

Port au Port Site, Little Passage Complex

The Little Passage Complex assemblage at the Port au Port site consists of 125 artifacts and 3.543 kilograms of lithic debris. The small size and non-representative nature of this sample proscribes the derivation of the lithic industries represented through such empirical means as refitting. As an alternative, the lithic industries presented are based on technological and typological distinctions which correspond to generally recognized types of Little Passage tools. These include: corner-notched projectile points, triangular bifaces, end scrapers, and linear flakes (Penney 1985), as well as non-diagnostic retouched flakes. In addition, several provisional categories are introduced: concave side scrapers, large ovoid bifaces, and large unifaces. Lithic debris, and other miscellaneous material such as iron pyrites and abraders, which can not be associated with any of the above groups will be discussed separately. As noted earlier, the chert from which this assemblage is manufactured is remarkably uniform, all of it falling into the range of variation of the two sources in Port au Port Bay.

Corner Notched Projectile Point Industry

The sample of corner notched projectile points includes two complete specimens and four main body fragments (Plate 15 a to f). The lateral edges are straight to slightly convex, with one exception having sides which are slightly concave toward the tip and convex toward the base. All of the fragments are missing portions of both their distal ends and base. Corner notching (where observable) is very deep in all cases but one, and stems are expanding. The complete specimens measure 28.9 by 17.6 by 3.8 millimeters and 26.5 by 19.7 by 4.1 millimeters.

Regarding maintenance procedures, assuming the hypothesis that these tools were periodically resharpened we recognize that they would have become shorter and possibly narrower through their period of use until they became too small to be functional or a sharp edge could no longer be effectively maintained and they were at this point discarded. By implication we should expect that those which were damaged and discarded before their period of functional utility was ended, would tend to be larger than their fully reduced and undamaged counterparts. Comparison of the lengths and widths of the complete specimens to the estimated original measurements of the main body fragments confirms this expectation and strengthens the hypothesis that Little Passage projectile points were subjected to periodic resharpening and an associated reduction in size.

To date variation in the form and size of Little Passage projectile points has been discussed in terms of long term trends, regional variability and function. In particular, Schwartz (1984:60-62) concludes that:

> Only points with biconcave side form and possibly those with point angles below 40° may prove to be functional 'types,' perhaps associated with sealing activities.
>
> Regional variation appears at present to be limited to differences in the use of raw materials....
>
> In summary, Little Passage projectile points appear to vary through time in the following ways. Biconvex and plano-convex sides become less frequent. The projectile points also tend to become smaller and to exhibit less surface retouch. They also become more likely to exhibit a flake ridge or marked asymmetry of base and/or shoulder...the notches of early Little Passage points tend to have parallel-sided and almost horizontal notches. Over time, the notches tend to change in position, remaining parallel sided but

> shifting downward, away from the horizontal. The proximal shoulder angle remains at around 130° for some time thereafter, but the notches tend to broaden during this time; thus the stem remains expanded, but the distal shoulders become straighter. These remain roughly horizontal as the notches continue to expand, this time by contraction of the stem. Thereafter, the projectile points retain more or less straight stems, although the distal shoulders vary widely. Finally stylistic control appears to be relinquished, and the latest Little Passage points exhibit a diversity of stemmed, contracting stemmed and basally notched forms.

While not attempting to discount these explanations, it is important to stress that variability in artifact shape and size through its period of functional utility needs to be addressed as well. Concave lateral edges and narrow point angles, for example, are probably the result of extensive resharpening, and may not be exclusively associated with a functional type as is suggested by Schwartz.

Triangular Biface Industry

Four triangular bifaces were recovered, one of which was mended from two fragments (Plate 15 g to j). They have straight sides, straight to slightly convex bases, and widths two-thirds of their lengths (Table 24). As with the projectile points, little can be said with regard to manufacturing except that they were probably reduced from flake blanks. With regard to maintenance, note that the mended specimen is longer than the others suggesting that it was broken and retired from service before it was reduced to a non-functional state through repeated resharpening.

Table 24 Metric attributes of triangular bifaces (in mm., n=4)

	mean	standard deviation	range	coefficient of variation
length	33.87	6.12	27.0 to 41.5	18.07
width	19.82	3.84	14.1 to 22.2	19.37
thickness	5.1	0.83	4.4 to 6.3	16.27

It is unclear how these tools were used. Their tips are not particularly sharp and thus they may have served as cutting tools rather than penetrating implements. The 'base' of one has been carefully worked to a sharp edge, and it is possible that some of these tools had their 'tips' mounted in a haft and their wider end was used as a working edge. An alternative explanation for these tools is that they may have served as preforms for corner notched projectile points. Examination of larger samples and microscopic use wear analysis would throw more light on these possibilities.

End Scraper Industry

The sample includes thirteen complete end scrapers and four distal end fragments (Plate 15 k to n). They vary markedly in shape, ranging from triangular to rectangular and may be described as random flake scrapers.

Manufacturing appears to have been simply a matter of forming a convex unifacial working edge on an appropriately shaped flake blank. The working edges are consistently positioned opposite the striking platform of the flake, and lateral edge or surface retouch is evident on only three specimens. On one of these one lateral edge is worked to a steep unifacial working edge and it may thus be more properly described as a side/end scraper. All but one of the complete scrapers display evidence of use and/or haft wear along their lateral edges.

Maintenance procedures are assumed to be similar to the constant resharpening described by Gallagher (1977) and Mason (1891), but due to their method of use, cultural preference, or possibly as a result of the small size of this sample, they do not appear to have been reduced to the same degree as the Dorset end scrapers.

Linear Flake Industry

The assemblage includes fourteen flakes with roughly parallel sides and one (n=12) or two (n=2) arrises (Plate 15 o to r). They range in size from a maximum of 46.5 by 23.6 by 7.3 millimeters (this specimen having two arrises) to a minimum of 23.1 by 11.1 by 3.1 millimeters. None of these artifacts shows clear evidence of retouch or use wear along the lateral edges. While the sample is small, one would expect that, if they were purposely manufactured to be used as tools, at least some would have traces of reduction or use. These specimens may thus be simply fortuitously shaped debris rather than the products of a true blade or blake-like industry.

Provisional Industries

Concave Side Scrapers

Five artifacts were recovered which may represent a concave side scraper industry in the Little Passage tool kit (Plate 16 a to e). They are manufactured on long narrow flakes, and each has a concave working edge formed along one lateral edge, one having evidence of use wear along the other lateral edge and distal end. The specimen with edge wear and one other are slightly narrowed at one end in a manner suggesting they were intentionally stemmed.

Large Ovoid Bifaces

Two large, crudely worked ovoid bifaces were recovered (Plate 16 g to h). The edge damage on these specimens indicates that they were completed and functional tools as opposed to blanks or preforms. They measure 67.8 by 45.5 by 23.5 millimeters and 81.6 by 49.1 by 21.3 millimeters, their thickness suggests that they were manufactured from core blanks as opposed to flake blanks. They are assumed to have served as heavy duty cutting or chopping tools.

Large Uniface

The assemblage includes one large uniface resembling an oversized end scraper, measuring 39.3+ by 66.2 by 18.0 millimeters, which appears to be the broken end of a larger tool (Plate 16 a). It is manufactured on a tabular block, the convex unifacial working edge extending completely across the distal end, and the remainder of the artifact is unretouched except for some use/haft wear or post-depositional damage along the base. It was possibly used as a scraper/plane.

Miscellaneous Materials

Three tabular sandstone abrader fragments were recovered, two of which articulate (Plate 17 a and b). They are similar to those described in the Dorset assemblage and the articulating pair has numerous striations on one face. The ground and polished edge of this specimen is 40.6 millimeters long and it is 8.3 millimeters wide. The remaining fragment retains very little of the ground working edge and is 8.0 millimeters thick.

Two pieces of iron pyrites were recovered, one quite crumbled and in poor condition (56.2 by 30.4 by 17.3 millimeters, weighing 62.5 grams), while the other is solid and in a good state of preservation (40.6 by 32.4 by 30.03 millimeters, weighing 101.3 grams).

Lithic Debris

Lithic debris excavated from this component totaled 3.542 kilograms, 2.869 kilograms of which were recovered from the four one-meter square units. The remainder were collected from the surface and from test units. The debris was most densely concentrated in the vicinity of the hearth in the southwest quadrant of unit N36W29 (Map 6, page 102). The debris ranges from small retouch flakes to a few large blocks with the cortex mostly or completely removed. Some flakes have been fire altered. The presence of blocks of raw material suggesting that tool manufacture took place on the site.

Port au Port Site, Beaches Complex

One side notched projectile point with convex base and sides, as well as one biface base (Plate 17 c and d) are assigned to this group. They measure 36.5 by 18.9 by 6.7 millimeters and 17.9+ by 25.7 by 6.3 millimeters respectively, and both are manufactured from a coarse black chert. One green, blue-green and beige chert block recovered from Area III may belong to this complex, or may relate to the Dorset occupation of Area II.

Isthmus Site

Only a few flakes were recovered from the surface of this site in the 1983 field season. Thus little can be added to Carignan's (1975a) observations that it consists of a Dorset and a 'Beothuk' component, except that the latter can now be more precisely identified as belonging to the Little Passage complex. While the Dorset end blade Carignan recovered probably represents activity related to the Dorset component of the Port au Port site's Area II, the stemmed Little Passage projectile point diverges significantly from the style of those recovered in Area III of the Port au Port site. According to Schwartz's (1984) conclusions regarding chronological trends in the hafting modification of Little Passage Projectile points, the Isthmus site's stemmed point appears to be more recent than the corner notched points of the Port au Port site, dating possibly to 550 B.P. or later. Unfortunately, due to the damage done to the site in recent years it is unlikely that much additional data will be recovered from the site to verify this.

Gravel Pond Site

The five artifacts recovered from this site are illustrated in Plate 17 e to i. The biface tip is manufactured from chert visually indistinguishable from locally available grey chert. The biface basal fragment contracts toward the proximal end, has a slightly concave base, and is manufactured from a brown chert which exhibits bedding planes upon close examination. The microblade core from this site has had microblades and possibly flakes detached from at least three striking platforms, although the flakes may have been detached in order to prepare the core face rather than to obtain flakes for further reduction into tools. As a result of the multiple striking platforms, it may be described as either a wedge shaped or tabular core. It is manufactured from a grey chert with heavy tan and brown cortex. Another specimen is either a biface blank or an exhausted flake core manufactured from a multicolored green to blue-green, brown and beige chert which does not resemble the locally available material. A final artifact resembles an exfoliated rim and corner fragment from a soapstone vessel, but is manufactured from an unidentified porous stone. The lip is unifacially beveled and the exterior corner angle is approximately 135 degrees. Lithic debris recoveries include a total of 293 grams of flakes from six productive test units and 578 grams from the surface. A variety of raw material types is represented, including a small amount similar to the locally available chert, as well as some beige and rose colored chert.

Long Point Site

The six artifacts recovered from this site are illustrated on Plate 18. The asymmetric biface has a slightly convex base and one straight lateral edge. The proximal third of the other lateral edge runs parallel to the first, while the distal portion of that edge angles across to converge with the other side. The biface basal fragment is similarly asymmetrical and is fractured just beyond the point where the one edge begins to converge on the other. Both are manufactured from a brown and grey chert, and the latter is fire damaged as indicated by the presence of 'pot lid' spalls detached from both faces.

The microblade which was recovered is complete and has retouch/use wear scars along both lateral edges. The remaining artifacts of this assemblage include three pieces of unidentified porous stone similar to that recovered from the Gravel Pond site. Two appear to be vessel body fragments and the third, somewhat thicker piece has a single flat facet suggesting it was used as an abrader. Three productive test units yielded 9.5 grams of lithic debris and surface recoveries bring the total up to 301.5 grams. The range of material includes grey-green chert, red-brown chert, and the porous blue chert from the central volcanic zone.

Summary

This chapter has described the range of lithic artifacts recovered, and the etiological framework in which it was presented has allowed important conclusions to be drawn regarding several artifact classes. Of primary importance is the recognition that maintenance procedures can significantly alter the form of an artifact through its period of functional utility. With regard to Dorset end blades, a mechanism has been proposed which explains regional variability in length. It has been argued that the west coast end blades, which are manufactured from high quality chert, tend to be reduced in length through resharpening to a greater extent than those made from coarse rhyolite on the south coast, and those of soft patinated chert on northeast coast.

The form of Dorset expanding flake end scrapers is also considered to vary greatly through their period of use. Thus the bewildering array of shapes exhibited in the sample is understood to be a function of how much they were reduced through resharpening before being discarded, as opposed to the more common explanation of scraper shape in terms of different functions. Further, variation in the preparation of the lateral edges and bases of these scrapers is argued to be a function of hafting requirements. Rather than altering the size or shape of the socket of a haft to fit a scraper, it would be more expedient to adjust the scraper to fit the haft. Some scrapers simply require much more extensive retouch than others in order to fit a given haft. It is proposed that upon examination of larger collections, post-manufacture reductions sequences may be constructed for other artifact classes, such as Dorset bifaces and Little Passage projectile points, and will provide better explanations for their variability in shape and size than are presently being formulated.

The following chapter will address the final body of data recovered, that of faunal remains, and will draw conclusions regarding the subsistence-settlement systems of the prehistoric inhabitants of the Port au Port Peninsula.

CHAPTER V

FAUNAL ANALYSIS, SUBSISTENCE AND SETTLEMENT

Introduction

Examination of the faunal material contributes to our understanding of the subsistence practices of the people who inhabited these sites. Following a description of the faunal remains of the Dorset and Little Passage occupations of the Port au Port site, the season(s) of occupation of each component will be discussed. Unfortunately, due to the paucity of sites discovered in the course of the survey, as well as small and unrepresentative faunal assemblages, this statement will have to suffice with regard to the objective of deriving culturally specific subsistence-settlement system outlines described in Chapter I. Interpretations will be based on the seasonal availability of the species present in the faunal assemblages, and in the one case, an age estimate for a young caribou individual. The chapter will conclude with a synthesis of other resources available in the seasons during which the site was occupied.

Faunal Material

Faunal remains were recovered only from the Port au Port site. The Dorset component in Area II yielded 590 fragments (966.5 grams) of bone and 35.9 grams of burned fat, while the sample from the Little Passage component of

Area III includes 1720 fragments (579.6 grams). Carignan's small faunal recovery from Area I was not submitted for identification. The sample was examined by David Black (1984), then a graduate student at McMaster University, and the following discussion draws heavily on his report.

Dorset Component

Only about 5% (by weight) of the bone was comprised of complete elements. However, identifiable portions of elements were common. Unfortunately much of the bone was weathered and identification as to species was possible for only twenty-three elements. An additional twenty-nine elements were identified to sub-family, twenty-two to family and three to order. Less than 1% of the sample was fire altered.

In general the sample is dominated by seal with minor representation of an avian species (either thick billed or common murre), caribou, beaver, marten, and a porpoise, dolphin or small whale (Table 25). This preponderance of seal is reflected in the count of identifiable elements, more than seventy-six for seal (including one specimen identified only as a large sea mammal vertebra), as opposed to a total of twelve for the remaining species combined. The minimum number of individuals for each species is reported, but due to the small sample size and non-representative nature of the assemblage, they are unreliable.

Table 25 Port au Port Site
Dorset Faunal Identifications

Taxonomic Identification	Number of Elements	MNI	Skeletal Age category
thick billed or common murre	4	1	adult
caribou	1	1	juvenile (1 1/2 to 3 months)
harbor seal	5	3	2 immature +
harp seal	3	2	2 immature +
harbor or harp seal	29	3	
ringed seal	5	3	1 adult, 2 immature +
seal	23+		
porpoise, dolphin or small whale	2	1	
large sea mammal	1	1	
beaver	2	1	immature
marten	3	2	2 adult

(Appendix 4 lists all skeletal elements identified)

as indicators of relative species proportions (cf. Grayson 1978; Uerpmann 1972).

The absence of caribou elements other than the mandible and teeth may be due to an inadequate sample, butchering practices, differential survival rates for the various elements, or the processing of at least some of the other elements into tools leading to their removal from the site.

Note that the presence of a young caribou's mandible on a site is consistent with Binford's (1978) observation that the Nunamuit often leave the heads of adult caribou at the kill site, but will transport the complete carcass of calves (i.e. including the mandible) to their place of habitation. Regarding the disproportionately high number of seal ear elements, Black (1984:8) notes that they were "apparently more resistant to weathering".

Seasonality

With the exception of caribou, the age estimates presented in Table 25 are based on osteological features[1] and have not been converted to absolute age in terms of months or years. The age at death of the caribou was

---

1 Skeletal age categories were defined on the following criteria (J. Cooper in Black 1984):
<u>Juvenile</u> – Juvenile cortex only over most of bone surface; some feature development; epiphyses, if any still completely detached.
<u>Immature</u> – Juvenile cortex absent, or, present only at epiphyseal lines; epiphyses may be attached at early fusing locations, but may or may not be attached at late fusing ones; epiphyseal lines complete and distinct at all locations where attached.
<u>Immature or older (immature +)</u> – Those portions of an element required to make a more specific skeletal age determination are not present, but the cortex is never of a juvenile nature and the size and feature development are equivalent to similar elements of the species which can be categorized as skeletally adult.
<u>Subadult</u> – No juvenile cortex present; all epiphyses attached or partly attached; epiphyseal lines at any early-fusing epiphysis no longer visible, those of any late-fusing epiphysis partially bridged across and still partly visible.
<u>Adult</u> – All epiphyses completely attached; although the line of fusion of a late-fusing epiphysis may be faintly visible.

determined on the basis of rates of eruption and wear of dentition. Three deciduous premolars P_2, P_3 and P_4, as well as one permanent molar, M_1, were recovered. P_3 and P_4 were worn with the dentin exposed, and P_2 was only minimally worn. The molar was completely unworn and presumably had not yet, or was just in the process of, erupting through the gum. Frank L. Miller's (1974) data for rates of tooth eruption and wear in the Kaminuriak barren ground caribou population of the central Canadian arctic, and Bergerud's (1970) data for Newfoundland caribou populations agree that M_1 begins to erupt and show wear at the age of three months. A minimal age is provided by Bergerud (1970) whose sample of one and one half month old Newfoundland caribou had wear on P_2 and P_3 but no wear yet on P_4.

Thus bracketed, the age of the caribou at time of death was one and one-half months to three months. Assuming the calving period to have been in May, as it is presently, the kill must have been made between the early part of July and the end of August. According to the environmental data presented earlier, caribou were located in the highlands at this time of year, in this region including: the Table Mountains of the Southern Long Range Mountains 3 kilometers to the northeast, and/or the Port au Port Peninsula's Pierways Hill 10 kilometers to the west and the White Hills 30 kilometers to the west. Assuming that this kill was not cached and brought to the site later in the year, a summer occupation is indicated.

The presence of thick billed or common murre in the sample lends further support for a summer occupation as these birds, members of the auk family, were available only during summer, either on offshore islands where they breed, or in bays and along the shore where they feed. A summer occupation is also implied by the presence of porpoise, dolphin or a small whale, for these were available inshore only during the summer months.

The presence of harbor, harp and ringed seal on the site is somewhat more problematical in terms of determining site seasonality. Ringed seals were available in the research area year-round and had no seasonal aggregates which would suggest a particular time of year as more likely than any other for the season of occupation. Harbor seals were present in the ice free season, which sometimes extended through much of the year at the Port au Port Peninsula.

Harp seals of the Gulf herd were for the most part available in the vicinity of the Port au Port Peninsula during a short period in December or January while they were migrating southward. However, strays from the northward migration (which is confined primarily to the north side of the Gulf, away from the Port au Port Peninsula) may have been available in May or June. Thus, while it is most likely that the harp seal were captured in December or January, their possible presence in early summer precludes making this a definite conclusion. Note that the absence of evidence for semi-subterranean 'winter' dwellings should not be taken as a strong objection to the possibility of a winter occupation, as these structures may have been present but have since eroded into Port au Port Bay.

Both beaver and marten were available year-round and are known to have no seasonal aggregates which would suggest an optimal period for their exploitation. Marten pelts were, however, in prime condition during winter months and if one is to assume that they were captured for their fur their presence could be taken to strengthen the argument for a possible winter occupation.

By way of a brief review, the Dorset occupation of the Port au Port site is judged to have taken place during the summer, with a possible mid-winter component as well. This is a minimal estimate and is subject to change upon the recovery of additional data. The recovery of juvenile caribou at the site indicates that some degree of mobility was practiced by all or part of the population during the summer as caribou of this age were available only in the highlands to the east and/or west of the site in that season.

On the basis of these rather limited data, the Port au Port site is interpreted to have served as a 'temporary summer base camp' for the Dorset people where primarily marine resources were exploited, and from which excursions to the adjacent highlands of the peninsula or mainland were mounted. In addition, it is possible that it was used during the winter as a location from which to exploit the January or December harp seal migration and collect terrestrial fur bearers such as marten. Note that 'temporary base camp' is a purely descriptive term and is not intended to imply a clearly defined site 'type'.

Little Passage Component

Virtually all of the faunal sample, 96% by weight, was either calcined or burned. This fire alteration has resulted in the sample being highly fragmented; the fragment to weight ratio for the Little Passage was 2.70 frags/gm., while that of the Dorset assemblage was 0.61 frags/gm. The high degree of fragmentation combined with the obscuring effect of charring and the fact that only 4% of the sample was comprised of complete elements rendered the identification process very difficult.

In total, species specific identifications were made for only seventy elements, and six elements were identified to the taxonomic level of family. The sample is dominated by caribou and beaver, with minor representation of bald eagle, a small bird of the auk family, a small goose or large duck, and marten (Table 26). The caribou and beaver remains include a total of twenty-one and thirty-nine identified elements respectively, contributing to an MNI of three for each. The remaining species are represented by a total of sixteen elements and MNIs of one for each. Again, more detailed qualitative determinations of the relative

Table 26 Port au Port Site
Little Passage Faunal Identifications

Taxonomic Identification	Number of Elements	MNI	Skeletal Age Category[2]
bald eagle	8	1	adult
small bird of the auk family	2	1	?
small goose or large duck	4	1	immature +
caribou	21	3	1 adult, 2 immature +
beaver	39	3	2 adult, 1 immature
marten	2	1	adult

(Appendix 4 lists all skeletal elements identified)

proportions of each species are not possible due to small sample size and the non-representative nature of the site sample.

It is of interest to note the conspicuous lack of caribou cranial, vertebral, rib and pelvic bones (Appendix 4). While this may be due differential survival rates for caribou elements, it is possible that they were butchered such that only the easily transported and high meat yielding quarters, as well as the tongue and mandible unit, were brought to the site.

2 Skeletal age category estimates for this body of data were based primarily on size. Thus, considering that bone may shrink as much as 25% when calcined they must be considered tentative and unreliable.

Seasonality

The presence of the small auk in the sample indicates a summer occupation as these birds were only available in this season. None of the remaining species, however, provide a clear indication of the Little Passage people's season of occupation at the Port au Port site. While the bald eagle is known to have aggregated during herring runs in summer, they were present year-round. Similarly, although more easily accessible during their warm season moults, such species as the Canada Goose and many ducks were available year-round.

Neither beaver nor marten contribute significantly to the problem of determining site seasonality, but assuming marten were sought in winter when their pelts were prime, their presence might indicate a cold weather occupation. This argument, however, must be considered as speculation. Regarding the caribou, since no juvenile dentition was recovered as was the case for the Dorset occupation, and considering that their summering and wintering grounds are both easily accessible from the Port au Port site, they provide no indications of seasonality.

In summary, Little Passage people were present at the Port au Port site during the summer, but their occupation may have extended through any of the other seasons, since the majority of species in the faunal sample were available year-round in reasonably close proximity to the site. More definite conclusions are pending the recovery of additional data from the site and the discovery of other sites in the region.

Additional Potential Resources

Tables 27 and 28 present the range of additional resources which may have been exploited by the Dorset and Little passage peoples in the Port au Port Peninsula region. These sets of resources were selected on the basis of two criteria: their occurrence in the research area exclusively during the periods which the above analysis indicates the site was occupied, or for species available other seasons as well, the existence of aggregates or other attractions during the seasons of occupation. The data are intended as guides for future research, and it is acknowledged that other resources were probably used as well.

Summary

The faunal recoveries indicate differences between the Dorset and Little Passage populations of the Port au Port site both in terms of the species they utilized, and their processing of food bone refuse. All but 4% (by weight) of the Little Passage faunal material was heat altered suggesting that they boiled the bones to render fat, intentionally burned them for fuel, and/or discarded them into hearths. On the other hand, less than 1% (by weight)

Table 27 Additional potential summer resources for the Dorset and the Little Passage groups of the Port au Port Peninsula region.

black bear	late summer aggregates along salmon streams
grey seal	aggregates present in bays during summer, absent in other seasons
hooded seal	present in spring or summer during northward migration
cetaceans	present inshore only during summer
capelin	aggregates on beaches in June or July
cod	inshore only during summer
mackerel	present only during summer
herring	early and late summer aggregates
blue mussel	peak weight in summer
salmon	early and late summer runs
arctic char	late summer run
brook trout	summer run
storm petrels	summer aggregates, absent in other seasons
gannets	summer aggregates, absent in other seasons
terns	present only in summer
herons and bitterns	present only in summer
bald eagles	early and late summer aggregates during herring aggregates

Table 28 Additional potential December-January resources for the Dorset of the Port au Port Peninsula region

otter	possible mid-winter aggregates in salt-water bays
hooded seal	present in December-January during southward migration
tom cod	spawn takes place in estuaries during December
grebes	present in winter only

of Dorset food bone refuse was heat altered, meaning that their fat requirements were presumably met without the necessity of processing bones, and/or that they did not burn bones for fuel or as a means of disposal.

The species represented in each of the samples indicate that these two populations followed significantly different subsistence practices while they were at the Port au Port site. While this may mean that their subsistence-settlement systems were characterized by the use of quite different sets of resources, the data at present are insufficient to support this interpretation. Alternatively, it is quite possible that they exploited similar sets of resources, but had different criteria for the selection of their living sites and hunting stations. Data from other Recent Indian sites in Newfoundland suggest that this latter interpretation is probably more correct.

At the Beaches site Helen E. Devereaux (1969) recovered a Recent Indian faunal sample dominated by harbor and to a lesser extent harp seal. Pastore (1985:326) reports the Little Passage/Beothuk faunal sample from the Boyd's Cove site includes a mixture of terrestrial and marine species, including harbor seal, bearded seal, whale, ocean going birds, marine fish, and marine shellfish. There thus appears to be a strong marine aspect to Recent Indian subsistence practices in some areas of Newfoundland, suggesting that this marine aspect has simply not yet been observed archaeologically in the Port au Port Peninsula region.

Pastore (1986) also observes differences in the distributions of Late Palaeo-Eskimo (Dorset) and Recent Indian habitation sites in Notre Dame Bay. Late Palaeo-Eskimo sites tend to be located on more exposed 'outer' locations, while Recent Indian sites are more often protected 'inner' locations. Future research in the Port au Port Peninsula region, or more preferably in areas which have not undergone post-glacial coastal flooding, can be expected to recover more information regarding the differences in site patterning between these and other groups.

To summarize, Dorset people were present at the Port au Port site during the summer and possibly in mid-winter, relying on: harbor, harp and ringed seal, as well as small whales, beaver, marten, caribou, and sea birds. An inland component of their seasonal round is represented by the Long Pond site. In addition to Robbins' (1985) interpretation of this site as a caribou hunting station, it is suggested that this site, and similar sites yet to be discovered, would have also provided access to such resources as anadromous fish and bears. In contrast, while they were at the Port au Port site the Little Passage people apparently made no use of marine resources, except for sea birds, and instead utilized such terrestrial and bird species as: caribou, beaver, marten, waterfowl, and bald eagle.

Having presented an analysis of the faunal remains, the following chapter will review the objectives and conclusions of the research, and will briefly address future directions in the study of culture process in Newfoundland and Labrador.

CHAPTER VI

SUMMARY

This body of research had as its primary objective the explication of the lifeways of the prehistoric inhabitants of the Port au Port Peninsula by delineating their subsistence-settlement systems. To this end it has succeeded in contributing data relevant to a Dorset, or Late Palaeo-Eskimo tradition occupation, and a Little Passage complex occupation of the Recent Indian period. It was less successful in characterizing a Beaches Recent Indian complex, two additional Palaeo-Eskimo occupations, and discovered no information pertaining to the Maritime Archaic tradition. This paucity of data from the earlier periods of the prehistoric record is perceived to be a result of flooding of early coastal sites due to post-glacial sea level fluctuations.

The Dorset of the Port au Port site appear to have relied primarily on harbor, harp and ringed seal, and to a lesser extent on caribou, beaver, marten and such sea birds as the common or thick billed murre. An interior aspect to their seasonal round took place most likely in the spring or fall and provided access to caribou, anadromous fish, and such scavengers as bears which are attracted to fish runs. The Little Passage population of the region exploited caribou, beaver, marten, bald eagle, a small species of the auk family and a species of small goose or large duck while they were at the Port au Port site. Enigmatically, there is no evidence for their use of marine resources other than sea birds, as there is at the Beaches and Boyd's Cove sites. These resources may not have been exploited at Port au Port, or future research may recover evidence of their use.

Several secondary objectives were also addressed, and these turned out to be of significant interest. The Port au Port site Dorset occupation was examined in the context of the regional expressions of Dorset across the island of Newfoundland as envisioned by Robbins (1985, 1986), and a mechanism was proposed to explain the regional variation in end blade lengths he observed.

The explanation was made possible largely due to the approach to lithic analysis used in this research. The intent of the analysis was to derive reduction sequences from manufacture through maintenance to discard for each of the lithic industries represented. In the case of Dorset end blades from the Port au Port site it was realized that periodic resharpening through tip fluting would have significantly reduced them in length to the point that they lost their utility or they could no longer be sharpened, and they were thus discarded. Given Robbins' (1985, 1986) observation that end blades from the west coast (including those from the Port au Port site) were manufactured from fine grained cherts, while those of the northeast and south coast were manufactured from coarser rhyolites and softer patinated cherts respectively, it was argued that tip fluting would have been less successful on the rhyolites and softer cherts. The Dorset of the south and northeast coasts would have been familiar with the limitations inherent in their raw materials, and once their end blades reached the point where they could no longer be sharpened without the danger of breakage (at which point they would have been much longer than their west coast counterparts), they would have been either discarded or resharpened by some other means, such as grinding on the south coast.

The lithic analysis also yielded interesting results regarding the variability of Dorset expanding flake end scrapers. Traditional lithic analyses have tended to define large numbers of Dorset scraper types (Linnamae 1975) which in the end are of little utility beyond describing the assemblage. For the purposes of this study, a majority of scraper assemblage was 'lumped' into one category and ordered according to variability resulting from two factors: maintenance procedures (resharpening), and hafting requirements. The reduction of scrapers through resharpening is a very rapid process, and as they are resharpened they quickly become shorter, become to short to function, and are discarded. In the case of Dorset expanding flake end scrapers, the corners at either end of the working edge also tend to become sharper as length is reduced. Thus, the same 'type' of scraper at the beginning and the end of its period of functional utility can look significantly different and be easily mistaken for different 'types' of scrapers.

The wide range of retouch characteristics for the lateral edges and bases of Dorset expanding flake scrapers is explained in terms of hafting requirements. It is argued that it would have been more expedient to retouch a scraper in order to fit it to a haft, rather than enlarge the socket of a haft to accommodate an oversized scraper (as the haft's socket would soon become so enlarged that 'proper' sized scrapers would no longer fit it). Thus, given even small variation in the shape and size of the proximal ends of a set of scrapers, some will require much more extensive retouch than others in order to fit them into their hafts. It is hoped that future analyses using approaches similar to that followed here, preferably in conjunction with such techniques as refitting or conjoining, will be able to demonstrate more precise lithic reduction sequences and provide additional explanations for intra and inter-site artifact variability.

Investigation of the Little Passage occupation of the Port au Port Peninsula revealed the presence of each of the four diagnostic artifact types defined by Penney (1985): corner notched projectile points, triangular bifaces, linear flakes, and scrapers, and has added several more possible industries: concave side scrapers, large ovoid bifaces, and large 'scraper/plane' unifaces.

The lithic source analysis undertaken suggests that grey-green cherts recovered from Little Passage contexts across the island were not derived from the Port au Port Peninsula, but that Dorset populations did transport a porous blue chert with gold colored inclusions from the central volcanic zone of the island to Port au Port on the west coast and possibly to Stock Cove on the isthmus to the Avalon Peninsula. It appeared that the Port au Port Little Passage lithic material was extracted from local sources, while the Dorset lithic material exhibited a great deal of variability and was presumably extracted from several sources along the west coast and elsewhere.

This difference in lithic raw material utilization between the Dorset and Little Passage populations of the Port au Port site is of some interest. The Dorset clearly brought 'exotic' lithic materials to the site, but the lack of much locally available material in the Dorset assemblage is rather puzzling. This problem, however, becomes more understandable if one considers the possibility that Dorset occupation of the Port au Port site was sufficiently short, that soon after arriving at the site they exhausted and discarded the 'foreign' lithic materials they had brought with them, but they left before they started to use and exhaust many of their locally made replacements (cf. Keeley 1982).

With regard to the subsistence-settlement systems of the Dorset and Little Passage groups of Newfoundland, it may have become apparent that this author is applying a different set of assumptions to each. As stated above, future research is expected to discover Little Passage subsistence-settlement patterns on the west coast and elsewhere which are similar to that Pastore (1986) is investigating in Notre Dame Bay. On the other hand, present data indicate, and additional research is expected to continue to verify, regional differences in the subsistence-settlement systems of the Dorset. Recognizing that at present very little information is available regarding the Little Passage people of Newfoundland, compared to what we know of the Dorset populations, the expectation of discovering uniform Little Passage subsistence-settlement practices may or may not hold to be true.

The Dorset presence at Port au Port, however, is consistent with what is understood for Dorset subsistence-settlement systems in Newfoundland and Labrador in general, that being a primary focus on marine resources (Cox and Spiess 1980; Harp 1976). Further, the Dorset economy, and the Eskimo economy overall, is characterized by a great deal of flexibility (Cox and Spiess 1980; Jordan 1986), and "the degree to which different species are exploited reflects the environment and the faunal resources, and only secondarily reflects an economic heritage" (Taylor 1971:15). Subsistence-settlement studies in Labrador have begun to identify regionally specific economic adaptations for the Dorset. In particular, Cox and Spiess (1980) have observed that in the fjords of northern Labrador they appear to have spent the summer and fall in the inner parts of the fjord subsisting primarily on birds and small seal species, while from freeze up through winter and spring they took part in ice edge sealing at the mouth of the fjord. This contrasts with the pattern in the bays characterized by many islands in central Labrador where the inner bay zone is not ordinarily used. Instead, the cold winter months are spent on the outer coast and more protected island areas, and from mid-winter possibly until spring camps are established further out near the ice-edge.

In this context Robbins' thesis of regional expressions of Newfoundland Dorset makes a great deal of sense. The differences between the Dorset in each of the three areas, the west coast, the south coast and the northeast coast, as he argues, stem from the ecological variations between the regions, principally due to dissimilarities in the timing, abundance, and types of seals available.

Despite this economic flexibility which one would expect to lead to long term stability, Dorset culture history is punctuated by a series of regional depopulations which can not be accounted for by fluctuations in the environment (Fitzhugh and Lamb 1985). The study of culture process in Dorset research thus can not rely only upon relatively simple environmental explanations, but rather, must pursue new avenues. Cox and Spiess' (1980) assertion that the Dorset lacked or possessed an inefficient breathing hole sealing technology, might be taken so far as to speculate that they lacked the technology to achieve long term stability. Alternatively, or in addition to this explanation, more complex social and historical factors must be examined (cf. Fitzhugh and Lamb 1985) in order to come to grips with the explanation of culture process in the study of prehistoric man in Newfoundland and Labrador.

References Cited

Ahrens, M.A.
1984 Atlantic Herring. Underwater World, Communications Directorate, Department of Fisheries and Oceans, Ottawa.

Banfield, C.E.
1983 Climate. In Biogeography and Ecology of the Island of Newfoundland, edited by G. Robin South, pp. 37-106. Dr. W. Junk Publishers, Boston.

Bangs, O.
1913 Land Mammals of Newfoundland. Bulletin of the Museum of Comparative Zoology 54(18):509-516.

Bergerud, Arthur T.
1958 Distribution, Movement and Population Dynamics of the Newfoundland Caribou. Ms. on file, Queen Elizabeth II Library, Memorial University of Newfoundland, St. John's.

1961 The Reproductive Season of the Newfoundland Caribou. Ms. on file, Queen Elizabeth II Library, Memorial University of Newfoundland, St. John's.

1967 The Distribution of Arctic Hares in Newfoundland. The Canadian Field-Naturalist 81(4):242-248.

1970 Eruption of Permanent Premolars and Molars for Newfoundland Caribou. Journal of Wildlife Management 34(4):962-963.

Binford, Lewis R.
1968 Archaeological Perspectives. In New Perspectives in Archaeology, edited by Sally R. Binford and Lewis R. Binford, pp. 5-32. Aldine, Chicago.

1978 Nunamiut Ethnoarchaeology. Academic Press, New York.

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

Black, David
1984 DdBq-1: Faunal Analysis, Port au Port Site, Newfoundland, Canada. Ms. in possession of author.

Brookes, Ian A.
1974 Late Wisconsin Glaciation of Southwestern Newfoundland (with Special Reference to the Stephenville Map Area). Geological Survey of Canada, Paper 73-40, Map 15-1973, Ottawa.

1977 Geomorphology and Quaternary Geology of the Codroy Valley and Adjacent Plateaus, Southwestern Newfoundland. Canadian Journal of Earth Sciences 14:2101-2120.

Brookes, Ian A., D.B. Scott and J.H. McAndrews
1985 Post Glacial Relative Sea Level Changes, Port au Port Area, West Newfoundland. Canadian Journal of Earth Sciences 22:1039-1047.

Cahalane, V.H.
1947 Mammals of North America. MacMillan, New York

Cahen, D., L.H. Keeley and F.L. Van Noten
1979 Stone Tools, Toolkits, and Human Behavior in Prehistory. Current Anthropology 20(4):661-683.

Cameron, Austin W.
1958 Mammals of the Islands in the Gulf of St. Lawrence. Bulletin No. 154. National Museum of Canada, Ottawa.

Carignan, Paul
1975a Archaeological Survey - 1975. Ms. on file, Newfoundland Museum, St. John's.

1975b The Beaches: A Multi-Component Habitation Site in Bonavista Bay. Mercury Series Paper No. 39. Archaeological Survey of Canada, Ottawa.

Cox, Stephen L.
1977 Prehistoric Settlement and Culture Change at Okak, Labrador. Unpublished Ph.D. dissertation, Harvard University, Cambridge.

Cox Stephen L. and Arthur Spiess
1980 Dorset Settlement and Subsistence in Northern Labrador. Arctic 33(3):659-669.

Damman, A.W.H.
1983 An Ecological Subdivision of the Island of Newfoundland. In Biogeography and Ecology of the Island of Newfoundland, edited by G. Robin South, pp. 163-206. Dr. W. Junk Publishers, Boston.

Dawe, G., J. Newell and G. Wells
1972 The Underdeveloped Shell-Fishery of Newfoundland. Ms. on file, Queen Elizabeth II Library, Memorial University of Newfoundland, St. John's.

Dean, Paul L. and J.L. Meyer
1981 Lithogeochemistry of Mid-Ordovician Chert and Shales of Central Newfoundland. Open File Newfoundland (1317). Mineral Development Division, Newfoundland Department of Mines and Energy, St. John's.

Devereux, H.E.
1969 Five Archaeological Sites in Newfoundland, A Description. Ms. on file, Newfoundland Museum, St. John's.

Dodds,
1983 Terrestrial Mammals. In Biogeography and Ecology of the Island of Newfoundland, edited by G. Robin South ed, pp. 509-550. Dr. W. Junk Publishers, Boston.

Eales, J.G.
1968 The Eel Fisheries of Eastern Canada. Bulletin 166. Fisheries Research Board of Canada, Ottawa.

Farmer, Geoffry H.
1981 The Cold Ocean Environment of Newfoundland. In The Natural Environment of Newfoundland, Past and Present, edited by A.G. Macpherson and J.B. Macpherson, pp. 56-82. Department of Geography, Memorial University of Newfoundland, St. John's.

Fitzhugh, William W.
1972 Environmental Archaeology and Cultural Systems in Hamilton Inlet, Labrador. Smithsonian Contributions to Anthropology Number 16. Smithsonian Institution Press, Washington.

Fitzhugh, William W. and H.F. Lamb
1985 Vegetation History and Culture Change in Labrador Prehistory. Arctic and Alpine Research 17(4):357-370.

Frison, George C.
1968 A Functional Analysis of Certain Chipped Stone Tools. American Antiquity 33(2):149-155.

1974 Archaeology of the Caspar Site. In The Casper Site: A Hell's Gap bison kill on the high plains, edited by George C. Frison, pp. 1-111. Academic Press, New York.

Gallagher, James P.
1977 Contemporary Stone Tools in Ethiopia: Implications for Archaeology. Journal of Field Archaeology 4:407-414.

Grayson, Donald, K.
1978 Minimum Numbers and Sample Size in vertibrate Faunal Analysis. American Antiquity 43(1):53-65.

Harp, Elmer, Jr.
1964 The Cultural Affinities of the Newfoundland Dorset Eskimo. Bulletin No. 200, Anthropological Series No 67. National Museum of Canada, Ottawa.

1976 Dorset Settlement Patterns in Newfoundland and Southeastern Hudson Bay. Eastern Arctic Prehistory: Palaeoeskimo Problems, Memoirs of the Society for American Archaeology No. 31, edited by Moreau S. Maxwell, pp. 119-138. Society for American Archaeology, Washington.

James, Noel P. and Robert K. Stevens
1982 Excursion 2B: Anatomy and Evolution of a Lower Palaeozoic Continental Margin, Western Newfoundland. Department of Geology, Memorial University of Newfoundland, St. John's.

Jangaard, P.M.
1974 The Capelin (Mallotus villosus): Biology, Distribution, Exploitation, Utilization and Composition. Bulletin 186. Fisheries Research Board of Canada, Ottawa.

Jochim, Michael A.
1976 Hunter-Gatherer Subsistence and Settlement: A Predictive Model, Academic Press, New York.

1983 Optimization Models in Context. In Archaeological Hammers and Theories, edited by J.A. Moores and A.S. Keanes, pp. 157-172. Academic Press, New York.

Jordan, Richard H.
1986 Palaeo-Eskimos in Atlantic Canada: A Regional Comparison of Newfoundland and Labrador Middle Dorset. Archaeology Papers, No. 1. Memorial University of Newfoundland, St. John's, in press.

Keeley, Lawrence H.
1982 Hafting and Retooling: Effects on the Archaeological Record. American Antiquity 48(4):798-804.

Laughlin, L.S. and Jean S. Aigner
1966 Preliminary Analysis of the Anangula Unifacial Core and Blade Industry. Arctic Anthropology 3(2):41-56.

Lazenby, Colleen M.E.
1980 Prehistoric Sources of Chert in Northern Labrador: Field Work and Preliminary Analyses. Arctic 33(3):628-645

Leim, A.H. and W.B. Scott
1966 Fishes of the Atlantic Coast of Canada. Bulletin 155. Fisheries Research Board of Canada, Ottawa.

Leudtke, Barbara E.
1978 Chert Sources and Trace Element Analysis. American Antiquity 43(3):413-423.

1979 The Identification of Sources of Chert Artifacts. American Antiquity 44(4):744-757.

Linnamae, U.
1975 The Dorset Culture, A Comparative Study in Newfoundland and the Arctic. Technical Papers of the Newfoundland Museum No. 1. Newfoundland Museum, St. John's.

Loring, Stephen
1982 An Archaeological Survey of the Inner Bay Region Between Nain and Davis Inlet, Labrador: A Summary of 1982 Fieldwork. In Archaeology in Newfoundland and Labrador 1982, Annual Report No. 3, edited by J. Sproull Thomson and Calum Thomson, pp. 32-56. Historic Resources Division, Department of Culture, Recreation and Youth, St. John's.

Mansfield, A.W.
1967 Seals of Arctic and Eastern Canada. Bulletin 137. Fisheries Research Board of Canada, Ottawa.

Mason, O.T.
1891 Aboriginal Skin-Dressing -- A Study based on Material in the U. S. National Museum. Report of the National Museum for 1889, Section III, pp. 553-589. Government Printing Office, Washington.

Mercer, M.C.
1976a Mammals. In Living Resources of Newfoundland - Labrador: Status and Potential, Bulletin 194, edited by A. T. Pinhorn, pp. 46-51. Fisheries Research Board of Canada, Ottawa.

1976b Mollusks. In Living Resources of Newfoundland - Labrador: Status and Potential, Bulletin 194, edited by A. T. Pinhorn, pp. 41-42. Fisheries Research Board of Canada, Ottawa.

Metcalf, George
1970 Some Wooden Scraper Handles from the Great Plains and the Southwest. Plains Anthropologist 15(47):46-53.

Meyers, J.T.
1970 Chert Resources of the Lower Illinois Valley. Illinois Valley Archaeology Program, Research Papers Vol. 2, Reports of Investigations No. 18. Illinois State Museum, Springfield.

Miller, Frank L.
1974 Biology of the Kaminuriak Population of Barren-Ground Caribou Part 2. Canadian Wildlife Service Report Series No. 31. Fisheries and Environment Canada, Halifax.

Morlan, Richard S.
1970 Wedge Shaped Core Technology in Northern North America. Arctic Anthropology 7(2):17-32.

Nagle, Christopher L.
1984 Lithic Raw Materials Procurement and Exchange in Dorset Culture along the Labrador Coast. Ph.D. dissertation, Brandeis University. University Microfilms, Ann Arbor.

1985 Lithic Raw Materials Resource Studies in Newfoundland and Labrador: A Progress Report. Archaeology in Newfoundland and Labrador - 1984, Annual Report No. 5, edited by J. Sproull Thomson and C. Thomson, pp. 86-121. Historic Resources Division, Government of Newfoundland and Labrador, St. John's.

Nelson, E.W.
1899 The Eskimo about the Bearing Strait. Bureau of American Ethnology, Annual Report, Volume 18, Part 1, pp. 19-518. Government Printing Office, Washington.

Northcott, Tom H.
1974 The Land Mammals of Insular Newfoundland. Wildlife Division, Department of Tourism, St. John's.

Osgood, Cornelius
1940 Ingalik Material Culture. Yale University Publications in Anthropology Number 79. Yale University Press, New Haven.

Pastore, Ralph T.
1982 Preliminary Report of a Survey of Eastern Notre Dame Bay. Archaeology in Newfoundland and Labrador 1981, Annual Report No. 2, edited by J. Sproull Thomson and C. Thomson, pp. 152-173. Historic Resources Division, Department of Culture Recreation and Youth, St. John's.

1983 A Preliminary Report on Investigations at Boyd's Cove-1, A Beothuk and Recent Indian Site in Notre Dame Bay, Newfoundland. Archaeology in Newfoundland and Labrador 1982, Annual Report No. 3, edited by J. Sproull Thomson and C. Thomson, pp. 133-160. Historic Resources Division, Department of Culture Recreation and Youth, St. John's.

1984 Excavations at Boyd's Cove, Notre Dame Bay - 1983. Archaeology in Newfoundland and Labrador 1983, Annual Report No. 4, edited by J. Sproull Thomson and C. Thomson, pp. 98-125. Historic Resources Division, Department of Culture Recreation and Youth, St. John's.

1985 Excavations at Boyd's Cove - 1984: A Preliminary Report. Archaeology in Newfoundland and Labrador - 1984, Annual Report No. 5, edited by J. Sproull Thomson and C. Thomson, pp. 322-337. Historic Resources Division, Government of Newfoundland and Labrador, St. John's.

1986 The Locational Distribution of Aboriginal Sites on the Island of Newfoundland. Archaeology Papers, No. 1. Memorial University of Newfoundland, St. John's, in press.

Penney, Gerald
1980 A Report on an Archaeological Survey of Bay D'Espoir. Ms. on file, Queen Elizabeth II Library, Memorial University of Newfoundland, St. John's.

1981 A Preliminary Report on the Excavation of the L'Anse a Flamme Site (CjAx-1). Archaeology in Newfoundland and Labrador 1980, Annual Report No. 1, edited by J. Sproull Thomson and C. Thomson, pp. 95-110. Historic Resources Division, Department of Culture Recreation and Youth, St. John's.

1982 Archaeological Investigations on the south coast of Newfoundland, 1981. Archaeology in Newfoundland and Labrador 1981, Annual Report No. 2, edited by J. Sproull Thomson and C. Thomson, pp. 226-237. Historic Resources Division, Department of Culture Recreation and Youth, St. John's.

1985 The Prehistory of the Southwest Coast of Newfoundland. Unpublished Master's thesis, Department of Anthropology, Memorial University of Newfoundland, St. John's.

Peters, Stuart R.
1967 Our Land and Sea Mammals. In The Book of Newfoundland, Vol. III, edited by J.R. Smallwood, pp. 317-331. Newfoundland Book Publishers Ltd., St. John's.

Peterson, Roger Tory
1980 A Field Guide to the Birds East of the Rockies. Houton Mifflin Company, Boston.

Pinhorn, A.T. and R. Wells
1976 Cod Gadus morhua. In Living resources of Newfoundland - Labrador: Status and Potential, Bulletin 194, edited by A.T. Pinhorn, pp. 5-8. Fisheries Research Board of Canada, Ottawa.

Pippy, J.
1982 Report of the Working Group on the Interception of Mainland Salmon in Newfoundland. Canadian Manuscript Report of Fisheries and Aquatic Sciences 1654. Research and Resource Services, Department of Fisheries and Oceans, St. John's.

Robbins, Douglas
1985 Stock Cove, Trinity Bay: The Dorset Eskimo of Newfoundland from a Southeastern Perspective. Unpublished Master's thesis, Department of Anthropology, Memorial University of Newfoundland, St. John's.

1986 'Newfoundland Dorset' culture? Archaeology Papers No. 1. Memorial University of Newfoundland, St. John's, in press.

Rutherford, J.B., D.G. Wilder and H.C. Frick
1967 An Economic Appraisal of the Canadian Lobster Fishery. Bulletin 157. Fisheries Research Board of Canada, Ottawa.

Sanger, Chesley W.
1973 Technological and Spatial Adaptation in the Newfoundland Seal Fishery during the Nineteenth Century. Unpublished Master's thesis, Memorial University of Newfoundland.

Schwartz, F.
1984 The Little Passage Complex in Newfoundland: A Comparative Study of Assemblages. Unpublished Honour's dissertation, Department of Anthropology, Memorial University of Newfoundland, St. John's.

Scott, Peter J.
1975 Edible Fruits and Herbs of Newfoundland. Oxen Pond Botanic Park, Department of Biology, Memorial University of Newfoundland, St. John's.

Scott, W.B.and E.J. Crossman
1964 Fishes Occurring in the Fresh Waters of insular Newfoundland. Department of Fisheries, Queen's Printer, Ottawa.

Sergeant, D.E.
1965 Migrations of Harp Seals Pagophilus groenlandicus (Erxleben) in the Northwest Atlantic. Journal of Fisheries Research Board of Canada 22(2):433-464.

Shaulk, Randall F.
1977 The Structure of an Anadromous Fish Resource. In For Theory Building in Archaeology, edited by L.R. Binford, pp. 207-249. Academic Press, New York.

Spurrell, F.C.J.
1880 On Implements and Chips from the Floor of a Palaeolithic Workshop. Archaeological Journal 37:244-299.

Steele, D.H.
1983 Marine Ecology and Zoogeography. In Biogeography and Ecology of the Island of Newfoundland, edited by G. Robin South, pp. 421-465. Dr. W. Junk Publishers, Boston.

Struever, Stuart
1968 Problems, Methods and Organization: A Disparity in the Growth of Archaeology. In Anthropological Archaeology in the Americas, edited by B. Meggers, pp. 131-151. Anthropological Society of Washington, Washington.

Taylor, William E. Jr.
1971 An Archaeological Overview of Eskimo Economy. In Eskimo of the Canadian Arctic, The Carleton Library No. 41, edited by Victor F. Valentine and Frank G. Vallee, pp. 3-17. McClelland and Stewart Ltd., Toronto.

Thomas, David H.
1974 Predicting the Past: An Introduction to Anthropological Archaeology. Holt, Rinehart and Winston, New York.

1976 Figuring Anthropology. First Principles of Probability Statistics. Holt, Rinehart and Winston, Toronto.

1979 Archaeology. Holt Rinehart and Winston, Toronto.

Tuck, James A.
1975 Prehistory of Saglek Bay, Labrador: Archaic and Palaeo-Eskimo Occupations, Mercury Series Paper No. 32. Archaeological Survey of Canada, Ottawa

Tuck, Leslie M.
1967 The Birds of Newfoundland. In The Book of Newfoundland, Vol. III, edited by Joseph R. Smallwood, pp. 265-316. Newfoundland Book Publishers Ltd., St. John's.

Van Noten, Francis, Daniel Cahen and Lawrence Keeley
1980 A Paleolothic Campsite in Belgium. Scientific American 242(4):48-55.

Uerpmann, Hans-Peter
1972 Animal Bone finds and Economic Archaeology: A Critical Study of the 'Osteo-Archaeological Method'. World Archaeology 4(1):307-322.

Wedel, Waldo R.
1970 Antler Tine Scraper Handles in the Central Plains. Plains Anthropologist 15(47):36-45.

Williams H., F. Turner and C.M. Gilbert
1955 Petrography: An Introduction to the Study of Rocks in Thin Section. W.H. Freeman and Co., San Francisco.

Personal Communications

Brookes, Ian A.
1984 Department of Geology, York University, Toronto.

Gibson, John
1985 Department of Fisheries, Government of Canada, St. John's

Krol, Carol
1985 M.A. Candidate, Department of Anthropology, Memorial University of Newfoundland, St. John's.

Renouf, M.A.P.
1986 Department of Anthropology, Memorial University of Newfoundland, St. John's.

Robbins, Douglas
1984 M.A Graduate, Department of Anthropology, Memorial University of Newfoundland, St. John's.

Stevens, Robert K.
1983, 1984 Department of Geology, Memorial University of Newfoundland, St. John's.

Tuck, James A.
1986 Department of Anthropology, Memorial University of Newfoundland, St. John's.

Plate 1

Port au Port site, Carignan's 1975 excavations

a Beaches projectile point

b drill

c-g biface fragments

h-m end scrapers

n large ovoid biface fragment

o notched end scraper

p Dorset end of blade scraper

r Dorset microblade

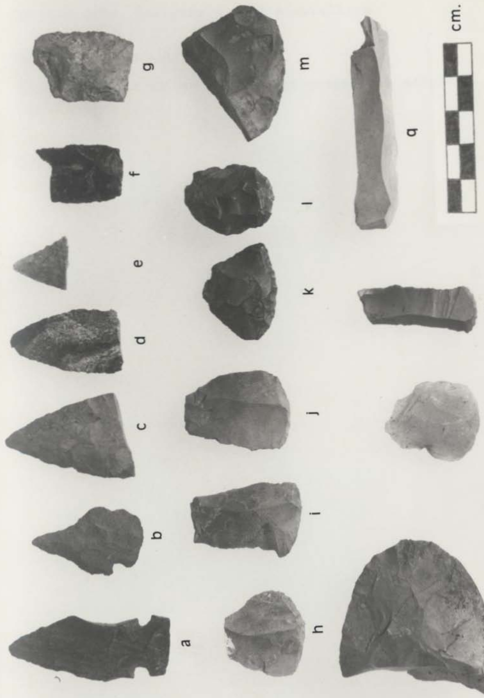


Plate 1

Plate 2

Isthmus site, Carignan's 1975 excavations

a Dorset end blade

b Little Passage expanding stemmed projectile point

Plate 2

Plate 3

Long Pond site

a Dorset end blade, side notched and tip fluted

b Dorset end blade, multiply notched

c-d Dorset end blades, triangular and tip fluted

e biface fragment

f notched end scraper

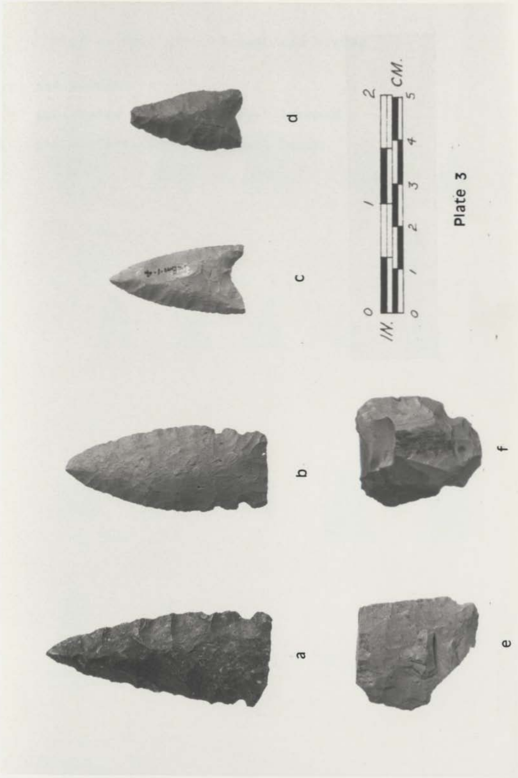


Plate 3

Plate 4

Port au Port site, Dorset end blades

a-p end blades

q-r end blades with 'incipient' notches

s end blade with ground basal facet

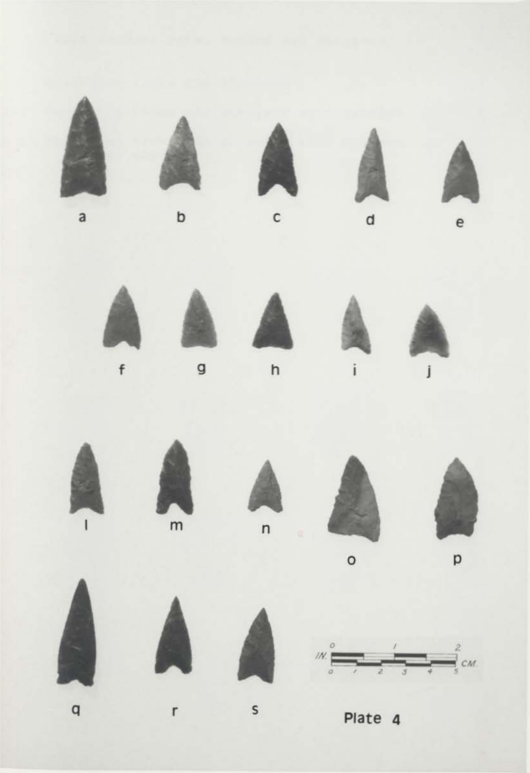


Plate 4

Plate 5

Port au Port site, Dorset end scrapers

a-l expanding flake end scrapers

m-p expanding flake end scrapers with notches

q-r expanding flake end scrapers with concave lateral edges

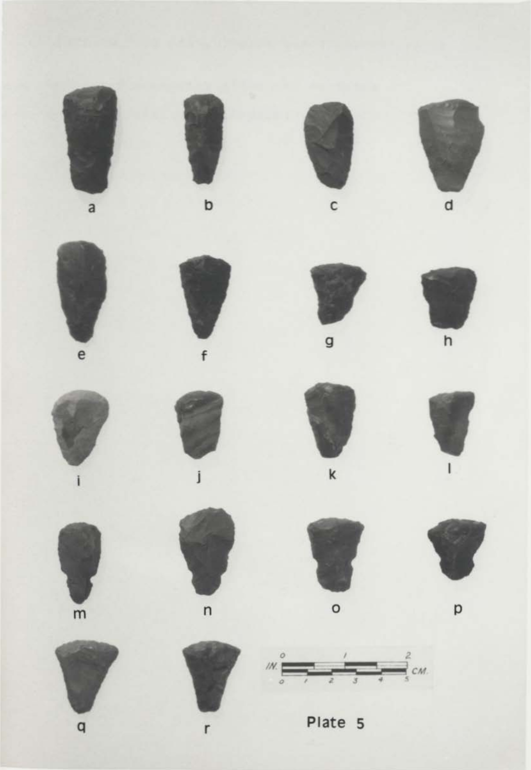


Plate 5

Plate 6

Port au Port site, Dorset end scrapers

a-w exhausted expanding flake end scrapers

x-z quartz crystal end scrapers

Plate 7

Port au Port site, Dorset chert microblade industry

a-e microblades

f-h microblades, 'backed with single notch

i-j microblades, notched

k-l end of blade scrapers

m-n concave side scrapers

o small multiply notched object

p 'micro-point'

q tabular core

r bipolar core

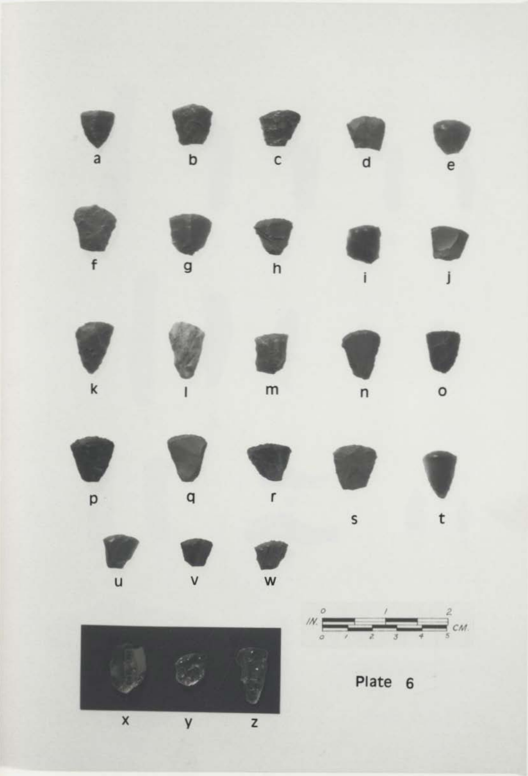


Plate 6

Plate 7

Plate 8

Port au Port site, Dorset quartz crystal microblade industry

a–e microblades

f–j microblades, 'backed with single notch

k microblade, stemmed

l microblade, single shoulder

m–o microblade, notched

p quartz crystal block with several ridge flakes detached

q wedge shaped quartz crystal core

r 'crystal' core

Plate 8

Plate 9

Port au Port site, Dorset biface industry

a lanceolate biface, (projectile point?)

b asymmetrical notched biface

c exhausted adze

d-m biface fragments

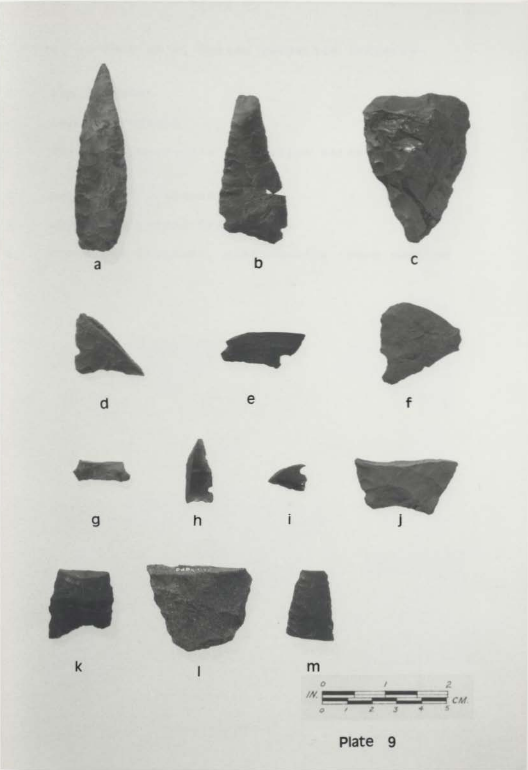


Plate 9

Plate 10

Port au Port site, Dorset soapstone industry

a rim fragment

b corner fragment

c thick fragment with depression interrupted by break

d perforated fragment

e soapstone vessel fragment

f soapstone fragment, plano-convex cross section.

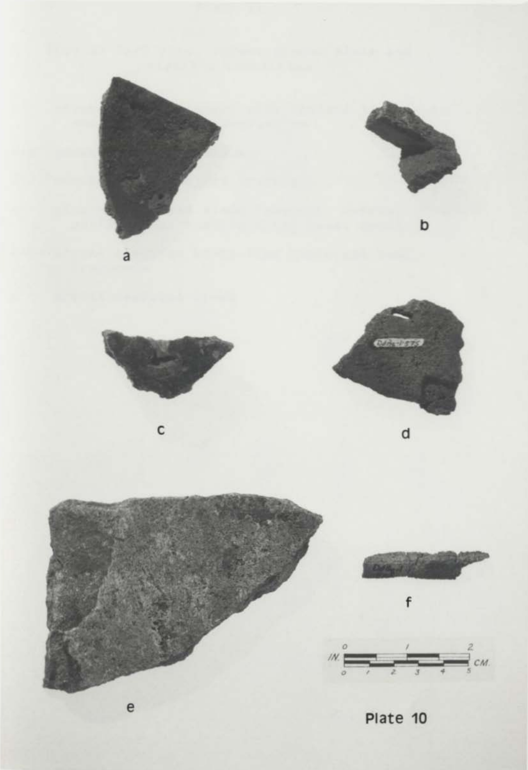


Plate 10

Plate 11

Port au Port site, Dorset ground slate and nephrite industries

a ground slate fragment with incised lines and shallow T shaped depression

b–c ground slate fragments

d notched ground slate fragment

e ground slate end blade fragment, notched with perforations visible along basal break

f–o ground nephrite burin-like tools and tool fragments

p ground nephrite block

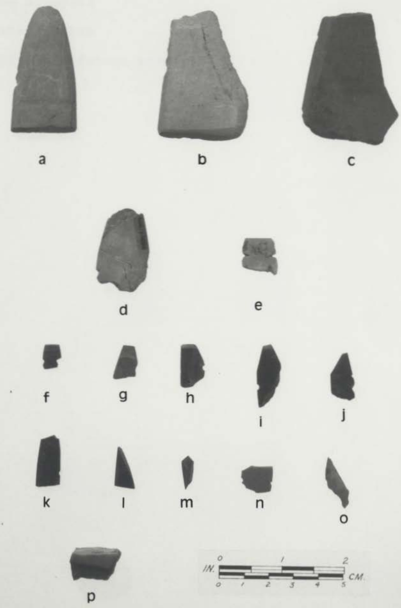


Plate 11

Plate 12

Port au Port site, miscellaneous Dorset tools

a–d side scrapers

e–f worked flakes

g tabular sandstone abrader

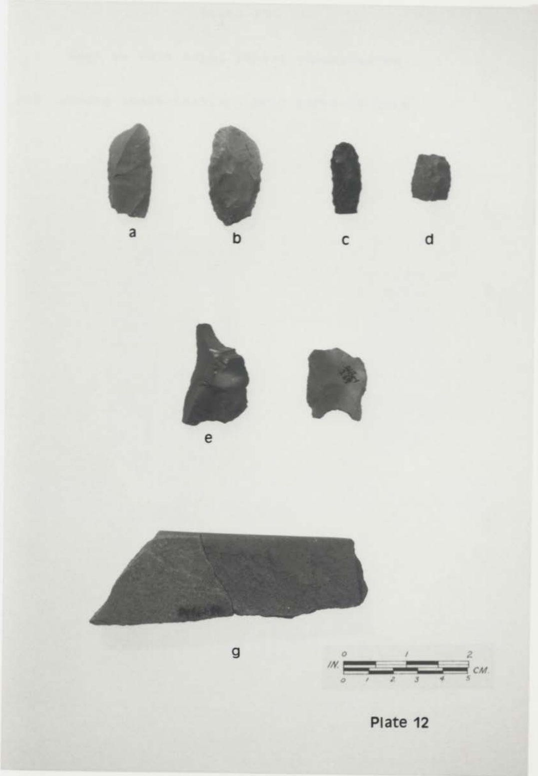


Plate 12

Plate 13

Port au Port site, Dorset hammerstones

a-b oblong beach cobbles, peck marks at ends

Plate 13

Plate 14

Port au Port site, Dorset hammerstone and cobble adze

a round beach cobble, peck marks around circumference and in center

b cobble adze

a

b

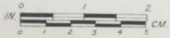


Plate 14

Plate 15

Port au Port site, Little Passage diagnostic industries

a-f corner-notched projectile points

g-j triangular bifaces

k-n end scrapers

o-r linear flakes

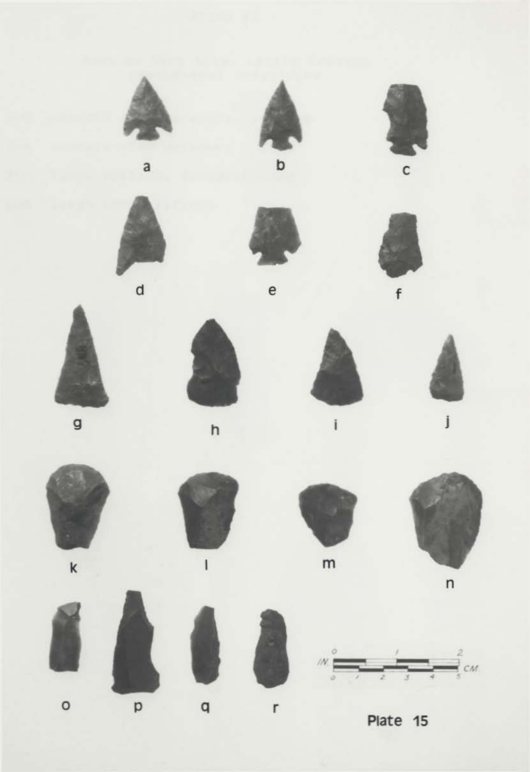


Plate 15

Plate 16

Port au Port site, Little Passage provisional industries

a–b concave side scrapers, stemmed

c–e concave side scrapers

f large uniface, scraper/plane

g–h large ovoid bifaces

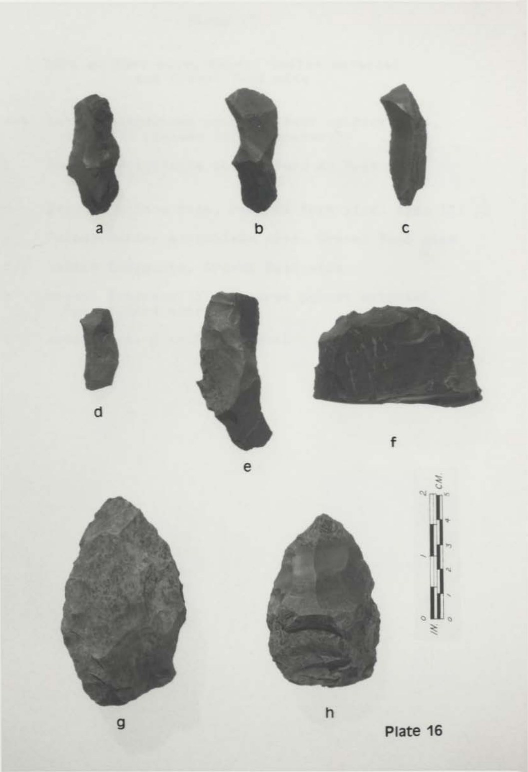


Plate 16

Plate 17

Port au Port site, Recent Indian material
and Gravel Pond site

a-b tabular sandstone abrader, Port au Port site, Area III (Recent Indian context)

c Beaches projectile point, Port au Port site, Area III

d Beaches biface base, Port au Port site, Area III

e Palaeo-Eskimo microblade core, Gravel Pond site

f-g biface fragments, Gravel Pond site

h vessel fragment(?) of coarse porous material, Gravel Pond site

i chert core, Gravel Pond site

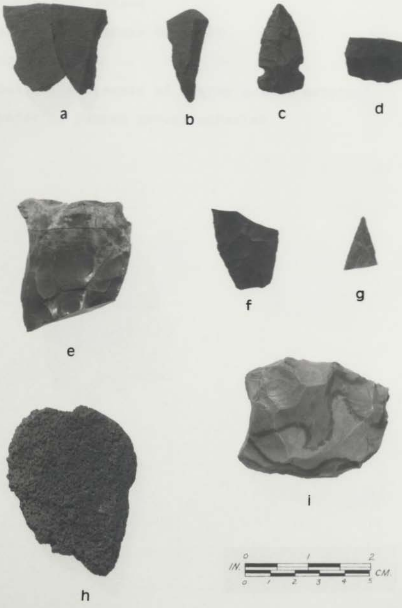


Plate 17

Plate 18

Long Point site

a asymmetrical biface

b asymmetrical biface fragment

c microblade

d-e vessel(?) fragments of coarse porous material

f abrader of coarse porous material

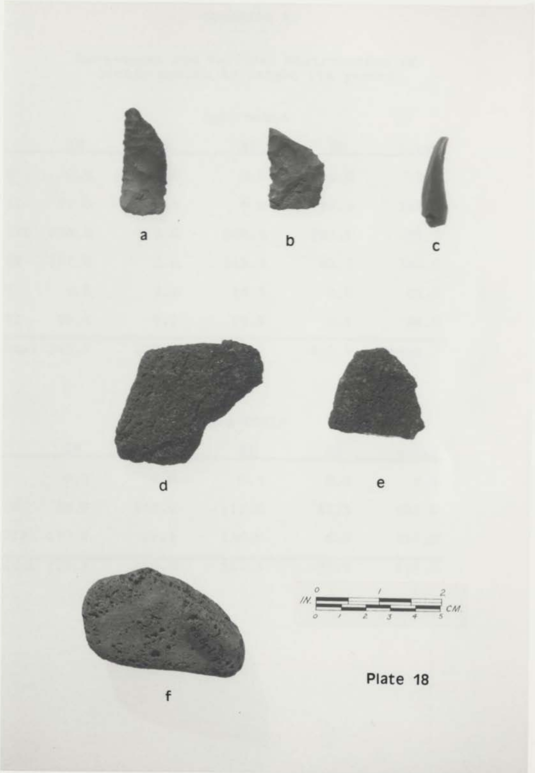


Plate 18

Appendix 1

Horizontal and vertical distribution of lithic debris by weight (in grams)

Unit N6E14

	SE	SW	NE	NW	total
I	0.5	10.0	0.2	0.0	10.7
II	71.0	101.0	0.0	92.5	264.5
III	106.0	116.0	268.0	263.5	735.5
IV	152.0	5.0	116.5	60.5	334.0
V	6.5	0.0	18.5	0.0	25.0
VI	29.5	0.0	19.5	0.0	49.0
total	365.5	232.0	422.7	416.5	1436.7

Unit N5E13

	SE	SW	NE	NW	total
I	0.5	0.0	0.5	0.0	1.0
II	78.0	148.0	111.0	57.5	395.0
III	170.0	11.5	136.0	0.0	317.5
total	248.5	160.0	247.5	57.5	713.5

Unit N4E14

	SE	SW	NE	NW	total
III	277.0	243.5	195.5	175.5	891.0
IV	54.0	7.5	86.0	29.5	177.0
V	7.5	0.0	21.0	4.5	33.0
total	338.5	250.5	302.5	209.5	1101.0 +92.0* 1193.0

* from pedistal in south wall, levels II and III

Unit N3E13

	SE	SW	NE	NW	total
I	18.5	0.5	0.5	12.5	32.0
II	17.0	15.0	0.5	115.0	147.5
III	93.5	88.0	315.0	126.5	623.0
IV	0.5	0.0	61.5	20.0	82.0
total	129.5	103.5	377.5	274.0	884.5

Unit N2E14

	SE	SW	NE	NW	total
III	138.0	68.0	82.7	56.0	344.7
IV	88.5	68.5	63.5	27.0	247.5
V	32.5	24.0	34.0	118.5	209.0
VI	0.0	8.0	8.0	0.0	16.0
VII	0.0	3.0	0.0	3.5	6.5
total	259.0	171.5	188.2	205.0	823.7 +56.5* 880.2

*provenience within unit uncertain

Unit N2E12

	SE	SW	NE	NW	total
I	0.1	0.0	0.0	0.1	0.2
II	33.0	28.0	61.0	22.5	144.5
III	97.5	67.0	89.5	17.0	271.0
IV	0.5	0.0	0.0	0.0	0.5
total	131.1	95.0	150.5	39.6	417.2

Unit N1E13

	SE	SW	NE	NW	total
II	12.0	0.0	2.0	18.0	32.0
III	91.5	88.5	114.0	178.0	472.0
IV	96.0*	69.5	147.5	122.0	435.0
V	56.0	114.0	65.0	25.5	260.5
VI	0.0	4.0	13.5	0.0	17.5
total	255.5	276.0	342.0	343.5	1217.0

* includes 1 Ramah chert flake

Unit N0E14

	SE	SW	NE	NW	total
III	72.5	69.0	79.5	75.5	269.5
IV	39.5	97.0	53.0	38.5	228.0
V	5.5	33.5	1.5	31.5	72.0
total	117.5	199.5	134.0	145.5	596.5 +12.0* 608.5

* provenience within unit uncertain

Unit S2E14

	SE	SW	NE	NW	total
I	0.0	0.0	0.0	0.5	0.5
II	1.0	40.5	0.2	28.0	69.7
III	166.0	121.5	167.5	88.5	543.5
IV	74.0	121.0	80.5	41.0	316.5
V	67.5	0.0	14.0	0.0	81.5
total	308.5	283.0	262.2	158.0	1011.7

Unit N36W28

	SE	SW	NE	NW	total
I	0.5	0.0	0.5	0.5	1.5
II	48.5	27.0	19.0	14.5	109.0
III	35.0	100.5	31.0	84.0	250.0
IV	20.5	16.0	0.0	92.5	160.0
total	104.5	134.5	81.5	191.5	521.0

Unit N37W28

	SE	SW	NE	NW	total
II	11.5	59.0	13.0	14.0	97.5
III	39.5	95.5	16.5	6.5	158.0
IV	118.5	7.0	0.0	16.5	142.0
total	169.5	161.5	28.5	37.0	397.5

Unit N36W29

	SE	SW	NE	NW	total
I	0.0	0.2	0.0	0.0	0.2
II	0.5	2.5	108.0	16.0	127.0
III	67.5	204.5	300.5	418.5	991.0
IV	63.0	80.0	0.0	0.0	143.0
V	21.0	49.5	0.0	0.0	70.5
total	152.0	336.7*	408.5	434.5	1331.7

* due to overlap with Test Trench B, an unknown portion of the test's 514.5 grams of debris are from this quadrant

Unit N37W29

	SE	SW	NE	NW	[redacted]
I	0.0	0.0	0.0	0.2	0.2
II	4.5	0.0	8.5	17.0	30.0
III	168.0	109.0	119.5	159.0	555.5
IV	0.0	25.0	0.0	0.0	25.0
total	172.5	134.0	128.0	176.2	610.7

Appendix 2

Summary of trace element data (in parts per million)

Provenience	Sample #	Elements							
		PB	U	TH	RB	SR	Y	ZR	NB
Geological sources									
Port au Port East Bay	DS-1	31	0	12	0	43	11	5	5
	DS-2	88	5	11	0	31	8	3	9
	DS-27+29	138	0	0	16	29	16	33	10
Port au Port West Bay	DS-3	2	0	5	12	56	28	29	4
	DS-4	14	7	16	5	51	4	0	2
	DS-5	20	3	12	6	51	7	0	4
	DS-15	16	6	22	16	52	10	4	14
	DS-16	6	0	14	5	43	6		4
	DS-28	37	0	7	28	41	15	30	16
Cow Head	CH-1	11	0	10	0	44	11	0	1
	CH-3	23	4	18	12	39	4	0	2
	CH-4	17	7	18	18	45	9	8	4
	CH-5	15	24	24	13	48	10	2	4
	CH-10	24	5	16	14	65	7	3	1
Archaeological Sources									
Port au Port Little Passage	DS-9	12	19	17	1	39	7	1	3
	DS-10	16	10	10	6	58	7	3	4
Port au Port exotic Dorset	DS-17	1	3	21	0	77	22	0	30
Burgeo	DS-6	17	7	21	2	58	9	0	13
L'Anse a Flamme	DS-17	17	15	15	3	42	12	0	20
Stock Cove	DS-8	9	13	18	11	130	37	84	22
Frenchman's Island	DS-12	24	15	30	159	139	40	229	18
Boyd's Cove	DS-13	14	3	22	9	48	7		13

Provenience	Sample #	GA	ZN	CU	NI	LA	TI	BA
		Elements						
Geological sources								
Port au Port East Bay	DS-1	0	0	33	0	2	0.19	3528
	DS-2	1	72	15	55	23	0.12	333
	DS-27+29	7	105	30	27	0	0.18	241
Port au Port West Bay	DS-3	3	18	4	1	35	0.15	388
	DS-4	1	0	6	0	14	0.06	499
	DS-5	1	0	13	0	12	0.06	226
	DS-15	0	0	4	48	15	0.10	544
	DS-16		6	30	0	12	0.09	957
	DS-28	7	27	29	10	0	0.18	485
Cow Head	CH-1	0	0	5	0	15	0.03	154
	CH-3	3	0	9	9	21	0.04	151
	CH-4	3	20	18	7	24	0.13	215
	CH-5	1	22	8	3	9	0.06	176
	CH-10		52	11	0	16	0.10	356
Archaeological Sources								
Port au Port Little Passage	DS-9	0	0	0	0	20	0.08	401
	DS-10		0	3	0	12	0.07	555
Port au Port exotic Dorset	DS-17		0	0	81		0.00	478
Burgeo	DS-6	0	0	6	42	11	0.07	558
L'Anse a Flamme	DS-17	1	0	2	50	13	0.04	382
Stock Cove	DS-8	7	11	0	50	23	0.12	356
Frenchman's Island	DS-12	10	37	6	34	41	0.45	1633
Boyd's Cove	DS-13		10	1	48	18	0.07	543

Provenience	Sample #	Elements V	CE	CR
Geological sources				
Port au Port East Bay	DS-1	0	36	21
	DS-2	5	8	238
	DS-27+29	44	73	82
Port au Port West Bay	DS-3	21	68	18
	DS-4	0	49	13
	DS-5	15	28	20
	DS-15	0	39	244
	DS-16	0	15	18
	DS-28	34	73	6
Cow Head	CH-1	0	29	18
	CH-3	0	9	26
	CH-4	90	24	31
	CH-5	23	26	19
	CH-10	15	16	22
Archaeological Sources				
Port au Port Little Passage	DS-9	0	31	19
	DS-10	0	35	15
Port au Port exotic Dorset	DS-17	0	52	308
Burgeo	DS-6	0	39	224
L'Anse a Flamme	DS-17	0	28	251
Stock Cove	DS-8	0	43	246
Frenchman's Island	DS-12	6	89	131
Boyd's Cove	DS-13	0	21	229

Appendix 3

Variability of complete Dorset expanding flake end scrapers (chert specimens only)

Retouch Characteristics	2 sharp corners	1 round and 1 sharp corner	2 round corners	total
Two side notches*:				
bilateral unifacial (dorsal)	0	0	1	1
bilateral bifacial	2	0	0	2
unifacial (dorsal)/ bifacial	0	1	0	1
Single notch*:				
bilateral unifacial (one edge dorsal, one edge ventral)	0	1	0	1
No notches:				
un-retouched	3	2**	0	5
unilateral unifacial (dorsal)	3	2***	1	6
unilateral unifacial (ventral)	1	0	1	2
unilateral unifacial (dorsal and ventral along same edge)	0	0	1	1
unilateral unifacial (dorsal) with bulb reduction	1	0	0	1
bilateral unifacial (dorsal)	15****	5	6	26
bilateral unifacial (dorsal and ventral along same edge)	0	0	1	1
bilateral unifacial (one edge dorsal, one edge ventral)	2	1	1	4
bilateral unifacial (dorsal) with bulb reduction	4	0	4	8
unilateral bifacial	1	0	0	1
unifacial (dorsal)/ bifacial	1	0	2	3
unifacial (dorsal)/ bifacial with bulb reduction	3	1	1	5
bilateral bifacial	1	0	3***	4
bilateral bifacial with bulb reduction	1****	1	0	2
total	38	14	22	74

* excluded from Tables 7 and 8

** one with bifacial working edge opposite striking platform

*** one with bifacial working edge

**** one with concave sides

Appendix 4

Summary of faunal recoveries

Port au Port site, Dorset component

Taxonomic Identification	Element	n=
Uria sp. (thick billed or common murre)	humerus (r)	1*
	humerus (1)	1
	radius (1)	1
	ulna (1)	1
R. tarandus (woodland caribou)	mandible and dentition	1
P. vitulina (harbor seal)	petro-tympanic (1)	2
	petro-tympanic (r)	3*
P. groenlandica (harp seal)	auditory meatus and jugular process (r)	1*
	petro-tympanic (r)	1*
	petro-tympanic, bulla, and jugular process (1)	1
P. hipsida (ringed seal)	astragalus (1)	1
	bulla (1)	1*
	calcaneum (r)	1
	petro-tympanic (1)	1*
	petro-tympanic and bulla (1)	1*
Phocidae	acetabulum (r)	1
	acetabulum (1)	2
	canine tooth	1
	humerus (r)	2
	innominate (r)	1
	metacarpal	1
	metatarsal	2+
	petro-tympanic (r)	1
	phalange	1
	phalanx I	2
	phalanx II	2
	phalanx	1
	palate	1
	palate and sphenoid (r)	1
	tibia (1)	1
	vertebra	1
	zygomatic arch (1)	1

* denotes elements used in MNI counts

Port au Port site, Dorset component (continued)

Taxonomic Identification	Element	n=
Pinnipedia		
	vertebra	1
Cetacian		
	bulla (1)	1
	petro-tympanic (1)	1
large sea mammal		
	lumbar vertebra	1
C. canadensis (American beaver)	molar tooth	2
M. americana (american marten)	mandible (1)	1*
	mandible and dentition (1+r)	1*
	maxilla and dentition (1+r)	1

Port au Port site, Little Passage component

Taxonomic Identification	Element	n=
H. leucocephalus (bald eagle)	Phalanx III	8*
Alcidae		
	humerus (r)	1*
	humerus (1)	1
Aniseriform (small goose or large duck)	bill	1
	carpometacarpus (r)	1*
	carpometacarpus (1)	1
	phalanx II	1
R. tarandus (woodland caribou)	astragalus (r)	3*
	astragalus (1)	1
	calcaneum (r)	2
	metapodial	1
	metatarsal (1)	1
	M_1 (1)	2
	M_3 (1)	1
	molar tooth	2
	P_4 (r)	2
	premolar	1
	scapula	1
	sessamoid	1
	tibia (1)	1
	phalanx II	2

* denotes elements used in MNI counts